# TUNING TO THE EXTREMES

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**Skills for refining piano tuning in the first, second, sixth, and seventh octaves.**
Adding a new check or group of checks can be challenging, as it involves changing our routines and investing the time and thought to learn. Try reviewing a new check one day later, then once a week to integrate it into your habits and improve your understanding of your work.

**Learning new checks**
Sometimes there are inconsistencies in the tone of a piano due to termination point, false beats, something in the wire or the wood, or whatever. String age alone can make a difference.
Adding a new check to your sequence can become very time consuming.
There is a memory that we develop so that when we need a check we do it the same way.
To imprint a new pattern into our memory, do it once tonight, once the next morning, a couple times the next day, in increasing frequency until it is a part of our habit.
The octaves have one or more pairs of partials that can be matched.

**Inharmonicity**
There is a paper chart that can be placed on a keyboard to show the harmonics of any given note. The problem with this device is that it does not take into account inharmonicity. In reality the harmonics will not precisely line up as they do in the chart. Inharmonicity means that the actual harmonics are not quite in line with the mathematical harmonics. The higher up the partials, the sharper the harmonic becomes.
An expanded 4:2 octave will be faster. As we go up, the 4:2 octave stretches. As we go up, actually the octave partials contract and move closer to the same beat. A stretch increases the size of the octaves.

**Bass**
*The usual arsenal for the bass:*

1. Second octave:
    a. m3/M6 check for 6:3 octaves
    b. Parallel M10ths and M6ths
2. First octave:
    a. m6/M3 check for 8:4 octaves (ghosting)
    b. Parallel M17ths and m14ths (octave plus m7, otherwise known as the "demented 7th")

*The bass problem:*

*Creating an even transition between 6:3 and 8:4 octaves without being faked out by false readings.*

1. Adding a contiguous M3 above the bottom m3 of a m3/M6 check to create a beat speed M6/m3/M3 sandwich
2. Getting familiar with the m6/M3 8:4 octave check.
3. Watching for the beat speed boundary between the M6/m3/M3 and the 8:4 octave as you make the transition.

In a 3:10 the 7th should be faster than the 3rd. The 17th check gets faster as we go up.
In the bass we tune wider octaves. We listen to the 6:3 partial in the bass because it is so dominant. It is also right where our ears are tuned. When we tune down in the bass and up in the treble, the scaling, the acoustics, and the pacing are all different. We need to make choices and compromises so these transitions are smooth. Usually the bass is a 6:3 octave, so the normal check is slower minor third to the major sixth above. When the checks start sounding muddy, use 17ths. Go up an octave on the top check note and the clarity and volume will increase. Check with decreasing minor 7ths. Check with an 8:4 octave. U

**Ghosting**
Ghosting means that you hold down the note you want to hear, and then pop the lower octave. You will hear the predominant harmonic. If it's an 8:4 octave, they should beat the same. This is a helpful technique on spinets, because it enables us to hear a tone clearly. As you hold the lower note down and the strike various harmonic notes above, listen to the beat rates of the residual tone.

**Checks**

If the top note is a plain wire and the bottom note is a wound string, it will seem as though the plain wire is too high. Do a 3:10 check and listen for expansion. Although it may be tempting to bring the bottom note up, run some other checks to hear if you like it. Play major sixths. We're not just listening just to the comparison of the beat rates, but also we're mentally comparing above and below, like reading a staff. Minor 3rds above the Major 6th will beat increasingly slower as they go up. If M6th is x, then m3rd will be x-1, the next m3rd will be x-2, etc. As we get slower, we get into the 8:4 range.

The m 3rd to the Major 6th and the m 3rd contiguous to the M 3rd is a good check.

Try also the Major 3rd to the minor 3rd below it.

We can always tell when we hit the 8:4 point because it will sound clean. However, as we get lower or higher, it is helpful to listen to more than one sound, hence multiple checks become important.

| | M6 | m3 | M3 |
|---|---|---|---|
| A typical 6:3+ would look like this: | x | x-1 | x-2 |
| A typical 6:3 would look like this: | x | x | x-1.5 |
| A typical 8:4 would look like this: | x | x-2 | x-2 |

**Treble**

Because the bass is so flexible, it is fairly easy to do. In the treble things are tighter. We want to constrict the expansion of the octave without having it sound flat, and to do it in a manner suitable for that piano. There is also less listening time before we lose the information. Sometimes the first strike is garble, which gives us only a second to find the right tone.

*The usual arsenal for the high treble:*

Sixth octave

M3/M10/m17 check for 2:1+ octaves stacked over 4:2+ octaves
Parallel M10ths, M17ths, and double octaves
M6/M17 check for the P12: the M17 should not be faster than the M6!
If it is, the high note is too sharp.

Seventh octave:

Quiet octave, busy M17; M3=M10=M17
P19>P12 (if the P19 is slower, the high note is too sharp)
P12>P5 (if the P12 is slower, the high note is too sharp)

**Arpeggios**

Arpeggios can mislead. We want to hear the top not higher when played in sequence than when played at the same time. When we listen simultaneously we are forced to hear the beat.

*The high treble problem:*

*Creating an even transition between 4:2+, 4:2, and 2:1+ octaves when it is so hard to hear.*

1. Working the 4:2 and p12 checks in tandem in preparation for the seventh octave.
   a. M3/M10/m17 + M6/M17 (M17>M6) = M3/M10/M6/M17
   b. M3/M10/M17 + M6/M17 (M17=M6) = M3/M10/M17/M6?
2. Parallel M23rds 9triple octave plus m2) – a sensitive test
   a. Most useful in the sixth octave once the reference not is into the plain wire
   b. Contracted interval (reads counter-intuitively)
3. 2:1+ octaves in the seventh octave
   a. P19/M17/P15/P12/M10 sequence: "slow/rapid/quiet/slower/rapid" progression. Notice what happens when the top note is slightly flat or slightly sharp by observing what happens to the progressions. Start as a double octave fifth. Most of the information we get off the first four notes. Play contiguous intervals on the low notes and the same note on the high note.
   b. "Clear as a bell" and "charge it". To pop the harmonic on a guitar, just barely touch it and release. Try this with a charge card on a piano string. The harmonic is present whether you touch the string or not. When right at the 2:1 point there is more sustain. This is a good reality check. Usually the note will be too high.
   c. Checks: 12ths and 17ths. Use the major sixth above the bottom note. Play the 3rd and the 6th an octave higher. This is a relative of the 6:10 check.

d. Another check is the triple octave plus one note. This is a very sensitive 9th partial. Use this once you have cleared the break. *When it speeds up it means your high note is low.* If the beats slow down, the upper note is high.

Play single, double and triple octaves going down, keeping the top note the same.
All these checks help us decide if we are above or below pitch.
By using these checks over a period of time, we find that we hear them differently by cross-checking our checks. We are adding more information and we have more flexibility. If a performer wants the top octave higher, we have the tools to make the changes evenly and steadily. These changes can be minute.

There are times when the treble might not sound even. These checks help solve that problem. Sometimes it is possibly to tune by octaves and simply hear when it's right on. In this case, spot-checking is all that is needed to confirm that things are correct. On a practical level, once we have the sounds of these checks in our ears and our heads, we can tune efficiently and quickly.

**Resources**

On Pitch by Rick Baldassin, available from the PTG Home Office
"Treble Octave Stretching" by Richard West, PTG June 1990, p. 32
"Ninth Partial Intervals" by Dan Levitan, PTG December 1993, p. 36
Pace Lessons, esp. #7-9, 14, and 18-23, available from the PTG Home Office
PTG Tuning Examination: A Source Book, available from the PTG Home Office