

Tuning for Non-12 tone per octave scales for Vsampler3  
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PART ONE:

8 April 2005

To tune non-12 scales for VSampler3 - until they make an automated procedure for it - you have to type in an individual value for each pitch. And these values have to be adjusted to take into account the pitch you wish to act as a reference note.

For example let's make a file to tune 17 tones per octave equal temperament. Any non-12 scale, just, equal, or any other kind, can be tuned using this method.

First, using Scala, get a listing of the scale in cents values. Here's 17 tone equal temperament:

0  
70.6  
141.2  
211.8  
282.4  
352.9  
423.5  
494.1  
564.8  
635.3  
705.8  
776.5  
847.1  
917.7  
988.2  
1058.8  
1129.4

(I've rounded off the values to .1 cent just for convenience. You can use any resolution you want.)

Now, for each octave of the scale, I prepare a chart showing what Key, Midi note number, cents deviation from our reference point, cents of the desired note in the scale, and actual number to put in the chart. For the first octave, it's easy. Here, we start on C3 (Midi 60) in order to give us the chance to have scales going above and below our reference point.

Key = Key name on Vsampler3

Midi = Midi note number

Cent/ref = Cents from the reference note for normal equal temperament

Scale = Cents value of the scale note from the reference point

USE = the actual value to put in the VSampler3 chart.

STARTING OCTAVE - 17 Tone Equal Temperament

formula for the starting octave - the negative difference between the Cent/ref. value and the Scale value.

| Key | Midi | Cent/ref. | Scale  | USE    |
|-----|------|-----------|--------|--------|
| C3  | 60   | 0         | 0      | 0      |
| C#3 | 61   | 100       | 70.6   | -29.4  |
| D3  | 62   | 200       | 141.2  | -58.8  |
| D#3 | 63   | 300       | 211.8  | -88.2  |
| E3  | 64   | 400       | 282.4  | -111.6 |
| F3  | 65   | 500       | 352.9  | -147.1 |
| F#3 | 66   | 600       | 423.5  | -176.5 |
| G3  | 67   | 700       | 494.1  | -205.9 |
| G#3 | 68   | 800       | 564.8  | -235.2 |
| A3  | 69   | 900       | 635.3  | -264.7 |
| A#3 | 70   | 1000      | 705.8  | -294.2 |
| B3  | 71   | 1100      | 776.5  | -323.5 |
| C4  | 72   | 1200      | 847.1  | -352.9 |
| C#4 | 73   | 1300      | 917.7  | -382.3 |
| D4  | 74   | 1400      | 988.2  | -411.8 |
| D#4 | 75   | 1500      | 1058.8 | -441.2 |
| E4  | 76   | 1600      | 1129.4 | -470.6 |

## FIRST UPPER OCTAVE - 17 Tone Equal temperament

formula for the first upper octave - the negative difference between the Cent/ref. value and the Scale value BUT don't forget to add 1200 cents to each scale value because you're 1 octave above your starting point. For each further octave, add another 1200 cents to each scale value, of course.

| Key | Midi | Cent/ref. | Scale  | USE    |
|-----|------|-----------|--------|--------|
| F4  | 77   | 1700      | 1200   | -500   |
| F#4 | 78   | 1800      | 1270.6 | -529.4 |
| G4  | 79   | 1900      | 1341.2 | -558.8 |
| G#4 | 80   | 2000      | 1411.8 | -588.2 |
| A4  | 81   | 2100      | 1482.4 | -617.6 |
| A#4 | 82   | 2200      | 1552.9 | -647.1 |
| B4  | 83   | 2300      | 1623.5 | -676.5 |
| C5  | 84   | 2400      | 1694.1 | -705.9 |
| C#5 | 85   | 2500      | 1764.8 | -735.2 |
| D5  | 86   | 2600      | 1835.3 | -764.7 |
| D#5 | 87   | 2700      | 1905.8 | -794.2 |
| E5  | 88   | 2800      | 1976.5 | -823.5 |
| F5  | 89   | 2900      | 2047.1 | -852.9 |
| F#5 | 90   | 3000      | 2117.7 | -882.3 |
| G5  | 91   | 3100      | 2188.2 | -911.8 |
| G#5 | 92   | 3200      | 2258.8 | -941.2 |
| A5  | 93   | 3300      | 2329.4 | -970.6 |

You might notice that EACH of the figures in the USE column for the ascending octaves is approx. 29.4c higher than the one below it. With more precision (more decimal places) that might be a way to set up an algorithm to do this instead of doing all this arithmetic. But this arithmetic shows the logic behind the numbers, and might help the programmer set up an algorithm to do this.

## DESCENDING SCALES.

For descending scales (scales below the reference point, we have to get inverse cents values for our scale. That is, the cent values for a scale below a reference point. For 17 tone equal temperament these values are the inverse of the 17 tone scale listed above. Look at the values in the "Scale" column here, and compare them with the listing of cents values for 17 tone equal temperament above. You'll see that they're precisely the inversion of them (Note: this listing of the scale backwards only works for equal temperament or equal interval scales. For just scales, or scales with different interval sizes, you'll have to actually do the arithmetic, subtracting each note's cents value from 1200).

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## IRST DESCENDING OCTAVE from C3 - 17 tone equal temperament

Formula - absolute value of Cent/ref minus absolute value of Scale - use positive number for result.

| Key | Midi | Cent/ref. | Scale   | USE   |
|-----|------|-----------|---------|-------|
| G1  | 43   | -1700     | -1200   | 500   |
| G#1 | 44   | -1600     | -1129.4 | 470.6 |
| A1  | 45   | -1500     | -1058.8 | 441.2 |
| A#1 | 46   | -1400     | -988.2  | 411.8 |
| B1  | 47   | -1300     | -917.7  | 382.3 |
| C2  | 48   | -1200     | -847.1  | 352.9 |
| C#2 | 49   | -1100     | -776.5  | 323.5 |
| D2  | 50   | -1000     | -705.8  | 294.2 |
| D#2 | 51   | -900      | -635.3  | 264.7 |
| E2  | 52   | -800      | -564.8  | 235.2 |
| F2  | 53   | -700      | -494.1  | 205.9 |
| F#2 | 54   | -600      | -423.5  | 176.5 |
| G2  | 55   | -500      | -352.9  | 147.1 |
| G#2 | 56   | -400      | -282.4  | 117.6 |
| A2  | 57   | -300      | -211.8  | 88.2  |
| A#2 | 58   | -200      | -141.2  | 58.8  |
| B2  | 59   | -100      | -70.6   | 29.4  |

NOTE that each value of the USE list is ALSO 29.4 cents less than the one above it. AND that the values in the USE list for this descending octave are the positive versions (and upside down) of the list for the first octave.

From this example, you should be able to figure out how to do any scale in VSampler3.

HOWEVER, what a lot of work! SURELY, the crew at Maz-sound can come up with an algorithm to do this- something like: Reference note? Number of Scale degrees? Scale file?

## PART TWO - SEPTEMBER 2005

The tuning files created by VSampler are indeed stored on your computer, and they are accessible for editing with a text editor.

Somewhere on your computer there will be a file called "microtuning". Usually, this will be in the VSampler folder. However, if you got the version of VSampler that was given out with Cakewalk Sonar, you'll find that the folder will not be with your normal VSampler installation, but in a folder in Cakewalk called "Shared DXI/Vsampler". Do a search for the "microtuning" folder, and you'll find all the scale files, including the ones you make, there. You can then open any of them and edit them with any text editor. This is also handy for making larger files with the method mentioned above.

## PART THREE - OCTOBER 2005

You may notice that if you have a normal instrumental multisample in VSampler (set for 12 tone tuning, as usual), and you use that with a microtonal scale of more than 12 notes, that some of your timbres will sound crummy. This is because the samples are being transposed way out of their optimal range relative to the keys they are placed on.

There is an easy way to correct this. You just have to do reassignment for all the keys.

For discussions sake, let's deal with 24 tone per octave equal temperament, although this method will work just as easily with any just or non-just, non-equal scale.

Let's discuss only 2 octaves of samples, in 12 tone et, and how what happens in 24 tone.

In 12 tone, our samples are  
sample 1 root C3 low note C3 high note F3  
sample 2 root G3 low note F#3 high note B3  
sample 3 root C4 low note C4 high note F4  
sample 4 root G4 low note F#4 high note B4

Now, if we tune the keyboard into 24 et, (assuming C4 as the centre of our tuning), then on KEY C3 will be the PITCH F#3. Similarly on KEY B4 will be the PITCH F quarter tone sharp.

So the samples on those keys will be transposed to play PITCHES well out of their range. And it will get worse as you go farther up and down the scale. So for these two octaves, what would apply for 24 tone tuning would be the following

sample 2 root G3 low note C3 high note B3  
sample 3 root C4 low note C4 high note Bb4  
sample 4 root G4 low note B4 high note - whatever....

Notice that the root keys stay the same, but your new low and high note settings for each zone are based on the location of ACTUAL PITCHES in your new tuning. At this point, names such as "C4" and "F#1" actually become unhelpful. Maybe thinking of each key just as a midi number with a pitch in the target tuning assigned to it, would be more helpful.