

GRAND
ACTION
REGULATION



Step 1 of 37



ACTION SCREWS (TIGHTEN)

Purpose:

- > To provide a solid foundation so that regulation will stay stable for a long time
- > To eliminate unnecessary noise
- > To allow the moving parts to be in correct relationship to each other

Standard or Specification:

Hand tight, very snug

Inspection of Present Situation:

Check all screws in the hammer rail, wippen rail, damper rail and under the key frame

Corrective Measures:

Center screwdriver in slot and tighten

Final Check:

Same as corrective measures

Tools:

Screwdriver

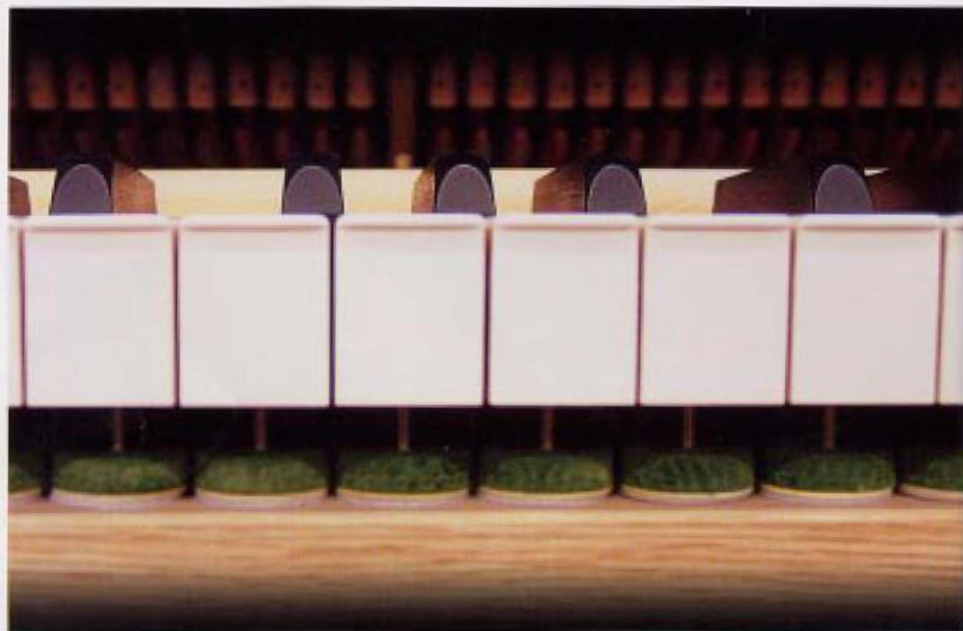


Caution:

1. When tightening a screw, do not let the part move out of position.
2. Not so tight as to compress wood or strip the thread.
3. Don't let screwdriver slip and mar the screw head or scratch the surrounding area.
4. Be careful not to scratch the front beam when the action is in vertical position.
5. If overturned, replace with a larger size, self-tapping screw.



Step 2 of 37



KEY FRAME - FRONT RAIL

Purpose:

- > To provide a solid foundation for regulation; to allow for solid feeling of touch by the musician; and to remove noise. (Independent unit, because of the need to shift for pianissimo playing.)

Standard or Specification:

- > Keybed and front rail should touch each other along the total contact area.

Inspection of Present Situation:

- > Remove action, loosen angled screws

first, remove keys, replace action, tighten angled screws last.

- > Raise all bedding screws until they no longer touch the keybed. Some bedding screws must be adjusted from the underside of the key frame using needle nose pliers or key frame bedding tool.
- > Put key frame and action in place and tighten key blocks.
- > Tap front rail, and listen for a "knock" type sound.

Corrective Measures:

If the "knock" is at each end, adjust screw (in each keyblock) for adequate down pressure on the guide pin. For other areas, place a strip of sandpaper between keyframe and keybed with cutting surface upward. Carefully remove wood from the keyframe, in the areas that don't "knock".

Final Check:

Test for "knocking" by tapping.



Caution!

Check the level of the keybed. If unlevel, remove excess wood.

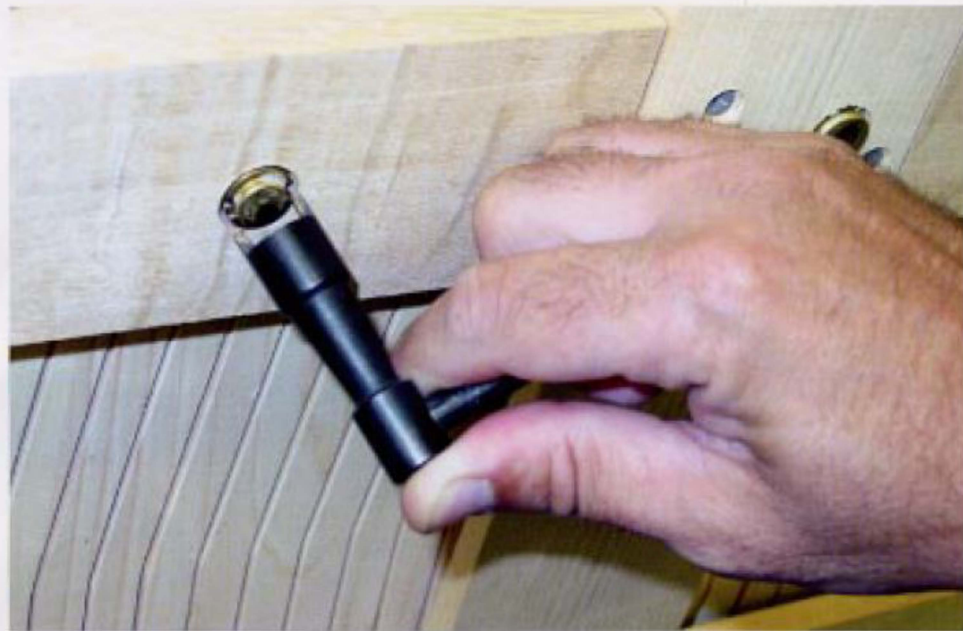
Tools:

1. Tuning Hammer or
Keyframe Bedding Tool
2. Sandpaper
3. Needle Nose Pliers.



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Step 3 of 37



KEY FRAME - CENTER RAIL

Purpose:

- > To provide a solid foundation for regulation, to allow for solid feeling of touch by the musician, and to remove noise. (Independent unit because of need to shift for pianissimo playing.)

Standard or Specification:

- > No space between keybed and all bedding screws.

Inspection of Present Situation:

- > No reason to check present situation because in Step #2 we have already raised all of the bedding screws; but if you're analyzing a piano without removing the keys, tap on the keys at the balance rail, and listen for a "knocking" sound.

Corrective Measures:

Either by knocking or by paper method - Turn bedding screw at far left, then turn #2. Check #1 and #2 then set #3. Check #1, 2, 3, then set #4, etc. Another approach could be to start at the mid-treble, and work toward the ends. After all from the top are set, then adjust the two (2) underneath (if equipped.)

Final Check:

With keyblocks in place and securely fastened, tap from above and below at both center and front rail. Listen for any "knocking" sound. (Grasp balance rail stud and lift slightly.)



Caution!

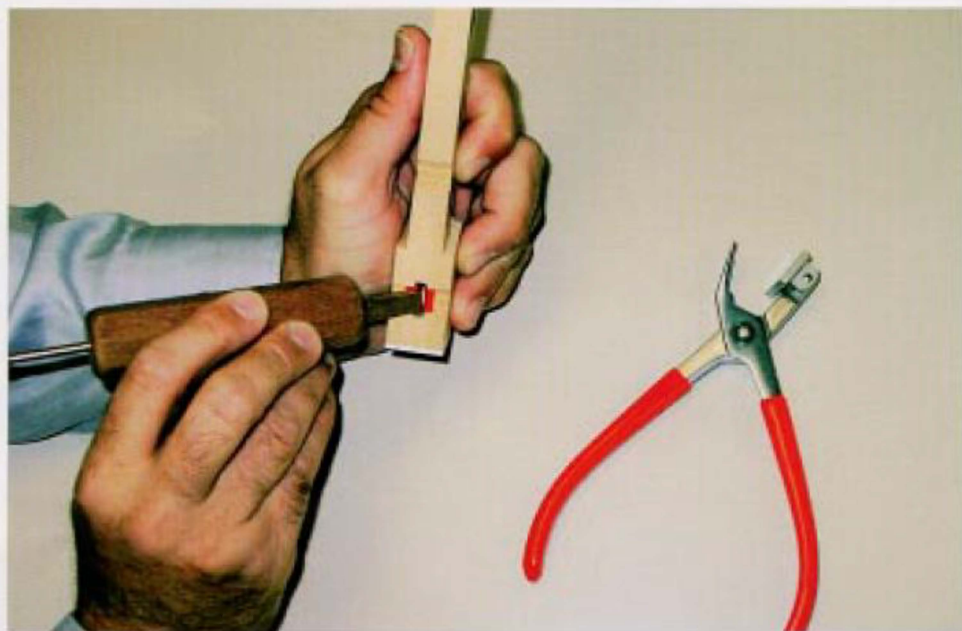
Do not raise the center rail so far as to lift the front rail from the keybed.

Tools:

1. Tuning Lever or Keyframe Bedding Tool
2. Needle Nose Pliers
3. Strip of paper



Step 4 of 37



KEYS - FRONT BUSHING

Purpose:

- > To provide smooth movement of the keyboard; and at the same time, hold the key in a stable, firm position.

Standard or Specification:

- > 0.3 mm lateral movement with key depressed. (Small but definite movement.)

Inspection of Present Situation:

- > 1. Remove the action, and replace the keys.
- 2. Depress and check each key by moving it from side to side.

Corrective Measures:

If the key is tight, check first to see if the front rail pin is straight, not turned. If the movement is too small, use key easing pliers or CF tool in the usual manner.

If the movement is too large:

- (1) Small amount, compress the wood by using the CF tool.
- (2) Larger amount, turn the front rail pin.

Final Check:

Check by moving each key from side to side.



Caution!

1. Do not squeeze too tightly with the pliers.
2. Check front rail pin; it must be smooth and polished.

Tools:

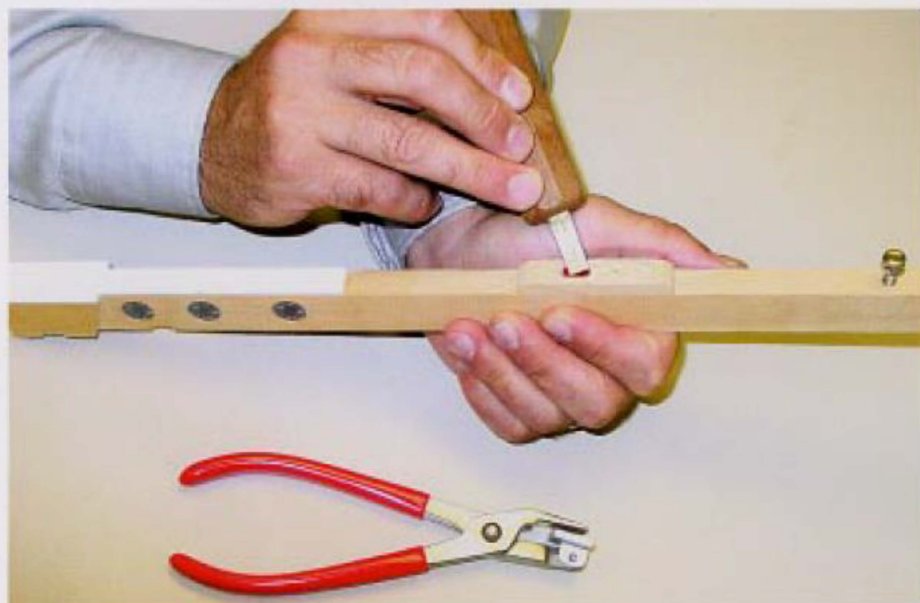
1. Key Pliers
2. Special CF Tool
3. Front Pin Regulating Tool



Step 5 of 37



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KEYS - CENTER BUSHING

Purpose:

- > To provide smooth movement of the keyboard; and at the same time, hold the key in a stable, firm position.

Standard or Specification:

- > 0.1 mm - 0.2 mm lateral movement.

Inspection of Present Situation:

- > 1. Move the key in a side to side twisting motion by grasping key at the front and rotating the wrist.
- 2. Observe condition of balance rail pins.
- 3. Observe condition of felt.

Corrective Measures:

If too tight, use key pliers or CF tool.

If too loose, re-bush.

If lubrication is necessary, use silicone oil on the center rail pin.

Final Check:

Same as inspection.



Caution!

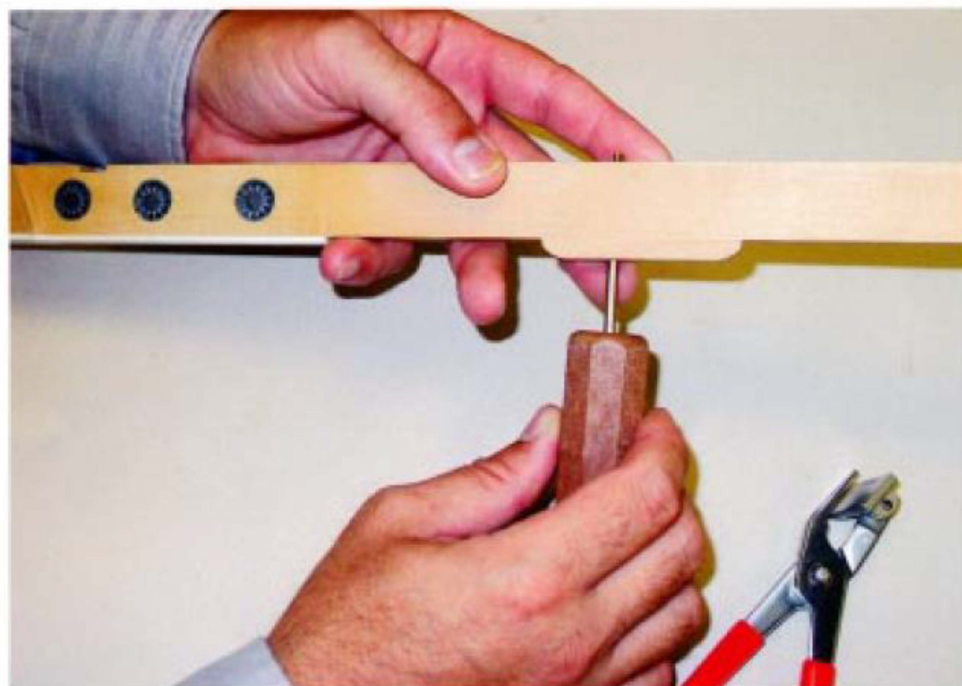
1. Avoid excessive use of key pliers.
2. Check center rail pin; it must be smooth and polished.

Tools:

1. Key Pliers
2. CF Tool



Step 6 of 37



KEYS - BALANCE PIN HOLE

Purpose:

- > To provide smooth movement of the keyboard and at the same time, hold the key in a stable, firm position

Standard or Specification:

- > No space (No movement of key)

Inspection of Present Situation:

- > 1. TIGHT: Raise front of key 10mm (it should slide down by its own weight)
- 2. LOOSE: Try to move the key forward and back (no movement allowed)
(If action is off, raise key without tilting by lifting both ends simultaneously)

Corrective Measures:

1. Use special tool for tightness
2. For looseness...
 - a. Small amount:
Burnish bottom of key
 - b. Larger amount:
Steam or water

Final Check:

Same as inspection



Caution!

1. Be very careful not to make the hole too large
2. Proceed slowly with care – several small adjustments are preferable to achieve specifications

Tools:

Special CF Tool

Step 7 of 37



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ACTION CENTERS

Purpose:

- > To produce a uniform, noise free, solid action movement with as little friction as possible.

Standard or Specification:

- > Generally speaking, flanges should have free but firm movement. One good rule is the flange should not drop of its own weight.

Inspection of Present Situation:

- > For general observation of hammer flanges, lift a number of shanks upward and let them drop. Look for sluggishness. Move hammer laterally to test for looseness. For specific problems, remove the part and test individually with the screw in the flange. In the case of the jack, unhook the spring from the repetition lever and move the jack back and forth with your finger.

Corrective Measures:

1. TOO LOOSE: Re-pin with a larger pin.
2. TOO TIGHT (Small amount): Use silicon oil and naptha, at a ratio of 1:7
3. TOO TIGHT (Larger amount): Remove pin, ream bushings, re-pin.

Final Check:

Same as inspection



Caution!

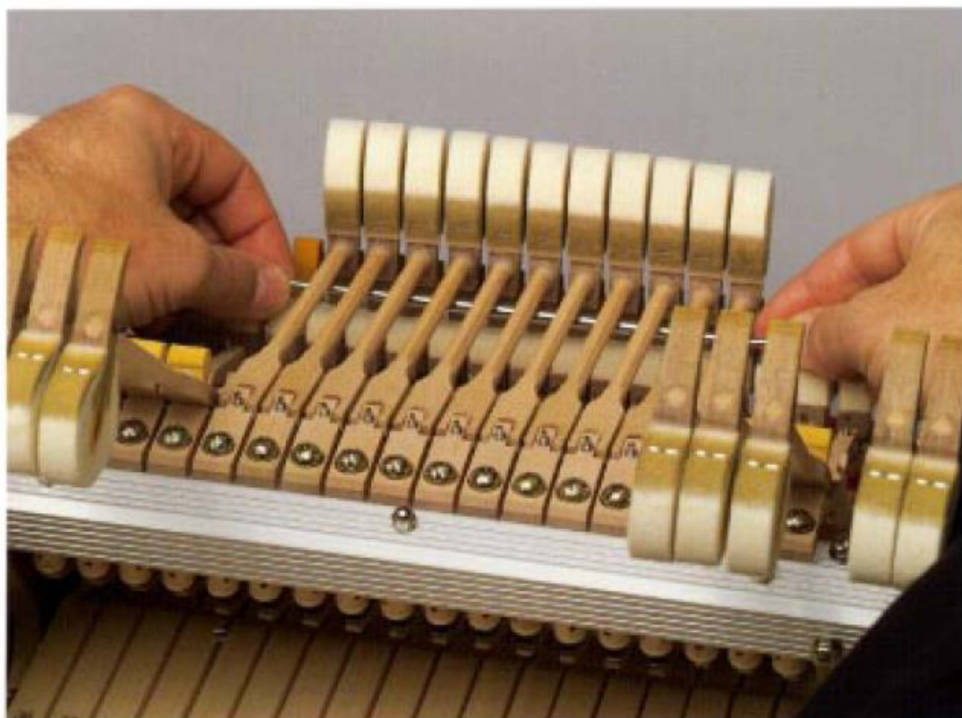
If there is too much space between the flange and the bird's eye of the shank, change the flange.

Tools:

1. Screwdriver
2. Spring Hook
3. Reamer
4. Pin Punch



Step 8 of 37



✦ TRAVEL HAMMERSHANKS

Purpose:

- > To allow hammers to move in a perpendicular motion from the keyboard

Standard or Specification:

- > Hammer spacing should be the same, whether at rest or at the top of the stroke

Inspection of Present Situation:

- > Lift a number of hammer shanks with a screwdriver blade and observe possible lateral movement of individual hammer

Corrective Measures:

Place a piece of traveling paper between flange and rail on same side of screw as hammer moves laterally. Amount of travel can be adjusted by length of paper used under flange. (And by thickness of paper. Paper less than full flange should start under flange end nearest the center of pin.)

Final Check:

Same as inspection. Continue to correct until no lateral movement exists.



Caution!

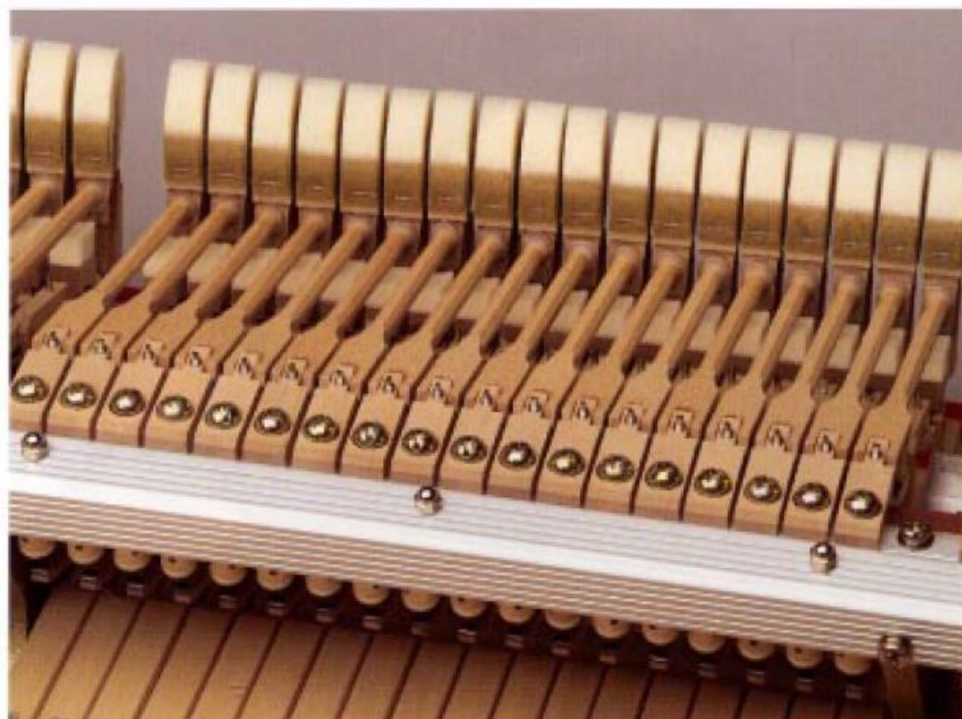
Check very carefully. This point is very important.

Tools:

1. Screwdriver
2. Straight Edge
3. Travel Paper



Step 9 of 37



HAMMER ANGLE

Purpose:

- > For the best transfer of power, the center of the striking surface of the hammer should be on a vertical line above the center of the shank.

Standard or Specification:

- > Symmetry and uniformity with adjoining (correctly angled) hammers.

Inspection of Present Situation:

- > Carefully observe and compare spaces between hammers both at top and bottom when the hammers are at rest and when one is raised. Check for uniformity and symmetry. Bass hammers need very careful observation.

Corrective Measures:

Apply hot air from a heat gun all along shank. Twist hammer shank by putting a gentle twisting motion to hammer head in opposite direction.

Final Check:

Same as inspection.



Caution!

1. Do not burn shank.
2. If shank is not properly heated (still too cold) it is possible to break the shank or injure the center pin area of the flange.

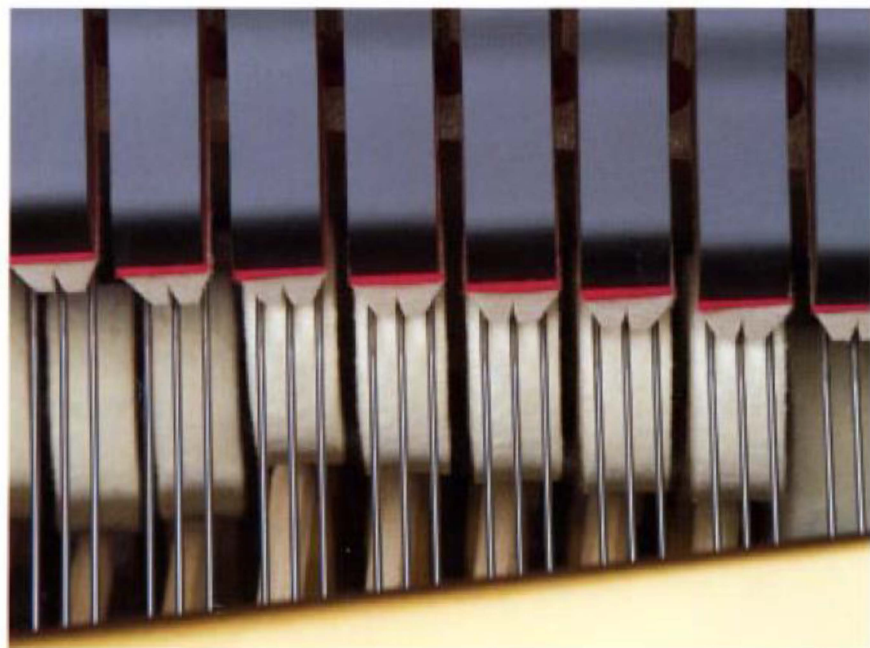
Tool:

Heat Gun

Step 10 of 37



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TRAVEL HAMMERSHANKS

Purpose:

- > A hammer that is centered under the strings will deliver the most power without loss and will be in correct position for the soft pedal adjustment.

Standard or Specification:

- > The center of all hammers should be at the center of string group when striking.

Inspection of Present Situation:

- > Place your finger on the jack and block the hammer against the string. Observe the position. Use a mirror for the high section.

Corrective Measures:

If all spacing is found to be incorrect in one direction, make the correction at the keyframe stop block. If only a few, mark the offenders with chalk, loosen the flange screw, move to the correct position, and tighten the screw.

Final Check:

Check the marked ones only. Use same method as inspection. When correct, remove the chalk mark. If incorrect, do not remove the mark, and repeat corrective measure.



Caution!

Check hammer spacing at the same time. If hammers are properly traveled and aligned to strings, spacing should be correct. If errors are noted, string spacing must be done.

Tools:

1. Screwdriver
2. Mirror
3. Chalk



Step 11 of 37



HEIGHT OF WHITE KEYS

Purpose:

- > To provide correct key movement to fulfill leverage requirements dictated by engineering design
- > To provide the physical condition for the action to fit into the piano
- > To provide for the beauty of uniformity

Standard or Specification:

- > Underside of the white key covering should be 64mm above the keybed. CF measurement is 66mm

Inspection of Present Situation:

- > Measure from the keybed to the underside of the key covering on sample keys #1 and #88 and compare with standard; if you use a short straight edge, appropriate additional samples must be set

Corrective Measures:

Estimate the punching size required to correct the present situation. Remove the action, raise it to a vertical position, and from under the keyframe (with tweezers) remove or insert properly cut punching.



Caution!

1. Be careful not to scratch the front beam when the action is in its vertical position.
2. Hammershanks should not rest on cushion felt. After setting keys on balance rail, check height again.

Tools:

1. Machinist's Scale
2. Tweezers

Step 12 of 37



LEVEL OF WHITE KEYS

Purpose:

- > To provide correct key movement to fulfill leverage requirements dictated by engineering design
- > To provide proper physical condition for the action to fit into the piano
- > To provide for the beauty of uniformity

Standard or Specification:

- > Keys must form a straight, level line, parallel to the keybed; Height: same as samples set in Step 11

Inspection of Present Situation:

- > Compare key level with straight edge. In addition to key level, look for any tilting of the keys

Corrective Measures:

1. Remove any tilt by manipulating the top of the balance rail pin, using your straight edge to tap the pin.
2. Estimate the punching size required, and mark the front rail with chalk. Raise the action to the vertical position, and correct as per instructions for height of key samples (Step 11). If many changes are necessary, save time and effort by removing the action and keys, and adding the punchings from the top.

Final Check:

Remove all chalk marks. Repeat procedures until sighting across keys from both ends, Key 1–Key 88, shows exact evenness of side edges of white keys. Prior to this test, depress all the keys with a glissando type motion.



Caution!

1. Don't raise the key too high and force an enlargement of the balance pin hole.
2. Double-check key easing (steps 4–6).
3. After setting keys on balance rail, check level again.

Tools:

1. Straight Edge
2. Tweezers
3. Punchings
4. Scissors



Step 13 of 37



HEIGHT OF BLACK KEYS

Purpose:

- > To provide correct key movement to fulfill leverage requirements dictated by engineering design.
- > To provide proper physical condition for the action to fit into the piano.
- > To provide for the beauty of uniformity

Standard or Specification:

- > Top of black key to top of white key: 12mm (at front of key)

Inspection of Present Situation:

- > Measure as close to the front of the black keys as is practical. Look for any tilt in the keys.

Corrective Measures:

1. Remove any tilt by manipulating the top of the balance rail pin, using your straight edge to tap the pin.
2. Estimate the punching size required, and mark the front rail with chalk. Raise the action to the vertical position, and correct as per instructions for height of key samples (step 11). If many changes are necessary, save time and effort by removing the action and keys, and adding the punchings from the top.

Final Check:

Straight edge



Caution!

1. Don't raise the key too high and force an enlargement of the balance pin hole.
2. After settling keys on the balance rail, check height again.

Tools:

1. Straight Edge
2. Tweezers
3. Punchings
4. Scissors
5. Machinist's Scale



Step 14 of 37



KEYS - SPACING

Purpose:

- > To provide for the beauty of uniformity

Standard or Specification:

- > All spacing should be even at the fronts of the keys

Inspection of Present Situation:

- > Observe: first the white keys and then the black keys

Corrective Measures:

1. Using front pin regulating tool, place it on the pin under the felt punching and as close as possible to the keyframe.
2. Bend the pin until the spacing is even.

Final Check:

Same as inspection.



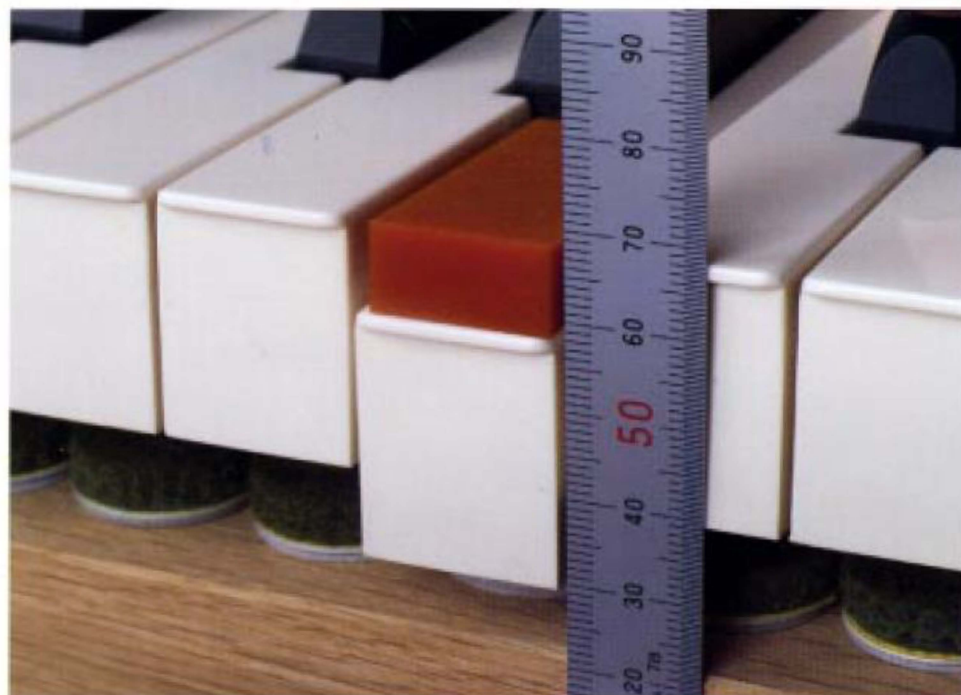
Caution!

Do not scratch or mark front rail pin.

Tool:

Regulating Tool

Step 15 of 37



DEPTH OF WHITE KEY

Purpose:

- > To provide correct and uniform touch

Standard or Specification:

- > 10 mm at the front of the keys

Inspection of Present Situation:

- > Use Key Dip Block for white keys. Place the block on the white key in question. Position the block so that the front edge is aligned with the front edge of the key. Depress the block and key. With your finger, compare the height of the top edges of the block and the next key. Test in the area of the front rail pin. (Remember that the Key Dip Block has a top side. Be sure to use it top side up)

Corrective Measures:

Lift the key the smallest amount necessary, and add or subtract paper punchings beneath the cloth punchings until the standard is met.

Final Check:

Depress three (3) adjoining white keys and compare the height of the center key with the other two.



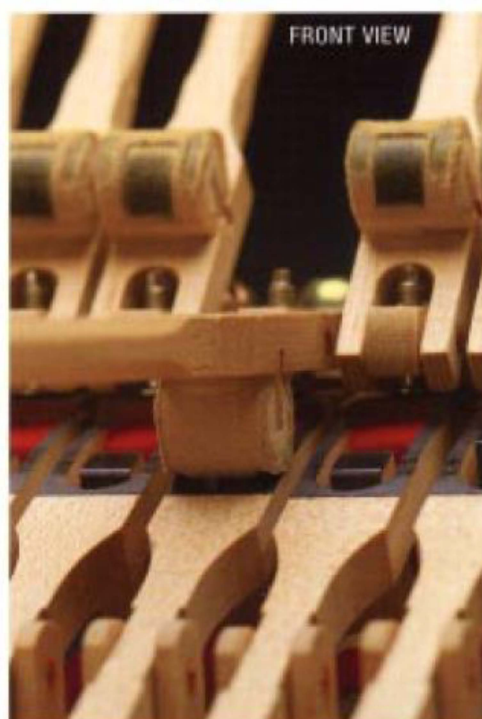
Caution!

1. Because of the beveled edge of the white keys, comparison with the block is easiest when the block is of slightly less height than the total travel of the key.
2. Graduate punching order with the thickest on the bottom.

Tools:

1. Key Block
2. Paper Punchings

Step 16 of 37



WIPPEN ALIGNMENT

Purpose:

- > For the best transfer of power from the wippen assembly and to prevent an uneven application of power to the two sides of the shank flange.

Standard or Specification:

- > The hammer roller should be centered on the repetition lever; the jack tail centered on let off button; and the capstan centered on the support cushion.

Inspection of Present Situation:

- > Raise a full section of shanks, so that they stand alone. Lower each separately and observe the standards listed above.

Corrective Measures:

Loosen the screw in the wippen flange, move the wippen to its new position, and re-tighten the screw. If it is impossible to correct with this method, filing the flange hole and/or application of traveling paper may be necessary.

Final Check:

Check the jack and capstan alignment.



Caution!

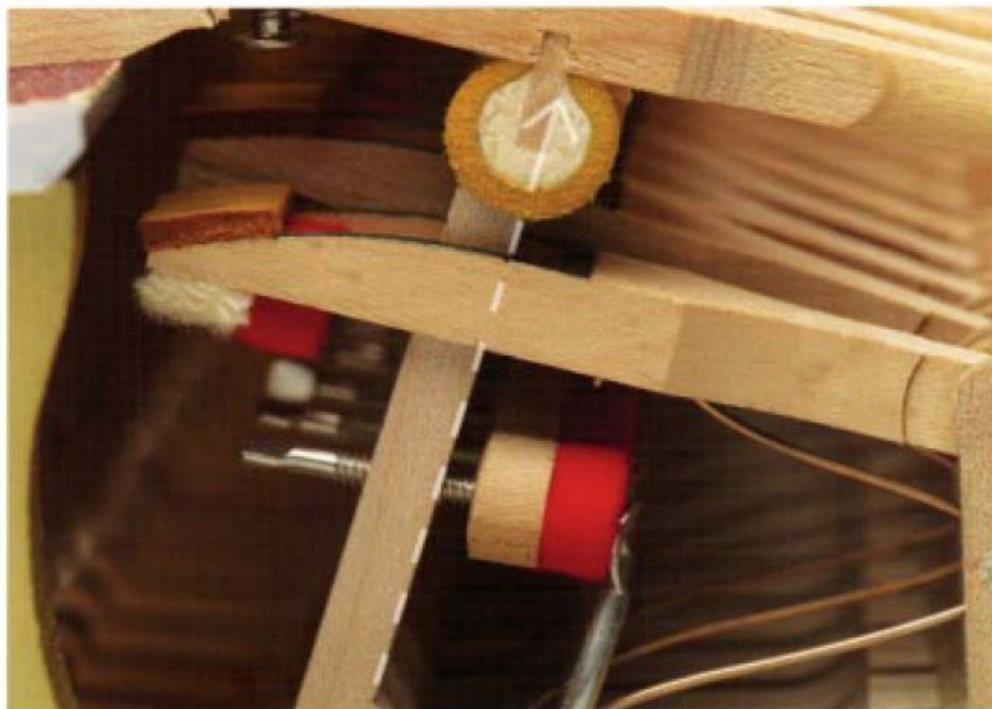
During this process, check the jack to make sure it is centered in the repetition lever slot. If not, center it by tapping the top of it while supporting the side of the wippen that the jack needs to be moved toward.

Tools:

1. Screwdriver
2. Round File
3. Traveling Paper



Step 17 of 37



JACK ADJUSTMENT

Purpose:

- > For the highest degree of power transference and quick return of the jack (to increase repetition speed)

Standard or Specification:

- > The edge of the jack nearest the hammer should line-up with edge of the roller wood nearest the hammer. (The reason for this is that the top face of the jack should remain in a plane, which is always tangent to the roller throughout the period of movement.)

Inspection of Present Situation:

- > Lift section of hammers until they rest standing up. Drop one shank at a time, and depress the repetition lever. When inspecting, keep your eye in the same plane as the surface being tested.

Corrective Measures:

Adjust the jack buttons.

Final Check:

1. Raise all hammers and look for a straight line made by the jacks. Recheck any which appear out of line.
2. Hold the hammer in its rest position and apply a firm blow on the key. The jack must remain under the roller.



Caution!

It's often better to use the Yamaha tool. Domestic tools are usually too large to easily fit through the space between the regulating buttons.

Tools:

Jack Regulating Tool

Step 18 of 37



REPETITION LEVER HEIGHT

Purpose:

- > To allow the jack to return for fast repetition.
- > To eliminate lost motion between the jack and roller.

Standard or Specification:

- > 0.2 mm between the top of the jack and the top of the repetition lever.

Inspection of Present Situation:

- > Raise all hammers to a standing position; then feel with your finger, the edge of repetition lever directly above the jack.

Corrective Measures:

Adjust the regulating screw for correct adjustment. Depress the lever to free the felt surfaces while turning.

Final Check:

1. Same as inspection.
2. Put the hammer into check; and upon very slow release of pressure on key, observe the jack as it returns to rest position.



Caution!

If the top surface of the lever is tilted, the two edges of the lever will give different measurements to the top of the jack. Set the height of the lever so that the standard is met on the low side. (Thus the high side will be more than 0.2 mm). Adequate repetition spring tension is necessary for final check #3.

Tools:

Jack Regulating Tool

Step 19 of 37



HAMMER HEIGHT (SAMPLES)

Purpose:

- > To provide for maximum acceleration of the hammer (which provides the greatest speed of impact) without destroying the tangent relationship of the jack to the roller.

Standard or Specification:

- > 48mm from the striking surface of the hammer to the underside of the string. Aftertouch should be present.

Inspection of Present Situation:

- > Measure by inserting a hammer height gauge. Take a reading at each end of each section. Do not use an end key if it is black.

Corrective Measures:

Adjust the capstan on each sample hammer until 48mm is reached.

Final Check:

On the same sample hammers, check for aftertouch. (All sample hammers above the bass section will form a straight line. If too uneven, re-check the samples.)



Caution!

To assure correct capstan adjustment, give the key a firm blow and recheck.

Tools:

1. Capstan Wrench
2. Hammer Height Gauge



Step 20 of 37



HAMMER HEIGHT (LEVEL)

Purpose:

- > To provide maximum acceleration of the hammer (which provides the greatest speed of impact), without destroying the tangent relationship of the jack to the roller.

Standard or Specification:

- > 46-48mm from the striking surface of the hammer to the underside of the string. Aftertouch should be present.

Inspection of Present Situation:

- > Remove the action and observe. (It is also possible to see the hammer line without removing the action).

Corrective Measures:

Adjust the capstan screws to allow hammers to be level with the samples previously set on Step 19.

Final Check:

Move your eye position to another point and judge.



Caution!

If the repetition springs are too weak, the hammer line will change when the tension is adjusted.

Tools:

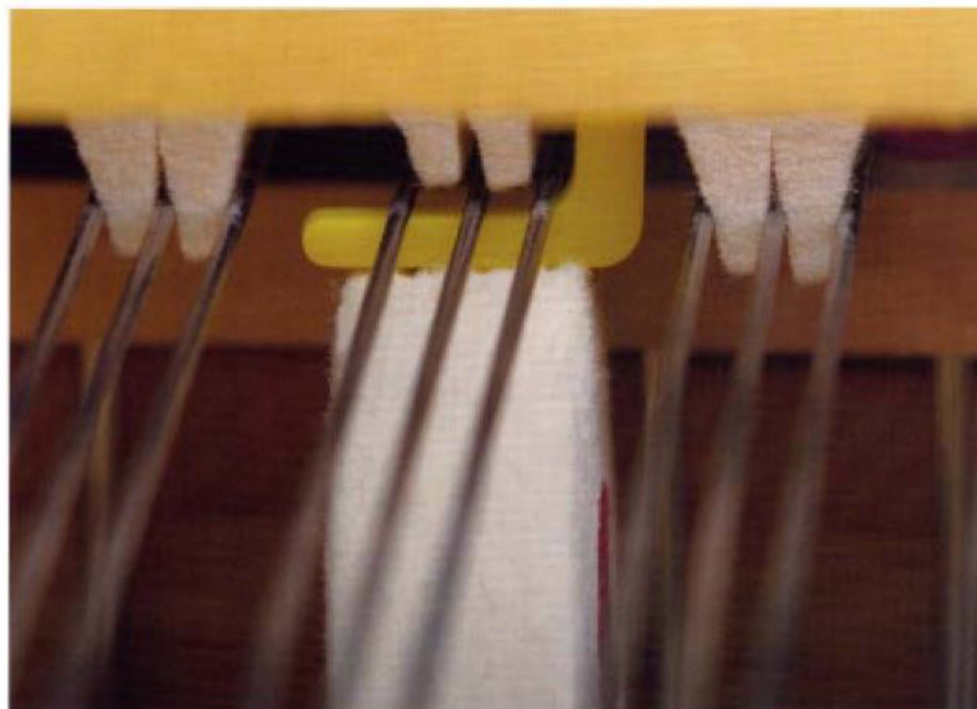
Capstan Wrench

Video:

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Step 21 of 37



Corrective Measures:

Adjust the let-off regulating buttons with the action in the piano.

Final Check:

Same as inspection.

Tools:

Capstan Wrench

LET-OFF

Purpose:

- > To allow the power to remain with the hammer for the greatest distance on its trip to the string, but to disengage before the hammer blocks against the string or otherwise interferes with the string vibrations.

Standard or Specification:

- > 3mm to 1.5mm

Inspection of Present Situation:

- > Depress each key slowly and judge the distance between the string and the top of striking surface of the hammer at its highest point of travel. For the highest section, use a mirror.



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Step 22 of 37



BLACK KEY DEPTH

Purpose:

- > To provide correct and uniform touch.

Standard or Specification:

- > Exact duplication of aftertouch found.

Inspection of Present Situation:

- > Compare the amount of aftertouch between an already correct white key and the black key in question. (A prerequisite for this method is correct let-off adjustment on all keys). Measure aftertouch by placing the index finger from each hand on the key at the same time. Depress slowly and feel the amount of key movement after let-off.

Corrective Measures:

Lift the key the smallest amount necessary, and insert or remove paper punchings under the cloth punching until the aftertouch feeling is the same as the adjoining two (2) white keys.



Attention!

Always check with two (2) white keys. If the white keys are different from each other, recheck white key dip.

Video:

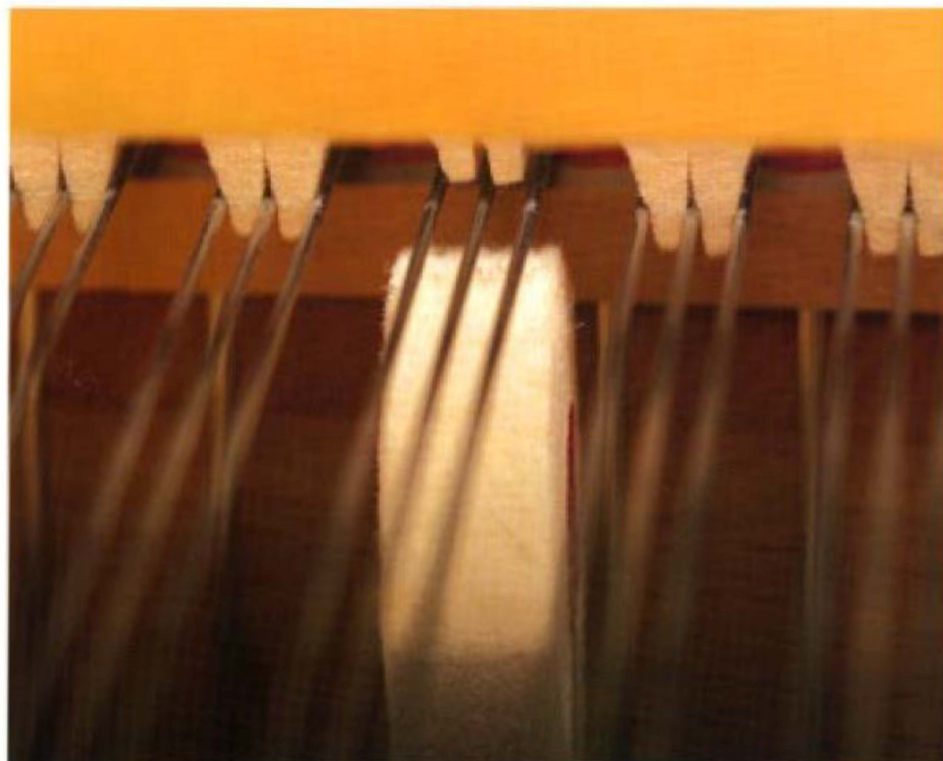
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Step 23 of 37



DROP

Purpose:

- > To keep the hammer from blocking against the string. (This blocking would be caused by the repetition spring.)

Standard or Specification:

- > Let off measurement plus 2 mm.

Inspection of Present Situation:

- > Remove the action; compare one key fully depressed with the next key partially depressed, so that its hammer is at the highest position just before let off.

Corrective Measures:

Adjust the drop screw until the standard is met.

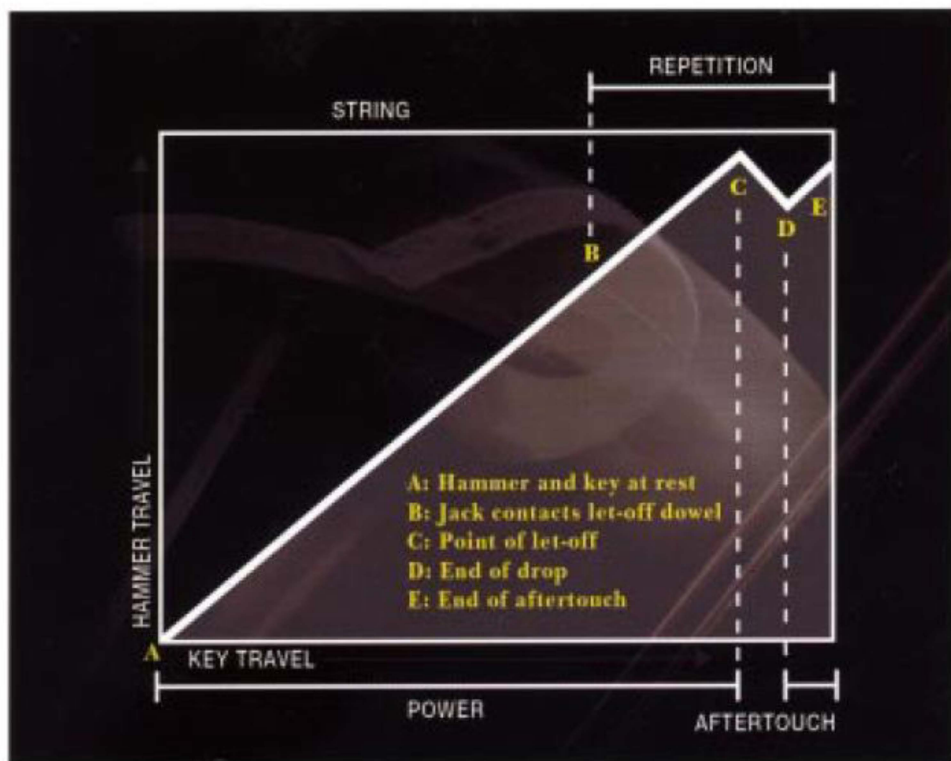
Final Check:

Return action to piano and check all keys, by depressing several keys at one time. Check for a straight line. The repetition lever should touch the drop screw at the same time the jack touches the let-off button. This condition can be felt with the finger on the key.



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Step 24 of 37



AFTERTOUCH MEASUREMENT

Purpose:

- > To provide for adequate escapement of jack, and to allow enough safety factor for changing climactic conditions.
- > To provide a uniform touch.

Standard or Specification:

- > After drop, you will notice a slight hammer rise when the key is fully depressed. (Aftertouch is not possible without complete escapement.)

Inspection of Present Situation:

- > Depress the key, and look for movement of the hammer. Also, you can feel with your finger, as you slowly depress the key and analyze the total process of action movement.

Corrective Measures:

A change can be made either by changing the key depth or the hammer travel distance. The choice of method is determined by the situation.

Final Check:

You should be able to produce a slight sound by moving the key only from the let off position to fully depressed.

Tools:

1. Capstan Wrench
2. Punchings
3. Tweezers



Attention!

Individual musicians' preferences may be taken into consideration when choosing amount of aftertouch.

Video:

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Step 25 of 37



BACK CHECK ALIGNMENT

Purpose:

- > To allow the hammer tail to contact the back check squarely.

Inspection of Present Situation:

From the back of the action, lift each key and check:

- > 1. That the back check is positioned so that the sides are vertical, and the back

check is properly spaced to match the tail of the hammer.

- > 2. That the hammer tail touches the back check with the same pressure at all points of contact.

Corrective Measures:

1. Use wire bending pliers at bottom of wire first to move the back check then at top of wire to make backcheck parallel to hammers.
2. Rotate the back check to proper position. Use the proper back check tool (wood). Raise hammers slightly to view the space between hammer and backcheck.

Final Check:

Same as inspection.

Tools:

1. Wire Bending Pliers
2. Back Check Tool (wood)



Attention!

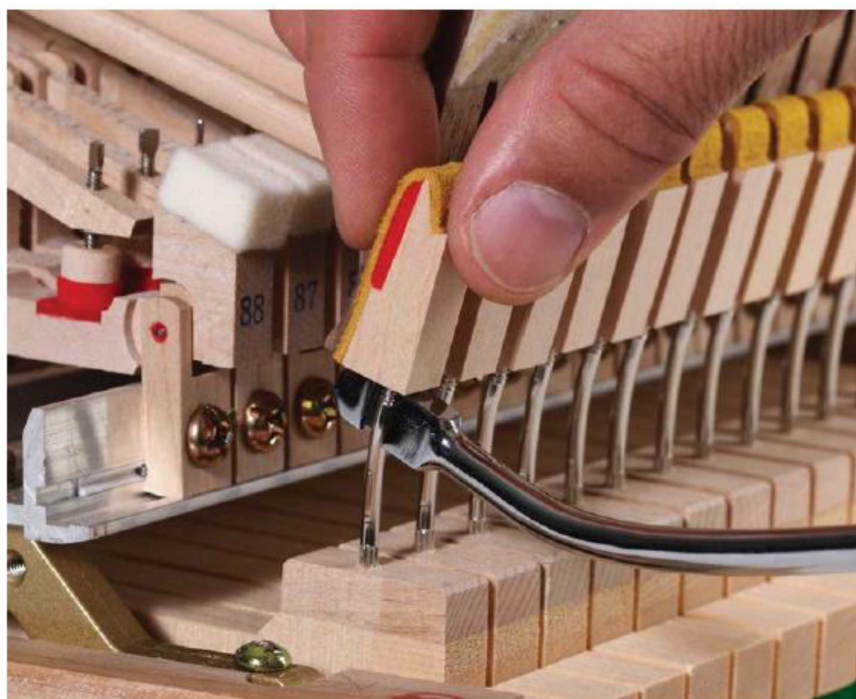
At the same time, check the spacing between all back checks for evenness.

Video:

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Step 26 of 37



BACK CHECK ANGLE

Purpose:

- > Efficient catching and releasing of the hammer.

Inspection of Present Situation:

- > Prepare a sample that is correct. At rest, the two surfaces should appear almost parallel. Depress the key so that the hammer is caught. Holding the key down, press the hammer further into the check. You should meet increasing resistance as you go further into the check.

Corrective Measures:

Compare the other keys to the sample. Correction should be made by bending at the top of the wire only.

Final Check:

Check for catching with a light touch.

Tools:

Wire Bending Tool



Attention!

On new pianos, this is seldom a problem and often it is best to combine this process with Step 27. Area of contact is critical. If too large, release is slow and repetition is affected. If too small, catching is difficult. Factors that influence this are: back check angle, amount of cushion, strength of wire and hammer face.

Video:

You can order the entire 37 Steps on video from Yamaha Piano Service. Call (800) 854-1569 today to purchase your copy.



Step 27 of 37



HAMMER CATCHING

Purpose:

- > Efficient repetition.

Standard or Specification:

- > 15mm from the hammer striking surface to the string. This is to allow for maximum speed of repetition without creating a problem that the musician can feel on a fortissimo blow.

Inspection of Present Situation:

- > Measure from the underside of the string to the top of the striking surfaces on a sample key inside the piano. Remove action, properly depress each key and compare with the sample. (Hint: Usually the measurement is correct when the bottom edge of the tail is caught just below the center of the red cushion felt.)

Corrective Measures:

Bend the backcheck wire by moving the backcheck with your fingers until the standard is met. (By using this process, the backcheck wire will always bend at the bottom only, which will not change the backcheck angle.)

Final Check:

With the action in the piano, play four or five white keys with one hand, and the included black keys with the other hand. Observe the hammer level when in check. Continue the test until all of the keys are checked.

Tools:

Backcheck gauge

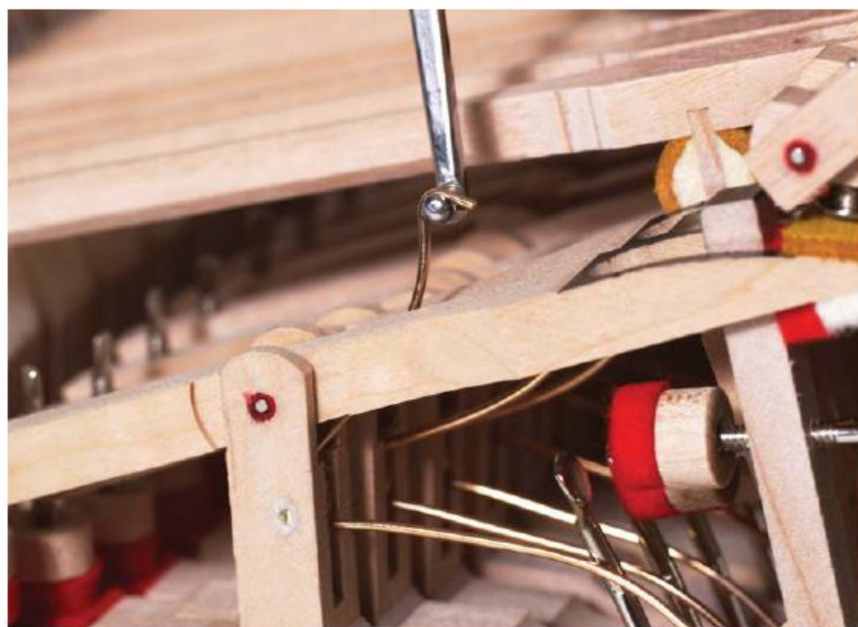


Attention!

Apply pressure on both the key and the hammer, and work the hammer up and down. Check to see that the hammer tail doesn't rub on the backcheck.



Step 28 of 37



REPETITION SPRING

Purpose:

- > To allow the repetition lever to support the hammer roller so the jack can return to its rest position at the fastest possible speed.

Standard or Specification:

- > Enough tension to raise the hammer from its position at the time of catching to the point where the repetition lever touches the drop screw. If the hammer rises so fast that the "bump" felt by repetition lever stopping at the drop screw is annoying to the musician, too much tension is present.

Inspection of Present Situation:

- > With a firm blow, place the hammer in check. Very slowly release the pressure on the key until back check releases the hammer. Pay close attention to the hammer movement at this point; it should rise all the way to the top with definite, firm movement, but not swiftly as to create an objectionable "bump" at the top that can be felt in the key. The measurement is correct when the bottom edge of the tail is caught just below the center of the red cushion felt.)

Corrective Measures:

To change the tension of the spring, bend it at the coil.

1. To weaken, press downward with the tool on top of spring and near the repetition spring coil.
2. To increase tension, unhook the repetition spring, allowing it to protrude upward between the levers.
3. Hook the tool in the end of the spring and pull upward.

Final Check:

Same as inspection with the action inside of the piano.

Tools:

Repetition Spring Tool



Attention!

1. Avoid excessive bending
2. The end of the springs must be clean, so that they will slide well in the repetition lever slots.
3. Be careful that the spring is correctly positioned in the valley of the repetition lever slot and not accidentally left on the shoulder of the slot. (Sight through the action under the repetition levers.)
4. Repetition spring adjustments may affect hammer height level (19) and drop (23).



Step 29 of 37



KEY STOP RAIL

Purpose:

- > To keep the keys in position during transportation.

Standard or Specification:

- > 1mm distance between the rail and the top edge of the black keys at rest.

Inspection of Present Situation:

- > Raise a black key at its front.

Corrective Measures:

Adjust the lower nuts for proper height. Lock this adjustment by tightening the upper nuts. For the two ends (which are fastened with screws), reduce the height if necessary, by removing the felt and/ or removing wood from the rail or keyframe. If it is necessary to increase the height, place paper or card of proper thickness between the rail and felt.

Final Check:

Raise the black keys at the front and observe the amount of motion.

Tools:

Screwdriver



Attention!

After installing rail, check the hammer line. If the rail is too low, it will touch the keys and cause the hammers to rise.



Step 30 of 37



DAMPER WIRE GUIDE BUSHING

Purpose:

- > To allow free movement of the dampers without allowing vibration.

Inspection of Present Situation:

- > Remove the action and lift several damper levers with your hand. Check for a sluggish feeling as the dampers descend.

Corrective Measures:

For a small correction, use a silicon oil and naphtha mix. If larger correction is needed, use an umbrella rib tool. This tool can also be used with heat.

Tools:

Umbrella rib tool



Attention!

The damper wire must be correctly bent. The portion that moves through the guide bushing must be straight and move vertically. Because the bushings are not glued, be careful to not push them out with the umbrella rib tool.



Step 31 of 37



DAMPER LIFT FROM KEY

Purpose:

- > To allow the tone to sustain the correct length of time.

Standard or Specification:

- > The damper should start to rise when the hammers have traveled half their distance.

Inspection of Present Situation:

- > If possible, find a sample in each section that lifts correctly. Remove the action. Temporarily block the lifting rail to just contact the bottom of the sample damper levers.

Corrective Measures:

Adjust all the dampers to rest on the lifting rail in the same manner as the sample by loosening the screw in the damper block and resetting the damper.

First tighten the screw with your fingers; then with a screwdriver.

Tools:

Small screwdriver

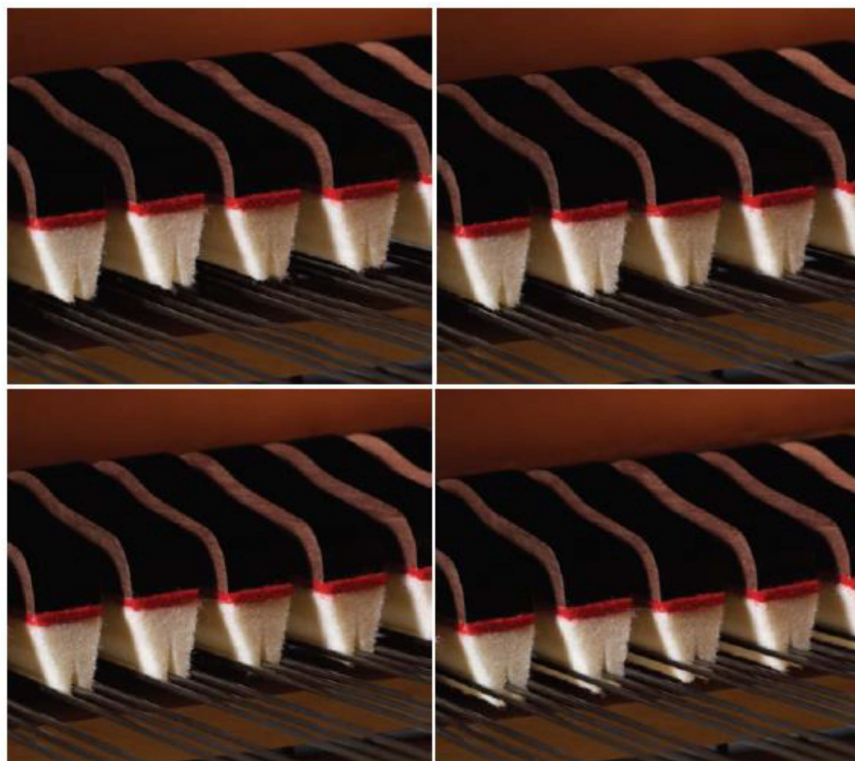


Attention!

When re-tightening the damper wire, it may try to rotate, and the damper will not align with the string. Holding the damper will minimize this.



Step 32 of 37



DAMPER LIFT FROM LIFTING RAIL

Purpose:

- > To allow for full sustain of tone and evenness of dampers. Also for the beauty of sight.

Standard or Specification:

- > All dampers must lift simultaneously.

Inspection of Present Situation:

- > Move the damper pedal and observe:
(1) Evenness of pick-up. (2) Damper head movement in a twisting motion.
(3) Dampers tilting, indicating that one end touches the string before the other. (4) Damper spacing at rest.

Corrective Measures:

1. Repeat portion of step 31.
2. For a small amount, use two sets of pliers. Holding damper flange with one and the damper wire with the other, twist the wire to the proper place.
3. For a large amount, release wire and remove damper from piano and straighten. For a small amount, lift damper head with fingers.
4. For a large amount, remove damper and correct the wire above the damper guide rail. For small amount, bend the wire slightly with pliers.

Final Check:

Same as inspection, especially with small pedal movement.

Tools:

1. Wire pliers
2. Screwdriver
3. Regular pliers



Attention!

Don't forget that the end result should be good damping. (A good pianist may use partial pedal travel.)



Step 33 of 37



DAMPER PEDAL ADJUSTMENT

Purpose:

- > To establish the correct amount of travel of the lifting rail before it touches the damper levers (lost motion).

Standard or Specification:

- > 1.0 mm space between the damper lift rail and the damper levers.

Inspection of Present Situation:

- > Remove the action and inspect the area between the damper lifting rail and the damper levers. (It is possible to train yourself to feel this space without removing action.)

Corrective Measures:

Adjust the pedal rod nut. When it is correct, tighten the lock nut securely against the head. If more than 1.5 mm space exists between the dag and the felt on the underside of the damper lifting rail, please attach the proper size felt. This felt should not support the lifting rail at rest.

Final Check:

1. Feel for lost motion with your foot.
2. Check for damping.

Tools:

1. Felt
2. Glue



Attention!

Check the wing bolts that fasten the lyre and the lyre braces for tightness.



Step 34 of 37



Corrective Measures:

Adjust the capstan on bottom of keybed.

Final Check:

Same as inspection.

Tools:

Capstan wrench



Attention!

Check for looseness of the capstan screw.

DAMPER PEDAL STOP ADJUSTMENT

Purpose:

- > To allow the dampers to be raised the same amount by the pedal as by the keys. In this manner, the pianist cannot feel the movement of the dampers through the key.

Standard or Specification:

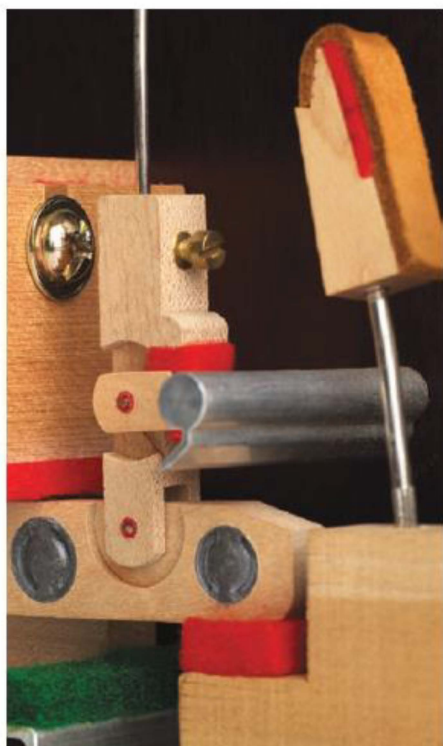
- > The pedal should stop when the dampers are at the same height that they reach when raised by the key.

Inspection of Present Situation:

- > Check for movement of the dampers in the following manner:
 1. Depress a key and move the pedal up and down.
 2. Depress the pedal and move the key up and down.



Step 35 of 37



DAMPER STOP RAIL

Purpose:

- > To limit the travel of the dampers so they will return to key end with a force that can not be detected by the pianist.

Standard or Specification:

- > 0.5 mm movement of the damper head when lifted above the position created

by a black key with a hard blow. (The measurement between the damper lever at rest and the stop rail will be 8 mm.)

Inspection of Present Situation:

- > Remove the action, depress the pedal, lift the damper lever and check for movement.

Corrective Measures:

Adjust the damper stop rail so it allows 1.5 mm of movement when the damper lever is lifted while the pedal is depressed. Adjust it by loosening the screws which hold the rail on the back beam. Move the rail; then re-tighten the screws. (This will produce the standard of 0.5 mm movement when testing a black key with a hard blow.)

Final Check:

Return the action to the piano, depress a black key with a hard blow, maintain pressure and check for 0.5 mm movement.

Tool:

Screwdriver



Attention!

For small adjustments, using a pencil mark can be of help.

Step 36 of 37



SOSTENUTO

Purpose:

- > For sustaining individual tones.

Standard or Specification:

- A. Vertical clearance should be minimal and still allow for rotation of the sostenuto blade from its "off" position without touching the tabs.
- B. When engaged, the blade should be horizontal and should extend under the tabs by 1.5 mm.

Inspection of Present Situation:

- > Remove the action and while moving the sostenuto pedal, carefully observe:

- 1. That the blade is parallel with the tabs.
- 2. That the tabs and the blade do not touch.

Engage all tabs and observe:

- 3. That the damper height, as a result of the sostenuto use, is exactly the same as with the damper pedal.
- 4. That the sostenuto blade extends under the tabs 1.5 mm.

Corrective Measures for Situations 1-4:

- 1. Loosen the bracket screws and adjust the bracket up or down. Re-tighten.
- 2. If touching, bend the bracket outward with a string hook.
- 3. Adjust the capstan screw under the keybed to stop the blade at its "on" position.
- 4. Bend the bracket inward to extend the blade further under the tabs.

Final Check:

Engage all tabs and then release the sostenuto pedal slowly. As the dampers begin to drop, don't be concerned with individual dampers dropping out of sequence. Large section movements out of sequence will indicate that the blade is not parallel with the tabs. Replace the action and test for catching of individual dampers, and also the possibility that action parts are touching the newly regulated sostenuto mechanism.

Tools:

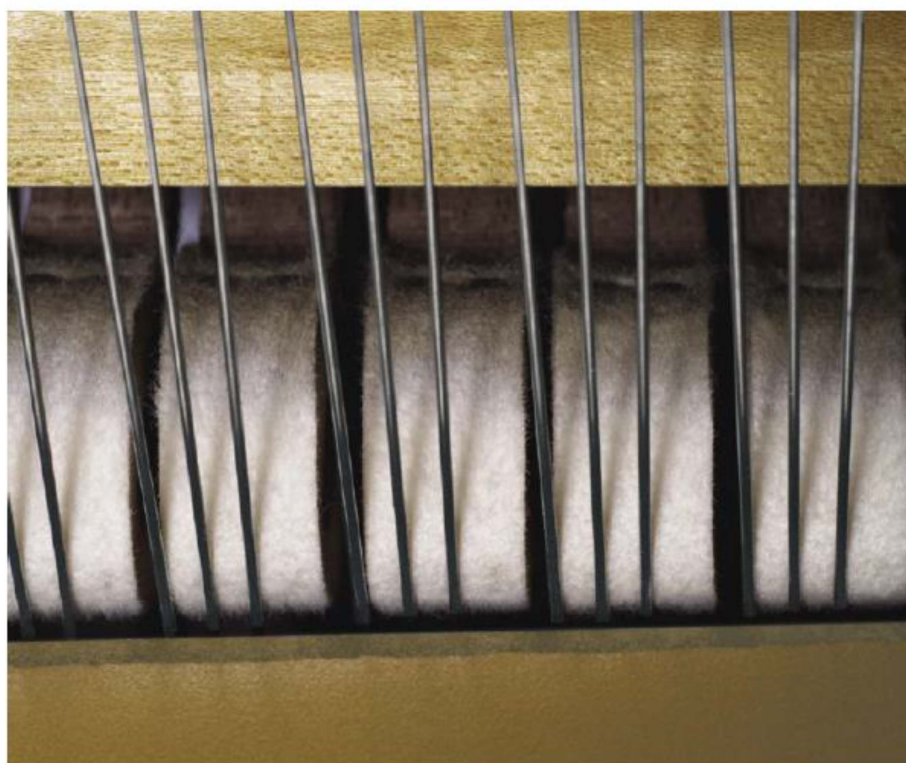
- 1. Screwdriver
- 2. String hook



Attention!

Tabs must form a perfectly straight line to achieve uniform dropping of dampers. Check for bent damper wires holding tabs out of horizontal line. The vertical line of the tabs can be improved by either papering or sanding the damper wire flange at the point of contact with the tab.

Step 37 of 37



SHIFT PEDAL ADJUSTMENT

Purpose:

- > To change tone, volume and color (without changing touch).

Standard or Specification:

- > Hammer should move an amount equal to the distance between the center lines of two adjoining strings of a three-string unison.

Inspection of Present Situation:

1. Check for lost motion of the soft pedal.
2. With the key blocks in place, depress the soft pedal. By placing your finger under a jack, block the hammer to the string and observe the position of the hammer and strings.

Corrective Measures:

1. Adjust the pedal rod head to remove all lost motion.
IMPORTANT: Be sure to secure the adjustment by tightening the lock nut against the pedal rod head.
2. Adjust the screw in the right key block so that the center groove in the hammer moves directly under the right string.

Final Check:

Tighten both key blocks and check again.

Tools:

Screwdriver



Attention!

Check that no hammer moves so far as to hit strings of two different pitches at the same time, and that hammers near the plate do not touch the plate. (The amount of shift is variable to meet the demands of individual musicians.)