The Basics of Harpsichord Tuning
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Basic categories of harpsichord

- "Historical": those made before 1800 or so, and those modern ones that more or less faithfully copy or emulate original instruments. Characteristics include use of simple levers to shift registers, relatively simple jack designs, use of either quill or delrin for plectra, all-wood construction (no metal frame or bars).
- 20th century re-engineered instruments, applying 20th century tastes and engineering to the basic principle of a plucked instrument. Pleyel, Sperrhake, Sabathil, Wittmeyer, and Neupert are examples. Characteristics include pedals to shift registers, complicated jack designs, leather plectra, and metal frames.
- Kit instruments, many of which fall under the historical category.
- A wide range of in between instruments, including many made by inventive amateurs.

Harpsichords come in many shapes and designs.

- They may have one keyboard or two.
- They may have only one string per key, or as many as four.
- The pitch level of each register of strings may be standard, or an octave higher or lower. These are called, respectively, 8-foot, 4-foot, and 16-foot.
- The harpsichord may be designed for A440, for A415, or possibly for some other pitch.
- Tuning pins may be laid out as in a grand piano, or they may be on the side of the case.
- When there are multiple strings per note, the different registers may be turned on and off using levers or pedals.

We'll start by looking at some of these variables, and how that impacts tuning.

Single string instruments

These are the simplest instruments, and the easiest to tune. They come in three basic shapes. There will be no provision for shifting jacks on or off, though there may be a "piano" stop, which moves the jacks a little farther from the strings so that the pluck is weaker. There may also be a buff stop (leather or felt held against the strings to create a lute-like sound). The buff stop shortens the sustain of the string, and should be turned off while tuning.

- Most have the standard "wing" shape, similar to a grand piano, with strings in line with the keys, and tuning pins directly behind their keys. Jacks are all on the same side of their strings.

- Rectangular, often called virginals, with strings running somewhat diagonally, almost at right angles to the keys. The tuning pins are usually on the right side of the case. Jacks alternate plucking left and right.
- "Bent-side" spinet," like a wing shaped harpsichord, but with the wing bent at an angle. The tuning pins are in front of the keys.
- Pentagonal or other shape, in between virginal and bent side spinet, generally with tuning pins on the right.
- Some of the smallest of these instruments may be designed as "ottavinos": they are pitched an octave higher than standard pitch.

Two string instruments

These are all wing shaped. The registers are plucked in different directions, with two jacks raised by the back of each key, one plucking to the left, the other to the right. The two registers can be turned off and on independently, using a lever above the keys, pedals, or, for some models, by pulling or pushing the ends of the registers which protrude on the treble side of the case. The strings may be either both 8-foot, or one 8-foot and the other 4-foot. When there is a 4-foot register, there will be a second bridge.

Three and four string instruments

These are (nearly) all two manual instruments. Most three-string instruments will have two 8-foot and one 4-foot register. The upper keyboard typically operates one of the 8-foot registers, which is fixed (cannot be turned off), while the lower keyboard operates the other 8-foot and the 4-foot. In addition, the upper keyboard can be slid inward to couple with the lower keyboard, so that when the lower key is played, the upper one is also played.

Some instruments also have a 16-foot register, but this is rare. 16-foot registers usually include many strings that are wrapped.

Rare

For the sake of being complete, there are also upright harpsichords, but you are unlikely to see one.

Tuning strategies – turning on registers and coupling

For **single string** instruments, tuning is pretty straightforward in those designs with tuning pins above the corresponding keys. Those with tuning pins on the right side can present something of a challenge, as it is not very easy to follow the strings diagonally across the bridge to their pins. In these cases, it is advisable to mark some of the pins, perhaps all the Cs and Fs, and use those as guideposts, counting to get to other pins. The pins are generally in two rows, in which case each of the rows is a whole tone scale: C, D, E, F#, G#, A#; and C#, D#, F, G, A, B.

For **two string** instruments, it is necessary to tune one register and then the other. This means learning how the registers turn on and off. The upper registers are slotted strips that hold the tops of a set of jacks, and that can be moved back and forth a very small distance to place the plectra under their strings or move them

away so they don't pluck. Usually there will be a lever at each side of the keyboard, one for each register, and it is simply a matter of experimentation and observation to find out which moves which register. One 8-foot register is tuned first, then the other register is tuned to it as unisons (or octaves in the case of a 4-foot register).

There are some instruments in which the register end protrudes beyond the treble side of the case. In these instruments, you must grasp the end of the register and either pull it out or push it in to engage or disengage it.

Occasionally two string harpsichords have pedals that operate the registers. Again, it is a matter of experimentation and observation to see what they do. Usually pedals are depressed, then shifted to one side or the other to lock in place. Occasionally, when they are depressed they catch, and to release them they are depressed again.

You can generally see the movement of the jacks under the jack rail, so as to tell for sure that your tuning hammer is on the pin corresponding to the key you are playing. Hint: when in doubt about whether you are on the right tuning pin, mute the string corresponding to the pin and play the note.

Three and four string instruments have two keyboards. The upper keyboard usually has one 8-foot register, while the lower keyboard has an 8-foot and a 4-foot. Occasionally there may be a 16-foot register as well, which is most likely to be connected to the lower keyboard, in which case the 4-foot may be on the upper. There is no hard and fast rule, so it is necessary to experiment and observe.

The two keyboards can be coupled together, usually by sliding the upper keyboard inward, grasping on both sides at once (there is usually a knob or the like on the key blocks at each end). I often don't bother coupling while tuning, but instead I simply tune a note on one register, then play the unison by placing my thumb on the lower manual key and forefinger on the upper manual key.

Some harpsichords have two sets of jacks that pluck the same strings, one quill or delrin, the other leather or peau de buffle. The leather set can be ignored for tuning purposes.

On harpsichords with pedals for turning registers on and off, coupling of the keyboards is often done by some kind of pedal mechanism. Usually there will be notations stamped into the pedals, to show what their functions are.

Tuning pins

The tops of the tuning pins have two basic shapes, square and oblong. The square tops are essentially consistent in size, and can be tuned with either a gooseneck or T-hammer with a star tip. Oblong pins vary in thickness, to such an extent that there needs to be a variety of sizes of hammer. The owner of the instrument will almost always have an appropriate sized tuning hammer. It is possible to order custom tuning hammers for unusual size oblong pins.

T-hammers for oblong pins often have a hook protruding in the middle of the handle, intended for use in twisting tails when replacing strings. While it is possible to align

you hand so that this hook goes between fingers, it may be more comfortable to remove it while tuning. It should simply screw out.

Should you need to remove an oblong pin for string replacement, the lack of threads means that the pin will not screw out of the block. Often, turning it back and forth lightly will loosen the pin enough that it can be easily removed. If not, it may be necessary to grasp the top of the pin with flat-jawed pliers and pull up while turning back and forth.

Tuning technique

There are several differences between harpsichord and piano tuning technique. The most noticeable is that there is considerably lower tension in the strings, and therefore much less friction is needed between the tuning pin and the pin block. The pins turn more easily. Turning a pin is more of a finger/hand/forearm movement, as opposed to whole arm/shoulder/body.

The pins are smaller in diameter. Hence, it takes more rotational turn to pull an equivalent amount of string onto the pin. This helps compensate for the lower tension, as a smaller change in tension creates a larger change in pitch, compared to a piano.

Since the strings are plucked rather than hit, there can be no use of hard blows to overcome bearing friction. Everything must be done with hammer technique. Due to the lower friction between pin and block, there is less twisting of the pin before the pin moves. However, because the pin is thinner, it flexes more easily, so it is quite easy to create a temporary pitch change without turning the pin.

Just as with a piano, it is necessary to feel the movement of the pin in the block, but this is on a more delicate level, so your sensitivity needs to be dialed up. Close attention must be paid to whether or not you are flag-poling/flexing the pin. A certain amount of flexing back and forth is useful to make sure the pitch you think you have established is stable, just as with a piano. Alignment of a gooseneck hammer in the 12 o'clock direction will minimize tuning change due to flag-poling.

When using a T-hammer, I find that the best approach is to apply pressure to the two ends of the handle, with the thumb on one end and finger or palm on the other, rather than try to grasp the handle and rotate your wrist. There are T-hammers available from HK Supplies (mail order, Italy) in which one arm of the handle is longer than the other, making it into more of a lever. This can be helpful when the tuning pin torque is higher than usual, and also for making more minute adjustments in pitch.

Oblong pins are unthreaded, and often "tapered," rather than cylindrical. Theoretically this means that they can be made tighter in the wrestplank by tapping them in a little, and the ends of the T-hammer handle are generally metallic for this purpose. Unfortunately, many oblong pins are only tapered on their very bottom, so the effect of tapping is less than ideal. You should be aware that, depending on the instrument and how the wrestplank was drilled, pins may become loose when

turning them, so some downward pressure should be applied to the T handle while tuning so that they will hold.

Another feature of most oblong pins is the absence of a becket hole. The wire is attached to the pin entirely be friction, with the coils wrapped over an end of the wire. Hence, it is very important to maintain the tension on the string. If the tension is lowered enough, the coil will become loose on the pin, and it is very troublesome to reestablish a tight connection.

Temperature and humidity

Harpsichords are very sensitive to changes in temperature and humidity. A temperature change will create an almost instantaneous change in pitch, which will be greater in the brass strings of the bass. You should always do your best to ensure that the temperature is stable, and has been for some time, prior to tuning. This can be particularly problematic in winter, when a cold breeze from an open door can raise pitch by about 10 cents almost immediately, and a trip in a van or truck can mean that when the instrument is set up, it is as much as 50 cents sharp. In the latter case, you should wait until the instrument has returned to pitch before tuning. If time is short, you can heat the strings through friction by rubbing them.

Humidity also affects harpsichords far more than pianos. I have found seasonal changes in excess of 100 cents, sometimes approaching 200 cents. For harpsichords with low tension wire, it can be important to lower pitch early in the high humidity season to avoid broken strings.

Changing pitch

There is no need for overpull when changing pitch on a harpsichord. The harpsichord will stay quite close to where you put it during the first pass, even on a 100¢ pitch raise (or lower). Usually there is no more than a few cents settling. Two passes, each done to target pitch, should be sufficient for even a large pitch change.

Temperament

In my experience, by far the majority of people who hire me to tune their harpsichords want equal temperament. The second most common choice is Vallotti. Typically harpsichordists who want more exotic temperaments will tune their own instruments. For information about the historical use of various temperaments, please see my series of nine articles, A Clear and Practical Introduction to Temperament History, available at http://www.artoftuning.com/tuning-history/.

Note that if a harpsichord is transposing, is it likely to be more practical to tune it in equal temperament, if the transposing feature is to be used. Otherwise nearly every note will need to be re-tuned for the transposed pitch.

Pitch and transposing keyboards

Probably the majority of harpsichords you will encounter have been made for A440 pitch. A significant number, though, are designed for A415 (a half step below), and will break strings if pulled to A440. You should always ask before tuning, and should

strings start breaking, you should suspect that the instrument is intended for lower pitch.

Many smaller bent side spinets, strung entirely in brass, are scaled for A415. Some have been strung (or restrung) in phosphor bronze so that they can be tuned to 440.

The presence of oblong pins suggests (though it doesn't guarantee) a low pitch instrument.

A fair number of instruments are made with a transposing feature. This means that the keyboard(s) can be shifted by one semi-tone (very occasionally two semi-tones), so that it can adapt to either A415 or A440 without retuning by 100 cents. In these instruments, there will be a removable wooden spacer between the keyblock and the cheek of the instrument.

The spacer is removed, the keyboard is shifted, and the spacer is replaced on the other side. Though this sounds simple enough, it is a process that rarely goes without a hitch. The problem is that jacks do not hang on their strings by their dampers in a consistent enough way, so that one or several will fall into the gap between keys during the shifting process.

Should you need to do this operation, turn on all registers, and play all keys (the purpose of these steps is to get as many jacks as possible to be hanging positively on their strings). Now remove the jack rail, and watch while you are shifting the keyboard(s). If any jacks drop, pull them up and out of the way (they can be pulled free from the lower guide, then slanted so that the bottom of the jack is resting on the guide). While shifting the keyboard, be careful not to depress any of the keys. Once you have shifted the keyboard far enough that the spacer can be inserted on the other side, slide it into place. Now play all key to be sure none are caught (the bottoms of some will almost always be caught against the side of the felt of their keys). If one is binding, pull up on its top while trying to pull up on the front of the key, until you disengage the jack.

If you are tuning an instrument with a spacer, the spacer will tell you which pitch to use: if it is on the bass end, use A440; treble end, A415. Sometimes tuning pins are laid out to mimic the sharps and flats of the keyboard. If so, it will correspond at one pitch and not at the other, and this can fool you if you are not paying attention (usually it is set up to match at low pitch).

Music wire

There are several different types of music wire. Modern spring steel and brass is used on many instruments, and is quite strong and not as easily prone to breakage. On the other hand, it has a more "metallic" tone color, and is harder to work with in making hitch pin loops and tuning pin coils.

Wire made according to historical principles is also available, and is preferred for its tone quality, but has a lower breaking point. Instruments made with historic wire are often but not always designed for low pitch (A 415). You should always match the type of wire on the instrument when replacing a string.

Sources for tools and supplies:

The Instrument Workshop, http://www.fortepiano.com, comprehensive tools, parts, supplies

Zuckermann Harpsichords, http://zhi.net, a good variety of tools and supplies.

Hubbard Harpsichord , http://www.hubharp.com, a good variety of tools and supplies.

HK Supplies (Italy), http://www.hksupplies.it, custom tuning hammers, various specialty supplies.