

# Aural Octave Tuning

The following is a description of how to tune the octaves above and below the temperament octave, defined here as F3 to F4 in Equal Temperament. The octave is an exact compromise between a 4:2 and 6:3 type. The midrange is C3 to B4. The bass is F1 to B2. The low bass is A0 to E1. The treble is C5 to E6. The high treble is F6 to C8.

## Tuning the Remainder of the Midrange

After completing the F3 to F4 temperament octave, begin tuning the rest of the low midrange starting with E3. First tune a reasonable sounding octave from E4, just slightly wide of beatless, then compare the P4 and P5 above it and adjust E3 so that the octave still sounds reasonable but the P4 and P5 beat *proportionately*. The P4 beats slightly faster than the P5. You can cause the P5 to be slightly less tempered sounding than the P4 but not at the expense of creating an obvious beat in the octave. The important thing is to have all three, octave, P4 and P5 sound reasonable.

Continue likewise down to C3 or the lowest note on the tenor bridge. Wherever the scale changes from plain wire to wound strings, you will notice that it will take less stretch in the octave to make the octave, P4 and P5 agree. Now, play chromatically all of the rapidly beating intervals: M3, M6 and m3. You may also use contiguous M3 and m3 checks. Minor thirds (m3s) are particularly useful in this range as they will be in the bass for finding and correcting very small errors. Wherever you may find unevenness, prove that the note you suspect may be slightly sharp or flat with any other intervals related to that note before changing it.

## Tuning the "Killer" Octave

The range just above the temperament octave is often called the "Killer" octave because of its difficulty in making compromises in both tuning and voicing. I think of the "Killer" octave as being F4 to F5 but some may think of it as an octave and a half or as much as two full octaves. Therefore, the "Killer" octave crosses from the midrange into the treble.

Begin with F#4 similarly to the way you tuned down from the temperament octave. Make the octave sound reasonable first by tuning very slightly to the wide side of beatless. Now compare the P4 and P5 below it. The P5 may sound close to beatless. If you cause the P5 to be too nearly beatless, the octave will be too obviously wide and you will cause a dilemma once you have reached the point where there is another P5 contiguous to it. The P4 may have a noticeable beat but it should not be too obvious, not much if any more than about one beat per second up to about C5. The P4 can be faster past C5, up to F5 but will begin to fade from perception in that range and therefore is no longer relevant at or about F5.

Once you reach E5, check from F#4 to E5 using chromatic M6s and M10s, listening for any unevenness. As with the section in the low midrange, prove any suspected error before you change it. Pay particular attention to chromatic P5s. Musicians, especially string players, are especially sensitive to any "beating fifths" (as they may call them) in this range. If you find any, you will have to make whichever compromise you must to improve whichever P5s beat noticeably. This may mean slightly flattening the lower note and sharpening the upper but all related intervals must still sound reasonably good and the rapidly beating intervals must progress smoothly. The "Killer" octave is difficult but the entire rest of the piano is so easy to do as to be "mindless".

## Tuning "Mindless" Octaves

Beginning at F5 and using the sostenuto pedal, play and hold the F3-F5 double octave. (If the piano has no sostenuto pedal or it does not work, use the damper pedal the same way you would use the sostenuto pedal. Play the notes first and then press the pedal. If you are tuning a vertical piano and using muting strips, the strip mute will hold open the treble dampers, so you do not need to use a pedal at all.)

Temporarily tune the F3-F5 double octave beatless. Now play and hold the A#3-F5 octave and fifth. You should hear a beat in the octave and fifth. Sharpen F5 slightly until both the double octave and the octave and fifth have virtually the same quality. Neither interval will have much of any audible beat. They will both sound apparently or very nearly beatless yet the double octave will be slightly wide and the octave and fifth will still be slightly narrow. You can continue this very same procedure to C8. With practice, you will find this very easy to do with remarkable precision but with little concentration required. A check with chromatic M10s and M17s will most often reveal a flawless progression needing little or no correction.

If you desire more stretch in the high treble, you can choose to start favoring the octave and fifth at or about F6. That will mean a wider double octave but in the high treble, that is often acceptable. You can delay such favoring until C6 or higher if you choose. The limitation you may find is in how wide of a single octave this creates in that area of the piano. If the single octave sounds objectionably wide to you, you may wish to keep tuning the equal beating double octave and octave and fifth until such a point in the scale that some slight beating in a single octave no longer sounds objectionable. If you are tuning for the PTG tuning exam, you must switch to 2:1 octaves at C7 to B7. Simply tune beatless single octaves and use the M10-M17 equal beating check to prove a 2:1 octave. You can also check with chromatic M17s for smoothness.

In making any of these choices, you are tuning the piano to (or making a compromise based upon) the actual inharmonicity that the piano has. If you choose to tune beatless octaves and fifths or even beatless double octaves and fifths in the high treble for a truly maximum amount of stretch, you are still using the piano's own unique inharmonicity to determine a pitch for the note to be tuned. However, anytime you favor one interval over another, you will compromise the interval you have disfavored. In the high treble, that essentially means that you will have audible beats in the single octaves. It is up to you to determine how far you can or should go with that compromise depending on the circumstances.

A maximally stretched high treble will sound very bright and is often appealing to many or most people. To others, however, those kind of single octaves "scream" with dissonance. In any case, the amount of beating in a single octave is never extreme, even with maximum stretch. Remember that sustain in the high treble is short (that is why there are no dampers). The actual musical context played in the high treble is not the kind of harmony played in the midrange. Therefore, a brilliant high treble (which projects well) is often a good choice in many circumstances. You simply need to use your professional judgment or respond to the suggestions or complaints of the person or people for whom you tune. The complaint may well be that the high treble sounds "flat" and if so, you will know what to do about that, regardless of your own opinion.

## **Tuning the Bass**

Beginning with B2 or the highest note on the bass bridge, do a "mirror image" of what you did in the treble. Tune first a reasonable sounding octave, slightly wide of beatless and then compare the P4 and P5 above it. You may favor the P5 slightly over the P4 but not at the expense of creating an overly wide octave.

At or about F2, you no longer need to consider the P4 above the note to be tuned. Simply concentrate on Octaves and 5ths. You can also use the sostenuto pedal and compare the double octave and octave and fifth as you did in the treble and high treble. Single octaves, P4s and P5s in the bass should all sound reasonable. Use m3s, M10s and M17s to check for evenness. In the low Bass, you will want to be sure that single octaves, double octaves and octaves and fifths all sound reasonable.

In the very lowest Bass, especially on smaller pianos, you may begin to hear a faint resonance when tuning a single octave. This is actually the result of a large difference in inharmonicity between partials beyond the eighth partial of the note being tuned and the note an octave above it. Oddly enough, even though it is actually a rapid beat, it does not sound objectionable but rather pleasing to the ear. That is why I call it a resonance rather than an octave with a rapid beat in it. You may hear this starting on or about F1 and lower. That resonance will often mimic the beat rates of M10s an octave above or those of the M3s in the temperament octave. Only the very largest 9-foot concert grand may not exhibit this resonance.

You may continue comparing the double octave and octave and fifth all the way to A0. However, just as with the high treble, you may begin to favor the octave and fifth or the double octave and fifth at some point in the low bass, beginning on or about C2. Check to make sure that whichever decision you have made does not create overly wide single octaves. The most useful intervals for checking evenness from A0 to C2 are chromatic double octaves and minor sevenths. Starting at C2, play C2 and A#3 and continue downward. It is a widened interval just like M10s and M17s, so use it identically.

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