

A quick and practical bearing method, by ear

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As discussed in my *Early Music* article about Bach's 1722 diagram, the required pattern to be delivered onto the keyboard is:

- **1/6 PC narrow 5ths F-C-G-D-A-E,**
- **pure 5ths E-B-F#-C#,**
- **1/12 PC narrow 5ths C#-G#-D#-A#,**
- **and the residual 1/12 PC wide diminished 6th A#-F.**

The following method, using a technique of several temporary notes, is a quick and accurate way to set up this pattern. It takes only a few minutes, with practice (having memorized this sequence through experience). The temporary notes are used to place some of the other notes precisely, without having to guess at beat rates in the 5ths. We need only know the *musical* technique of listening accurately to a rhythm of triplets against duplets. See www.larips.com for an more detailed explanation how and why it works.

- Take A from the tuning fork or other appropriate source.
- Set F: tenor F-A (below middle C) beats wide at 3 beats per second. First tune it pure with the tenor A, and then lower it until this major 3rd beats at the proper speed. It has 3.0 beats per second (or double the metronome speed of 89) if we are starting from A=440; or 2.8 beats (double the metronome 84) if starting from A=415. Such speeds can be memorized by thinking of the tempos of some appropriate compositions; or, use a watch with a digital readout or a ticking second-hand.
- From the tenor F tune down a 4th to C, temporarily pure. We will move this C later.
- From the tenor A tune down a 5th to D, temporarily pure.
- Set tenor G from that C and D so the 4th D-G beats 1.5 times as fast as the 5th C-G. (Triplets against duplets.) Our temporary C and D are only there to set this G precisely into place, halfway between the F and the A: a *mean tone* between them. The sounds of this 5th and 4th here are remarkably rough (technically it is 1/3 comma each), and it is therefore easy to hear these beats, because we have not tempered the C or D yet.
- Set middle C from the tenor F and that G, likewise: the 4th G-C beating as triplets against the duplets of the 5th F-C. These are now our 1/6 comma 5ths, placed accurately.
- Set middle D from tenor G and A likewise, with the 4th A-D beating as triplets against the duplets of the 5th G-D. **By this point we have achieved F-C-G-D-A as regular 1/6 comma 5ths.**
- Correct the lower D and C to match these two, as octaves. In this correction we have averaged the (temporarily) pure and 1/3 comma 5ths/4ths on either side of them to be two 1/6 comma 5ths/4ths.
- Set middle E from tenor A slightly flat, with the same quality as these other 5ths. It should beat as a major 3rd from middle C at 4.5 times per second. Also check it as a 10th from tenor C, the same 4.5 times per second. An excellent test for this particular F-A and C-E is found at bar 21 of the *WTC* book 1 C major prelude. These two major 3rds should have exactly the same character as one another, although the beat rate is different (since the pitch is different).
- Copy middle E down to tenor E. Check that the E-A 4th sounds properly with 1/6 comma quality.
- Set pure 5ths E-B-F#-C#. These are in their final positions. Test them also as pure 4ths.
- From the F above middle C, tune pure fifths downward F-Bb-Eb. This is a step to set the Eb exactly; we will move this temporary Bb soon.
- Copy that tenor Eb up to middle Eb, and test this as a pure 4th from the Bb.
- Tune tenor G# pure to tenor C# and then slightly lower it so the C#-G# 5th and the Ab-Eb 5th (flanking middle C) have the same quality as one another: a very slow beat from each. It is so slight that it is scarcely noticeable from either one. These are our 1/12 comma 5ths.
- Lower A# slightly so it has a slow beat from D# like that of C#-G# and Ab-Eb. This also introduces a slow beat into the Bb-F 5th, but it is wide rather than narrow. We have now placed A# into its proper position, which coincidentally softens the F#-A# major 3rd slightly.
- We now have the complete bearing. Confirm the entire pattern to be sure no errors have been introduced anywhere: **1/6 PC narrow 5ths F-C-G-D-A-E, pure 5ths E-B-F#-C#, 1/12 PC narrow 5ths C#-G#-D#-A#, and the residual 1/12 PC wide diminished 6th A#-F.** The 1/12 comma 5ths are so subtle as to be scarcely perceptible.
- Finish the instrument with pure octaves and unisons: all the bass, then all the treble. It is useful especially in the treble to check all the octaves' purity by testing the 5ths and 4ths within them. This ensures that we still have the proper pattern of 1/6, 1/12, or pure 5ths and 4ths at each position.