Drum-Set Tuning Guide

Tune-Bot enables you to accurately tune your drums to a specific notes or frequencies and once you know the notes or frequencies you want, you can quickly tune and retune your drums. This tuning guide will help you determine the notes and frequencies to use for your specific drum-set. Then you can use tune-bot to tune your set to those specific values. After you've tuned your set to your liking you can also store the pitches of all your drums in tune-bot to allow you to quickly retune to the same sound over and over again.

Tom Tuning

A good way to tune your toms and your snare as well, if you like, is to use notes in musical intervals or chords for the fundamental pitches of the drums. One consideration, in selecting which interval or chord to use for tuning, is the number of toms (and optionally snare) in your set. If you have a small number of drums you might prefer larger intervals between drums whereas with a large number of drums you might be better with smaller intervals, otherwise, you might span too small or too large a range of pitches with your drums.

Summary of Tuning Steps

1) Choose the fundamental notes for every drum using Table 1.
2) Decide on the amount of Resonance[1]: low, medium, high or maximum and if top or bottom head is higher in lug-frequency.
3) Calculate the top and bottom head lug-frequency for every drum head.

For each drum:

4) Tune top and bottom heads to required lug-frequency.
5) Equalize top and bottom heads.

Note: These formulas may not be exact. Depending on your drums dimensions you may have to fine tune the lug pitches to get the desired note: These formulas will however get you close!

[1] Explained in next section.

Details of Tuning Steps

Fundamental Note Selection

Suggested tunings for a variety of drum set configurations ranging from 2 to 6 toms are listed in the following table. The table also covers most popular tom sizes ranging from 8 to 16 inches in diameter. All the notes in any of these tunings can be moved up or down a few semi-tones (the distance between A and A#; a half-step) to suit individual tastes without changing the intervals. Only the fundamental pitch of the drum, i.e., the lowest pitch of the drum (obtained when the drum is hit in the center and is mounted on a stand), is listed in the chart, not the lug-pitches. You will get the same fundamental pitch whether you hit the top or bottom head since the top and bottom heads vibrate in unison when the drum is hit in the center. The corresponding top and bottom head lug-pitches, however, are independent of each other and can be 1.2 to 2.3 times higher than the fundamental pitch for typical drum sizes.

Table 1. Recommended Fundamental Notes and Frequencies for Various Tom Configurations.

Tom Sizes	Number of Toms (Notes and Frequencies in Hz)									
	2	**2**	**3**	**3**	**3**	**3**	**4**	**4**	**5**	**6**
8									3E 165 Hz	3G# 208 Hz
10	3C 131 Hz		3C 131 Hz	3C 131 Hz			3D 147 Hz	3E 165 Hz	3C 131 Hz	3E 165 Hz
12		2A 110 Hz	2A 110 Hz	2G 98 Hz	2A 110 Hz	2A 110 Hz	2B 124 Hz	2B 124 Hz	2G# 104 Hz	3C 131 Hz
13					2F 87.3Hz					2G# 104 Hz
14	2F 87.3 Hz		2F 87.3Hz			2F 87.3 Hz	2G 98 Hz	2F# 92.5 Hz	2E 82.4 Hz	2E 82.4 Hz
16		2D 73.4 Hz		2D 73.4 Hz	2C# 69.3 Hz	2C 65.4 Hz	2D 73.4 Hz	2C# 69.3 Hz	2C 65.4 Hz	2C 65.4 Hz
Type of Interval	**Perfect Fifth**	**Perfect Fifth**	**Major Chord**	**Perfect Fourths**	**Major Thirds**	**Perfect Fourths**	**Call to Post**	**Perfect Fourths**	**Major Thirds**	**Major Thirds**

Resonance and Top or Bottom Head Tuning Options

With a two-headed drum, the fundamental pitch of the drum can be varied by adjusting either top or bottom heads so there are an infinite number of top and bottom lug-pitch combinations for any specific fundamental pitch. The resonance (or sustain) of the drum depends on the lug-frequency relationship between the top and bottom heads. After you decide on the amount of drum resonance you want, from low to high, specific top and bottom lug pitches can be easily determined for any desired fundamental pitch.

Selecting the amount of resonance that is right for you depends on the type of sound you want: maximum resonance and slower decay is obtained with top and bottom lug-pitches tuned to the same pitch; alternatively, lower resonance and quicker decay is obtained from larger differences in top and bottom lug-pitches. For live performance more resonance might be desirable whereas for a recording situation, it might be better to have less resonance and faster decay. Another consideration if the heads are tuned differently is which head is higher in pitch. Again this is a personal choice: typically, a more controlled sound is obtained with the bottom head tuned higher than the top head, a good choice for recording. On the other hand, more attack is attained with the top head tuned to the higher lug-pitch.

Calculating the Top and Bottom Lug-Frequencies

The following lug-frequency formulas are values for typical drums. The actual values for your drums will depend on the ratio of the drum shell diameter to the depth, the type of drum heads you are using and if the top and bottom heads are the same type. Use these formulas as a starting point and adjust them to suit your specific drums and heads.

Maximum Resonance: Tune top and bottom lug pitches to the same pitch. Depending on the specific drum, the lug pitch will be between 1.6 and 1.9 times higher in frequency than the fundamental pitch. To start, multiply the frequency of the desired fundamental note by 1.75 and tune both top and bottom lug-pitches to that frequency. Then, measure the fundamental pitch of the drum and adjust the pitch of top and bottom heads accordingly.

Example 1. Maximum Resonance with 4 Toms: 10”, 12”, 14” and 16”. Both Heads Equal.

Tom Size	**Fund. Note**	**Fund. Freq. (Hz)**	**Top and Bottom Lug Freq. (Hz)**
10	3D	147	257 (= 147 x 1.75)
12	2B	124	217 (= 124 x 1.75)
14	2G	98	172 (= 98 x 1.75)
16	2D	73.4	128 (= 73.4 x 1.75)

High Resonance: With the bottom head tuned higher, multiply the frequency of the desired fundamental note by 1.85 and tune the bottom head lug-pitch to that frequency. Then tune the top head lug-pitch to about 1.5 times the fundamental frequency. Then, measure the fundamental pitch of the drum and adjust the pitch of the top head until it equals the desired frequency. For high resonance with the bottom head tuned lower, simply switch the numbers in the two columns.

Example 2. High Resonance with 4 Toms: 10”, 12”, 14” and 16”. Bottom Head Higher.

Tom Size	Fund. Note	Fund. Freq. (Hz)	Top Lug Freq. (Hz)	Bottom Lug Freq. (Hz)
10	3D	147	221 (= 147 x 1.5)	272 (= 147 x 1.85)
12	2B	124	186 (= 124 x 1.5)	229 (= 124 x 1.85)
14	2G	98	147 (= 98 x 1.5)	181 (= 98 x 1.85)
16	2D	73.4	110 (= 73.4 x 1.5)	136 (= 73.4 x 1.85)

Medium Resonance: Follow the instructions in the preceding paragraph using 2.0 times and 1.4 times the fundamental frequency instead of 1.85 and 1.5 times.

Example 3. Medium Resonance with 4 Toms: 10”, 12”, 14” and 16”. Bottom Head Higher.

Tom Size	Fund. Note	Fund. Freq. (Hz)	Top Lug Freq. (Hz)	Bottom Lug Freq. (Hz)
10	3D	147	206 (= 147 x 1.4)	294 (= 147 x 2)
12	2B	124	174 (= 124 x 1.4)	248 (= 124 x 2)
14	2G	98	137 (= 98 x 1.4)	196 (= 98 x 2)
16	2D	73.4	103 (= 73.4 x 1.4)	147 (= 73.4 x 2)

Low Resonance: Follow the same instructions using 2.3 and 1.2 times the fundamental frequency instead of 1.85 and 1.5 times.

Example 4. Low Resonance with 4 Toms: 10”, 12”, 14” and 16”. Bottom Head Higher.

Tom Size	Fund. Note	Fund. Freq. (Hz)	Top Lug Freq. (Hz)	Bottom Lug Freq. (Hz)
10	3D	147	176 (= 147 x 1.2)	338 (= 147 x 2.3)
12	2B	124	149 (= 124 x 1.2)	285 (= 124 x 2.3)
14	2G	98	118 (= 98 x 1.2)	225 (= 98 x 2.3)
16	2D	73.4	88 (= 73.4 x 1.2)	169 (= 73.4 x 2.3)

Snare Drum Tuning

Most 14” diameter snare drums sound good with a fundamental pitch in the range of 3E to 3A#. Some drummers like to have the fundamental pitch of their snare in the same interval relationship as their toms while others like to set it independently; it’s really a matter of personal preference.

A good pitch relationship for the drum heads is to tune the lug pitch of the bottom head a perfect fifth higher than the top head (1.5 times higher in frequency, see Appendix). This combination works well for a couple of reasons: a higher-pitch resonant head helps minimize snare buzz and a lower-pitch batter head avoids choking the drum. When tuning to higher fundamental pitches, eg., above 3G, it’s a good idea to keep the resonant head from exceeding a lug-frequency of 400 Hz, to avoid stretching or choking; typical resonant heads are only 3 mils. thick and can easily deform. In these cases simply reduce the size of the interval to perfect fourths or major thirds (1.33 or 1.26 respectively) or lower, to keep the resonant head from getting too high in lug pitch.

Recommendations

Suggested top and bottom (batter and resonant) head lug tuning frequencies for a typical 14” snare drum are listed below. Depending on the specific drum, and the thickness of the drum heads, the required frequencies may vary so try these as a starting point and adjust accordingly.

Lug-Frequencies for a typical 14” Snare Drum.

Fund. Note	Interval	Top Lug Freq. (Hz)	Snare Lug Freq. (Hz)
3E	Perfect Fifth	229	343
3F	Perfect Fifth	240	359
3F#	Perfect Fifth	252	378
3G	Perfect Fifth	266	398
3G#	Perfect Fourth	299	398
3A	Major Third	318	400
3A#	-	356	400

Bass Drum Tuning

A lot of factors go into tuning your bass drum such as, the type of heads, use of cut-outs or kick-ports in the resonant head and the type of damping, eg., a pillow in the drum etc. A good starting point is to tune the lug-frequency of the resonant head a perfect fifth (1.5 times) higher in frequency than the batter head. Some people prefer the opposite while others prefer the heads closer in lug-frequency; again, a matter personal preference and some experimentation may pay off.

Diameter	Fund. Note	Batter Lug Freq. (Hz)	Resonant Lug Freq. (Hz)
24”	1C	49	74
24”	1C#	52	78
22-24”	1D	55	82
22”	1D#	58	87
22”	1E	61	91
20”	1F	64	96
20”	1F#	68	101
18”	1G	71	107

Appendix A. Musical Intervals for Drum Tuning

Before describing each of these interval relationships in detail some terminology will be defined. First, an octave corresponds to a doubling in frequency, for example the notes A (220 Hz) and A (440 Hz) are one octave apart. Second, there are twelve semi-tones in an octave (A, A# … G#) and the semitones are evenly spaced, i.e., the frequency ratio of any two successive semi-tones are equal. Expressed mathematically, the frequency ratio of two successive semi-tones is $2^{1/12} = 1.0595$ and consequently, the frequency ratio of 12 consecutive semi-tones is $\left(2^{1/12}\right)^{12} = 2$, exactly one octave as required.

Major Thirds

Consecutive notes in this interval are 4 semitones apart, or equivalently, have a frequency ratio of $2^{4/12} = 1.2599$. Since there are 12 semi-tones in an octave, a set of 4 notes in major thirds spans an octave and is a good choice for tuning a set of 4 or more toms. The following table shows all possible sequences of major thirds. The top row in the table shows the corresponding frequency ratios to allow arbitrary tuning in major-thirds.

1.0	1.26	1.59	2.0
C	E	G#	C
C#	F	A	C#
D	F#	A#	D
D#	G	B	D#
E	G#	C	E
F	A	C#	F
F#	A#	D	F
G	B	D#	G
G#	C	E	G#
A	C#	F	A
A#	D	F#	A
B	D#	G	B

Perfect Fourths

Consecutive notes in this interval are 5 semitones apart, or equivalently, have a frequency ratio of $2^{5/12} = 1.335$. This interval is a good choice for tuning a set of 4 toms if you want to span more than a single octave in frequency. The following table shows all possible sequences of perfect fourths. The top row in the table shows the corresponding frequency ratios to allow arbitrary tuning in perfect fourths.

1.0	1.33	1.78	2.38
C	F	A#	D#
C#	F#	B	E
D	G	C	F
D#	G#	C#	F#
E	A	D	G
F	A#	D#	G#
F#	B	E	A
G	C	F	A#
G#	C#	F#	B
A	D	G	C
A#	D#	G#	C#
B	E	A	D

Perfect Fifths

Consecutive notes in this interval are 7 semitones apart, or equivalently, have a frequency ratio of $2^{7/12} = 1.50$. This interval is a good choice for tuning a set of 2 or 3 toms. The following table shows all possible sequences of perfect fifths. The top row in the table shows the corresponding frequency ratios to allow arbitrary tuning in perfect fifths.

1.0	1.5	2.25
C	G	D
C#	G#	D#
D	A	E
D#	A#	F
E	B	F#
F	C	G
F#	C#	G#
G	D	A

G#	D#	A#
A	E	B
A#	F	C
B	F#	C#

Major Chords

A major chord consists of three notes, a root note, a major-third, and a perfect-fifth (7 semi-tones from the root note). The three notes in a chord are a good choice for tuning a set of 3 toms. The following table shows major chords for every major scale. The top row in the table shows the corresponding frequency ratios to allow arbitrary tuning with major chords.

1.0	1.26	1.5
C	E	G
C#	F	G#
D	F#	A
D#	G	A#
E	G#	B
F	A	C
F#	A#	C#
G	B	D
G#	C	D#
A	C#	E
A#	D	F
B	D#	F#

The Call to the Post

The 4 notes making up the song, "The Call to the Post", are also a popular choice in tom tuning and are separated by 5, 4, and 3 semi-tones respectively. The following table shows the sequence in all possible major keys. The top row in the table shows the corresponding frequency ratios to allow arbitrary tuning to this song.

1.0	1.33	1.68	2.0
C	F	A	C
C#	F#	A#	C#
D	G	B	D
D#	G#	C	D#
E	A	C#	E
F	A#	D	F
F#	B	D#	F#
G	C	E	G
G#	C#	F	G#
A	D	F#	A
A#	D#	G	A#
B	E	G#	B

Appendix B. Frequencies of Musical Notes for first Five Octaves

Oct.	C	C #	D	D #	E	F	F #	G	G #	A	A #	B
1	32.7	34.6	36.7	38.9	41.2	43.7	46.2	49	51.9	55	58.3	61.7
2	65.4	69.3	73.4	77.8	82.4	87.3	92.5	98	103.8	110	116.5	123.5
3	130.8	138.6	146.8	155.6	164.8	174.6	185	196	207.7	220	233.1	246.9
4	261.6	277.2	293.7	311.1	329.6	349.2	370	392	415.3	440	466.1	493.9
5	523.3	554.4	587.3	622.3	659.3	698.5	740.0	784.0	830.6	880.0	932.2	987.8