

Vertical Voicing and Regulation

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SIGNS THAT REGULATION IS NEEDED

- Uneven checking / uneven back check line / checking either too close or too far from strings.
 - Uneven key level / dip
 - Lost or gained motion
 - Uneven let off
 - Misaligned parts
 - Winking keys with depression of soft pedal
 - Harsh tone
 - Time interval has passed
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PRESTART

- **Evaluate key height.**
 - Look at key height in relation to the key slip and the key up stop rail.
- **Remove case parts.**
 - Keep screws in order.
 - If the key up-stop rail has a threaded center post and if the key lift at the center matches key lift at the ends, mark the height of the bottom nut with a Sharpie pen.
 - Tape screws onto rolling chair to keep in order.
 - Add magnets to Spurlock lid prop to hold screws.
- **Tighten the screws of the case parts.**
 - Shim loose screws with bamboo (a kabob stick).
- **Work the damper pedal.**
 - Are there any sounds in the damper system?
- If yes, determine if the sounds are from the trapwork or from the action.
- **Check soft pedal for extra sounds / squeaks.**
- **Tighten the damper bracket screws into bottom panel.**



- Tighten hammer flange screws.

- Use a headlamp. Sit on the piano bench.



- Tighten let-off rail screws.
- Space hammers to strings. (Tools: headlamp, 2 screwdrivers, travel paper, jack holder, alligator tweezers, scissors, pyropen, flange spacer, board strait edge, pencil, and eraser.)
 - Travel
- Use string cuts to help determine which hammer is not traveling straight.
- Indicate direction of hammer movement with a diagonal arrow on the hammer wood. The travel paper will go on the back of the hammer flange on the side of the start of the arrow.
 - Put a line on the non-glued side of three thicknesses of travel paper.
 - If bridal tapes are brittle or tight, apply drop of Protek to the bridal tape tab.
 - Use some type of jack "hold back" tool for access to flange.
 - Use an 1/8" blade by 6" shaft screwdriver for getting hammer flange screw into the rail. Tighten with a regular screwdriver.
 - Have telescoping magnet tool for the inevitable dropped screw.
 - If there is any question about hammer travel, don't do it.
 - If traveling would make hammer centering on strings worse, don't do it.
 - After traveling indicate on the hammer head that it was done.



- Angle

- Use "<" and ">" symbol to show which direction hammer needs to twist.
 - I use the Weller Pyropen WSTA3 to heat the shanks.



- Center

- First use a flange spacer. If you cannot use the flange space, loosen the hammer flange screw. Make sure the flange is loose from the rail. Move the hammer to the correct position. Hold the hammer butt and tighten the screw.
- If the hammer moves back to its original position, put paper under the flange, sticky side up. Loosen flange screw, insert paper that you cut with scissors under the loosen flange on the opposite corner that you want the hammer to move. Insert the travel paper with alligator forceps.



- Repeat travel, angle, and center – a circle of refinement.
- Erase marks on hammer heads.
- Even the damper lift from the damper pedal.
 - Turn down the damper pedal bolt to the point that an early lifting damper gives a slight ring.
 - Adjust ringing dampers by pulling back on the wire at the lowest point of the wire and pushing the damper head forward.
 - Check with the pedal that the adjustment didn't result in a late damper.



REGULATION – What does it do?

- Balances key travel with hammer travel. There needs to be enough key travel to take the hammer through let off plus more (aftertouch).
 - “Active” measure of aftertouch: slowly depress the key and feel the amount of movement after let-off. “Passive” measure of aftertouch: when the hammer is in check, the jack is clear of the hammer butt.
- Key travel should never be less than 10mm nor greater than 11mm.
- Regulation evens the timing of the key start, the damper lift from the key, the hammer let-off from the strings, the amount of key travel and checking from note to note.

Setting samples: Regulate a natural that is close to the end of the tenor section.



To remember the order of regulation I say, “Blow caps, level let, dip check. Aftertouch!”

‘The Duo’

- Blow distance and capstan regulation. (Blow caps)
 - Use a wooden block to measure blow distance. Start with manufacture specifications or standard 1 3/4”, 45mm. (Service manuals are at my.ptg.org/education)
 - Decrease (hammers move closer to the stings) blow distance by adding balance rail punchings at the rest rail support brackets.

- Increase blow distance (hammer move further from the strings) by removing material at the hammer rest rail brackets.
- **Any time the blow distance changes, capstans must be adjusted.**
- Capstan regulation place the jack just under the hammer butt.
- Lost motion means there is too much space between the jack and the butt. Key movement is wasted.
 - With a light touch to the keys see if the backcheck moves before the catcher moves.
- Gained motion means there is no space between the jack and the butt. The hammer shank may be off the rest rail.
 - Run fingers over the keys, close to the action, and with downward pressure. If hammers wink, there is gained motion.
- Test for the perfect jack position by having the hammer in check, then very slowly raise the key. The jack should be able to snap back to position and rest on the jack felt.
- **Set the key height. (Level)**
 - Start with manufacturer height. If not available set height of naturals in relation to the key slip, key up-stop rail, the balance pian and the front rail pin.
 - Look at amounts of balance and front rail punchings.
 - Support key 1 and 87 with an adjustable block.
- **Set let-off. (Let)**
 - When setting samples, I use the 5 in 1 gauge to measure 1/8", 2.5mm.
- **Key dip, Checking Distance, and **Aftertouch. (Dip, check, aftertouch.)**
 - Set dip by putting an aftertouch gauge on top of the punchings. Adjust punchings so there is just enough key travel to get the hammer to let off. The hammer will barely fall back when the key touches the aftertouch gauge. Use dip block to see if that dip falls in the acceptable range of 10-11 mm. (Active measure of aftertouch.)
 - *For samples I put paper punchings on top of the felt.*
 - Adjust the back check so that when the hammer is in check the jack is clear of the butt. I start with the manufacture recommendation. Use a measuring block to see if the hammers check from the strings falls within the acceptable range of 5/8 to 1/2".

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- **Regulate end natural of each section**
 - Transfer your chosen key dip to the WN&G key dip tool.
 - *Put masking tape on key fronts to show the range of the sample notes. For key level the keys on each side of the sample need to be level.*
 - **Set position of bridle wire of each note at the end of a section**
 - Soft pedal lift rod should have 1 mm of play before tab moves.
 - Adjust soft pedal travel if hammers go more than halfway to the strings when left pedal is depressed.
 - Bridle tape should have the slightest amount of slack when the soft pedal is fully depressed Wippens should never wink.
 - **If you added material to shim the hammer rail for blow distance, glue it into place.**
 - **Straiten and space stickers if the piano has them.**
 - **Regulate all Capstans**

- Sit low using automotive stool. Keep tool close to the capstan, keeping it at the angle it came off the capstan, unless you are at the end of the range of motion.
- Work efficiently – one movement of the backcheck then move capstan, keeping in mind the amount the capstan was moved.
- If the capstan moved too much, move it back by half.
- **Space and square back checks to the catcher.**
 - Sit low using automotive stool.
 - Use wire bender that has a cut-out for the bridal wire.
 - Mark one handle of the wire bending pliers with tape to indicate the direction of the wire bend.
 - Block hammers towards the strings to raise the catchers.
- **Straighten the back check line between the samples.**
 - Use string with lead weight for a vertical straight line.



- **Look at the jack to hammer butt and whippen to capstan spacing.**
 - Mark the ones that need to move.
 - Balance the need for jack to move to align under the butt with the spacing of the capstan to whippen heel.
- **Action Out.**
 - Remove soft pedal dowel when taking the action in and out of the piano.
 - Make sure pedal dowels are free in the lift tabs before lifting the action off the action posts.



- **Fix jack to hammer butt and whippen to capstan spacing by moving the whippen.** (I rarely need to do this.)
- **Tighten whippen flange screws.**
- **Tighten butt plates if the piano has them.**
- **Adjust bridal wires.**
 - Put string with lead weight on the backchecks. Straighten the backcheck line by moving the bridal wire in or out.
- **Check clearance of bridle wires and backcheck wires. Bend bridle wire as needed.**





- Needle hammers.
 - "Taking the Upright Piano Seriously by Fred Strum. PTG Journal May and June 2017.
- File hammers.
 - Don't touch the Dampers. Pretend they are a hot oven rack.
 - Vacuum frequently.
- Level strings.



- Practice finding the spoon with action out of the piano.
 - Put masking tape on the handle of the spoon bender locating the end of the whippen when the tool is on the spoon.
- Take tape off the key fronts.
- Take the keys out of the piano.
 - Put action under the worktable and on keys on the table.
- Use a sharpie pen and put a black dot on the punchings in front of the balance pin to show its orientation.
- Vacuum the keybed.
- Vacuum felt of key stop rail.
- Vacuum the bottom panel.
- Vacuum the back, if accessible.
- Clean, polish the balance rail pins. Clean front rail pins if it is needed.
 - Remove punchings. Place them on the backrail cloth.
 - Mask the balance rail with 3 strips of tape. Wear a disposable glove, put glitz on the glove. After cleaning the pin, buff it with a small soft cloth.
 - Key rebushing?
- Put punchings back on the clean balance rail pins. Paper punchings of samples go under the felt. Orient the dot on the punchings.
- Put the action into the piano. (keys are out) Put on action bracket nuts.
- Regulate the damper lift from the key – spoon bending.



- Dampers should lift when the hammer is halfway to the string.
 - Wedge a ¾ stick that is 1/2 blow (23mm) and the length of a section between the hammers and the strings. Lift the wippen. The damper should barely move when the hammer touches the board.
 - Put cloth over balance rail pins for arm comfort.

- **Action Out.**
 - *Place it under the table.*
- **Keys in.**
 - **Evaluate the tightness or looseness of the key at the balance pin.**
 - Key should be able to gently drop down the balance rail pin.
 - If the key does not drop freely, ease the balance hole.
 - Draw a line on balance hole easing tool showing the thin orientation, also a dot showing the wide orientation. The goal is to compress the wood at the side of the key and not the front to back wood of the key.
 - If the key drops quickly, check for fore and aft movement, pulley keys.
 - Treat pulley key by using wood glue thinned with water. Applied the thinned glue with a small brush or pipe cleaner.
- **Damper system.**
 - The damper system must be quiet and smooth.
 - Rubber grommet – *replace with bushing cloth.*
 - Lift rod brackets – *lubricate with Protek or WD-40*
 - Lift rod – *apply Protek to the damper lever felt. In bad cases remove the lift rod to thoroughly clean.*
 - Damper springs - *Apply drop of Protek or graphite slot with a soft pencil lead.*
 - Spoons – *apply a drop of Protek.*
- **Soft pedal – must operate quietly. Fix issues noted in the initial evaluation.**
- **Action in**
- **Attach damper and soft pedal dowels/rods.**
 - *If the piano has middle pedal for bass damper lift, insert that rod in its tab first. Depress the middle pedal, lean the action back just enough to put the damper rod into its tab.*
- **Attach action bracket nuts.**
- **Adjust damper pedal for lift and travel**
 - Dampers lift when pedal has travels ¼ inch
 - Pedal travel should lift the dampers the same amount as the key to 1/8" further than damper lift with the key. Change the felt under the damper pedal or add paperboard shims under the existing stopping felt.
- **Fit hammers to strings.**

- Have sandpaper strip that is 7mm (1/4") wide.
- **Complete the regulation to all notes.**
 - Quick check of capstans – jack just under butt but must be able to snap to hammer butt felt on a slow key release.
- Key level, squaring, and spacing.



- Sit on low rolling stool.
- Props are still under 1 and 87 and blocks are on top of 1 and 87 for sharp height.
- **Correct any keys that are high.**
 - Put notation flags (sticky notes) on backchecks of keys that are high.
 - If a key is high and there are no paper punchings, sand the bottom of the key at the balance pin hole.
 - **For keys that are low, put punchings under the level stick.**
 - Do one size per pass, at most two sizes, starting with the thickest. Use the punching that is ½ of the space of the gap between the key and the level stick.
 - When putting the punching in place, never put down the tweezers, do not remove the key from its place.
 - Work from treble to bass.
 - If time allows, consolidate punchings and put punchings in order of thickness with the thickest at the bottom and the thinnest at the top.
 - After every “round” of adding balance rail punchings, check for keys that are high.
 - Level the sharps.
 - *Use the same procedure as the naturals.*
- **Remove key props and blocks.** Level the keys that were propped.
- **Put in front rail punchings under #1 and #87.**
- **Check capstan #1 and #87.**
- **Let-off.**



- **Place stick (1 ¼ x section length x ¾) between the rest rail and the hammer shanks. Push the hammers toward to let off 1/8" from strings.**
 - If the piano has a muffler strip, increase the let off distance.
 - **When the jack touches the hammer butt at 1/8" let off, the shank will make the faintest tick sound on the stick.**

- If you hear no sound, the let off button needs to be raised so the jack travels further. If the hammer shank makes a percussive sound, the let off button needs to be lowered. **The sound and movement of the shank on the stick is minimal. The backcheck does not touch the hammer butt. Don't go to the bottom of the key.**
- The let off tool goes in from the front under the backchecks, between the backcheck wires. Keep let off tool close to the action. Remember the amount you turned the let off button
- Sit on the low automotive stool.
 - **For this procedure to work, there needs to be enough key travel to take the hammer through letoff. The hammer return spring must function. Be aware of the chance of the backcheck hitting the catcher.**
 - This is a “go”/ “no-go” regulation.
- When hammers are propped towards the strings, re-inspect hammers-to-strings for correct travel, angle, and spacing. Check backcheck spacing.
- Key travel (dip)
 - Naturals



- Use the Wessell, Nickel, & Gross [WN&G] key dip tool.
- Always keep tweezers in hand.
- Move the WN&G tool two keys away when putting punchings in place.
- If time, consolidate punchings and stack in order of thickness.

- Back check line
 - Perfect the backcheck line and hammer checking position. Use naturals at section ends and weighted line.
- Key travel (dip)
 - Sharps



- Rise at back of key should match the neighboring keys.
- Key travel of sharps should have the same checking alignment with the naturals and with the same amount of aftertouch as the naturals.
- If sharp hammers check further from the strings, increase dip (remove punchings). If sharp hammer checks too close to the strings, decrease dip (add punchings).
 - Lift the sharp and its natural neighbors just high enough to access the punchings. Do not remove the key.

- **Check all for even checking.**
 - **If it is not even look at:**
 - **Back check – Can the back check line be adjusted?**
 - **Key dip – Can the key dip be changed?**
 - Increase dip and checking will be closer to strings, decrease dip and checking will be further from strings.
 - **Capstan – Is the capstan placement exact?**
 - Lower the capstan and checking will be further, raise the capstan and checking will be closer.
 - **Key height - Is key level consistent? Irregularities will affect key dip.**
- **Check for even aftertouch.**
 - **Let off – Can the let off be adjusted?**
 - If let off is closer to the strings, there will be less aftertouch. If let off is further from strings, there will be more aftertouch
- **Check the regulation of the pedals.**
 - **Check bridle straps – no key movement when left pedal is depressed.**
 - **Adjust damper pedal for minimal, ¼ inch, travel in pedal before dampers lift.**
 - **Damper lift with the pedal should match lift from key or continue damper travel 1/8-inch more than the key travel.**
 - **Put hard cardboard under the pedal felt, or if necessary, replace the felt to regulate the pedal travel.**
- **Tune the piano**
 - **Recheck hammer fit on any note that is more difficult to tune or has different timbre.**
 - Play the piano
- **Install case parts. Pack up. Leave the area as tidy as when you came.**