Teardown of a Piano

Ed Howard

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1. List piano's name, serial number and size.

2. Record plate height (not string height) in specified locations in bass and treble. I like using a Jaras String Height gauge under a good reference point, like a strut, and pencil mark location of base and write down dimensions on info sheet and key bed.

3. Use wood wedges, or indexing holes in plate and pin block, to indicate plate location. Usually, the areas used are as follows: bass corner of plate to case, treble corner to case, the last plate screw on tenor hitch side to case, and one somewhere in the middle. On full perimeter plates, use common sense. Before marking any space as specified above, make sure you have clear passage for any plate screws or bolts. The plate position is too often neglected as some people may think, for example: five nose bolts should insure proper location, but they can flex or bend. When reinstalling plate, insert marked wedges in designated location and go around and evenly tap to lines, or locate plate to indexing holes.

4. Before going further into tear-down, make a preliminary assessment of the piano's design for peculiarities. Before taking bass pattern, record bass down-bearing.

5. Wound string patterns and samples: look at all wound strings – are they original? Are any missing? Please specify on a chart! Using craft paper, butcher paper or freezer wrap paper, cut to fit just between the struts, making sure all wound strings, hitch pins, agraffes, locating pins and bridge pins are covered. Lightly tape patter in position – tight with no wrinkles. Using 80 grit sand paper, carefully mark off all hitch pins, wrap ends, a-graffes, locating pins, and with pressure bars or V-bars, draw line exactly at the termination point. If you have tenor wraps, take patter after all bass wound strings are removed.

6. Sample strings to be sent with pattern: the 1st and last of all single, double and triple unisons in bass and also tenor. Send the entire length of string to aid the string maker, in case there are any discrepancies in bass pattern. Wrap up strings as if you had to open them, bearing in mind they can injure someone quite easily. List double wound and single wound changes.

7. Down-bearing: Take three measurements from each section. My choice for checking down-bearing is a dial indicator with special base. Usually you have to further modify base so you can gauge bridges next to struts. You can use an inexpensive rocker gauge, but you need an educated feel. Also available are bubble gauges, which I have never used. Check down bearing visually or by feel throughout the piano. Obvious problems are easy to detect, such as a=excessive bearing, flat or negative bearing, and rolled bridges. Also check for lack of or excess side bearing. Check a few spots in each section and record. If you find problems, check more spots. There are several possible reasons for bearing problems, so I suggest you

contact an experienced rebuilder to evaluate. I don't necessarily believe in proper universal down bearing specifications; however, I will list a very broad bearing guide line: bass positive .000 to .015, tenor .004 to .015, low treble .008 to .018, high treble .008 to .025, all with a front to rear differential of about .001 to .003 with front (speak length) having the higher reading.

8. Original pin size and condition. After taking wound string pattern, look at the tuning pins. Have any been replaced with over-sized pins? Sometimes only wound string areas have been restrung, so check sizes throughout area. Using micrometer, measure diameter at top, center, and bottom of threads to see if the pins are radically tapered. The block should be reamed if it is not being replaced. Pin sizes are as follows: 1/0 .276, 2/0 .282, 3/0 .286, 4/0 .291, 5/0 .296, 6/0 and 7/0 are taboo.

9. Inspect tuning pins. Before removing pins, write down torque or tightness of pins in all areas. Record the length of the tuning pins. Typically most modern pianos uses 2-3/8" and 2-1/4" lengths. If you choose to use a longer pin with existing block, you must drill beyond length of new pin threads. Some pianos have thin pin blocks and will not allow for longer lengths. Be careful. Measure the tuning pins. Make sure there is no taper on the original pins. If you put an oversized pin in a tapered hole it won't work right. Forget reamers; they glaze the hole. Drill and then use a 276 gun brush. For all pianos he uses 2-1/2" pins for all pianos. Usually there is a reason when pianos use short pins. Grade the pins since most pins vary in diameter.

10. Check for rust or rotting wood on threads. Whenever possible pin block should be replaced unless it is in very good condition. Sometimes economics do not allow for block replacement and there are reliable tricks that can be used, depending on application. Epoxy sometimes is necessary to reduce the size of holes. Epoxy soaks in within the first 15 minutes and won't soak after that. If the hole is elongated it might need to be filled and re-drilled, but the better choice is to put in a new pin block.

11. Unusual hitch pin patterns. This is without a doubt the most overlooked information tuner/technicians see and record. After wound strings have been removed, carefully look at each and every hitch pin as sometimes strings share common hitch pins to assist in fanning and expanding bridges. There are also other hitch patterns that are very strange. If you do not record this information, get ready for a real nightmare. Also look for blind hitch pins under struts, or broken hitch pins or extras not being used, which should be removed. No tie or unusual hitch pin formula: number of notes times 1-1/2 equals number of hitch pins.

12. Tied strings. Some pianos do not have tied strings, some have 1, 2, 3, 4, or many more. Write down locations carefully. I have also seen replacement tied strings where they do not exist, so try to distinguish between original ties and repair jobs.

13. Replace hitch punchings wherever factory placed them. Some understring felt has holes punched to accommodate hitch pins. Sometimes I change this to a felt-hitch pin combination.

14. Understring cloth/felt: Duplicate as factory, except where obvious problems exist, such as: one popular piano has a cardboard shim underneath felt that is not thick enough to support coils on strings. You can modify shim, making it thicker towards tuning pins and shaping it very thin towards strings. You can modify shim, making it thicker towards tuning pins and shaping it very thin towards agraffes. Also you can incorporate 1/8" round brass stock or machined half-round brass stock.

15. Duplex bars, etc. List type and locations. With sectional duplex bars, you can drill two small holes per segment to help locate while stringing. On all duplex bars, scribe locations on plate after strings are removed. Keep each section of individual duplex bars separate and watch out for different widths next to struts/breaks. Take a long board and lay out the bars and you can see how irregular they are. Triangular duplex bars will shoot out when de-stringing. Steinway sub-sectional screw-on duplex bars will break if you try to take them off; leave them there and mask them off when painting. A lot of pianos have a lot of wear on the capo bar.

16. Braid. Duplicate factory's choice of braid except when dead strings are unmuted, which could cause problems. Most duplex scale pianos do not use braid in duplex sections; however, some do. Trust the factory's choice.

17. Check for plate bushings. Check for length and diameter. Some pianos have different lengths throughout piano, especially pianos with raised bass pin block platform. Most pianos use 7/16" outer diameter plate bushings; however, some more modern pianos use 13/32" outer diameter bushings. Watch out for some older pianos, like Kimball products, which use 15/32" bushings, which you cannot purchase. They have to be custom made.

18. Plate wedges. List plate wedges and reinstall exactly in same place. If plate wedge(s) are missing, fit new one(s) in before relieving tension. Keep the plate wedges.

19. String scale. Usually where there is a tied string the diameter changes. Loosen only strings where wire size can change, such as sties or every other unison. Mic strings where campers were located as rusty strings can give you a false reading. Mark pins with chalk and write down number of unisons for each size. Some European pianos don't use American steel and wire size standards, so convert to closest American steel and wire sizes. An easy formula to convert size in inches to American steel and wire gauge is to mic strings in inches, subtract .005 and divide in half. Example: .031 subtract .005 equals 26. Divide in half and your wire size is 13 ga. AS&W.

20. Remove tuning pins with a drill. Let the drill pull the pin up. Keep things consistent when removing pins and parts, especially when keeping the original pinblock.

21. Remove strings. Before relieving tension, make sure plate screws/bolts are tight. Loosen one row of tuning pins up and down the scale at a time, trying to relive tension as evenly as possible. Loosen each ½ turn. My choice for removing strings from tuning pins is a beckett breaker. Lean the tool towards the beckett and shearing it off. After removing tuning pins, vacuum becketts and use magnet in pin holes, key bed, etc. Removing the single strings, first record the hitch-pin connections and the diameters. Particularly record tied strings. Remember that there are 1.5 times as many hitch pins as there are unisons. If the number is off, figure out where the ties go. Replace any hitch pin punchings where they came from. Steinways don't use hitch pin punchings. Record if there were braids.

22. After pins are removed, remove nose bolt nuts, pin block screws, and bolts. Check for plate rocking. Remove damper guides, install case shields (protection) and pull plate. Measure now bolt shoulder height, record any lean and remove carefully. Clean and check all glue joints and components, top and bottom. Remove nose bolts before loosening the perimeter plate screws; otherwise the plate will pop up and put pressure on the nose bolts.

23. One piano, McPhail, uses roller bearings that are press-fit into agraffes. They must be removed after tension is lowered and before strings are removed. Remove agraffes if they are to be replaced. Otherwise, clean out the agraffes with a sharp drill bit by hand and then with a pipe leaner. An alternative to agraffe spacer washers is a special agraffe bottom-reducer (~$50).

24. Pressure bars. Initially loosen pressure bar screws with a hand screwdriver before using a drill so the screws don't break. If you break a pressure-bar screw, drill it out. Assume others are going to break. Go out and buy a new set of screws. Sand and buff the underside of the pressure bar. Hand-sand the V-bar; sometimes it takes a Dremmel with a sanding drum. End by shoe-polishing with sandpaper, but make sure not to round the top edge too much, since this point should be smooth, straight and thin.

25. Bridge splits. Remove the pins. Inject slow-setting epoxy into the splits and pin holes with a hypodermic needle. Trim the tip of the needle so it isn't so sharp and won't poke you. Quickly clean up the excess epoxy with cheese cloth and cotton string, making sure not to leave any epoxy on the surface of the bridge or on the speaking side. Use paper towels at first to wipe off the worst. Lacquer thinner will remove the epoxy, but don't let the thinner get into the splits being glued or it will remove the epoxy from the repair.

NOTES:

- Wegman pianos use a metal pinblock with tapered pin holes. With these, always keep and reuse the same tuning pins. Wurlitzer also makes one like this.
- Pulling plates. Some plates have glued or varnished coats.
- Color epoxy with artist dry pigment. Titanium oxide in ochre.
- Never set metal tools on plates.
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