Grand Action Regulation

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Who knows the standards for piano performance and who pays the bill?
It is necessary to explain things and communicate well to the owner, because they don't have the expertise, the tools or the knowledge.

Benefits & goals of regulating
Achieve control
Power; dynamic range
Reliability – improve repetition

Evaluate the condition
Hammers
Key bushings end felts (remove end felts, rout unevenness, replace felts; steam cawls to soften bushings)
Knuckles (very important; replace instead of bolster)
Backchecks
Action centers (re-pin instead of lubricate)
Keyframe
Repetition lever coating (too loose? Repin?) 4 grams
Whipp en felts
Touch

Pre-Regulation:
The Three D's
1. Sufficient key dip (11 mm min.); remove front rail punchings
2. Drop 9turn down)
3. "Dance" repetition springs are strong

Locating and Alignment
1. Locate Action *place a screwdrive under the treble end of the keyframe and slightly lift the keyframe to hear if it improves the tone. If it does, then add or remove wood from the back of the keyframe by sanding or veneering.*
2. Bed the Keyframe *Keep the keyframe sprung. Raise all the balance rails first to get a clear knock on every one equally. This makes sure the front and back are tight and the middle is suspended in the air. Tap on the back rail with a long strong screwdriver, listening for bumps. Sand the front and bed it, although Steinways have a side-to-side spring tension built up and is up in the front. At the end, turn down the balance rail studs just to stop the tap. Thje test is to lift up on the hammer rail while you tap and you should hear a taping again. This tell s you that there is still springiness – the rail is still sprung down. Wikth weather changes, instead of moving with weather changes, the pressure changes, but the position stays the same.*
3. Square, Space and Ease Keys
4. Level Keys
5. Space and Travel the action
    - Travel hammers first
    - Space the strings
    - Space hammers to strings *Do two passes – once quickly & tighten the screws, 2nd time fine. Place the treble hammers a little toward the treble and the bass a little toward the bass for unachorda.*
    - Space and travel the whippens *(turn the action backwards on the workbench) Line up whippens to the knuckles. First try tipping the whippen. If flanges get tipped different ways, go through and straighten them all out and paper them to prevent scuffing and to keep things in line.) Remove the hammer stop rail if you need to do a lot of whippen work.*

1. **Align backchecks** to hammer tails. *Look at the angle of the backcheck as it contacts the hammer. First check for the angle surface at rest; the backcheck and the tail should be parallel. Hold the bottom, place parallel pliers on the top of the backcheck and adjust it. A check is to tap on the hammer and drive it in a little bit. It should take some effort to drive it in. If it drives in too hard or too easily, it's out of adjustment. Adjust a sample at the end of each section. Get a feel for the wire stiffness, then bend them all, matching the feel. Check with a straight edge. This will take 30-60 minutes.*
2. ***Action Spread Check*** *It's worth the time it takes to take some measurements. Normally the rail moves back from the force of playing. If you don't have the spec, pick a note and regulate the capstan, drop, knuckle, etc, then measure down-weight and up-weight and write it down. Subtract it to get the difference. If you suspect it needs to go narrower, move it 1/16th and look how the jack lines up. Loosen the screw, bump it and tighten the screw. Regulate again and see how it is. The difference between the down and the up should get smaller. If it gets bigger, go the other way. If you get a low friction figure and the jack looks screwy, lean toward where the jack looks right. Changing the spread changes all the leverages slightly. This will change how the whippens sit on the capstans, etc. but the goal is to get it back to where the manufacturer had it. Do all this on one hammer like an action model. Measure the centerpin to centerpin spread, then copy it throughout the action. To make double sure, you could do a friction test somewhere else as well. When you have it, write the spread on a key. Snug the screw rather than squeezing it tight on older wood or the screw will become loose again.*

Space jacks in repetition lever windows.. *Lightly tap it in place. Another more permanent way is to put a bend in the center pin and find the angle in the jack.*

Heart of the Regulation

Jack under Knuckle *The notch is to help factory manufacturers set the jacks quickly. Start by regulating the jack to the mark or the knuckle. The back edge of the jack should line up. A good pianist feels this.We want a consistent travel. Regulate it to the core. Whack the keys with your hand above the hammers and feel for cheating*

Repetition lever height. *First pass do by feel. The second pass is done after adjusting the springs; feel how the jacks rub on the knuckle. The jack should be supporting the knuckles slightly. Stick with a consistent depth.*

Let-off *Set samples in the piano. There is a start point where everything is at rest and the key height is the reference point. The limit to the action travel is the strings, so it is important to get this limit even and accurate. Once it is decided, all the other adjustments are set to these constants. Regulate let-off with your eyes on the strings and hammers. Set the key slip on the piano over the hammers, resting across the rim, and rest a little flashlight pointing down.*

Determine the best Blow-Dip-Aftertouch specifications. *Pianists might notice a dip that is too shallow. They feel from the point they hit the let-off button until they feel the after-touch. With low friction they might not notice a lot of aftertouch but it might feel too light.*

1. *First find a starting point. The dip is pre-set at 11 mm, or whatever the spec is. Manufacturers measure dip from the pin and technicians measure from the front.*
2. *Find out the blow distance. 48 would be at the high end.*
3. *Find out if there is any aftertouch. For regulating purposes, aftertouch is the motion of the action after the hammer stops rising. When the hammer gets as high as it goes, the motion after that is aftertouch. The jack is the indicator point. If the spread is too wide, the jack will have no room to work at all, and the aftertouch will be minimal. Generically, the jack should just clear the knuckle and half about an equal amount of space before it hits the stop felt. There is a learned feel that determines an amount of drag or clunk.*
4. *What to change? Minimal aftertouch, increase dip by removing a punching. In other words, to increase aftertouch, increase dip. Raising dip on the sharps too much makes the touch heavy, so keep the sharps. A high leverage action might need more blow distance. If aftertouch is too minimal, it*

doesn't feel like it's done, because the jack is still hanging up on the knuckle. If the jack jams too much, a hard-playing pianist could break a jack. Keep things close to a good feel.

5. *Make an aftertouch guage. For miscellaneous pianos where you don't know specs and the action dimensions are unknown,like when the balance rail pins are not positioned correctly so that the blacks and the whites are not at the same ratio. Be able to have the key go down so it touches and the hammer doesn't go down at all, passing let-off just a little bit. Add more punching thickness and test again. This punching guage makes it stop at the highest hammer travel, and when you squeeze it more the hammer drops.*

Regulate the capstans *Make a tool out of wood. Set the tool on top of the hammer you are going to regulate and hold it down. The hammer is regulated just at the right blow distance. Once these samples are set, either eyeball it in the piano or use a let-off rack. On a Kawai the hammer height measurement is 46 mm from the strings. The gauge will be too short in the bass because the the let-off is a bit lower.*
Adjust the drop screws. *Set drop by feel. Dip, drop and dance. If it is a little on the low side, you can play the note slowly, watch the jack, and feel the drop screw touch. Start with the drop screw low and feel. There is a sponginess in the low and the high area. The first time around, raise the drop screw up so the cushion touchs the screw. This is the lowest acceptable range. This will be close to being done. Watch the drop. This is pretty good, but will change after the springs are done. The spec on drop is 1/16th after let-off after the regulation is done – after the hammer comes back up again. This spec is for the hammer at rest. Put it 1 mm or 1/16th under let-off. If the drop is too high, the note won't sing out. If there is uneven ghosting, check the jack 7 knuckle.*

Regulate the key dip according to aftertouch *Use the punching guage. When not squeezing at all, the hammer is high. When squeezed, the hammer drops. If it goes up more with the squeeze, there is too much. If it lets off all the way, there is too much key dip. Touch it and it stops, squeeze it and it drops. Remove the gauge and replace the punchings. Hammer travel and key travel match perfectly.*

Regulate backchecks. *Use neighboring keys. The Kawai spec is 15mm. Set samples, replace the action and check in the piano. Then remove the action and adjust.*

Repetition springs *They should be quick and uneven. Don't kink the wire. To strengthen it, pop it out of the slot and give it a little tug. To make a strong change, hold down the lower spring section with one tool and yank it up with another tool. Don't change the shape of the curve, because then the spring will push on a different point on the wood. All the spring does is to hold the hammer up in the air while the key is being pushed down. When the key goes down, then the jack returns. In dry climates, the spring should go faster. The height of the rise is determined by the drop screw, and the speed is determined by the spring tension.*

Rep levers feel the jack-knuckle rub in the piano check the drop for evennes by feel.
If the drop screw looks low, look at the key to see if the dip is low. Look at the jack on the knuckle.
When you see the drop is uneven, don't just turn the drop screw until you have checked other things.