Bass Trombone Slide Positions

by Tom Kirkland
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Lately it seems even first-year students are playing are playing F-attachment trombones, and many do not seem to be fully comprehending the positions they use to make the notes they are playing with the trigger. There is even more confusion among young players of double-valve bass trombones as to what is really happening when they mash the triggers.

I first played a single-valve Bb-F bass trombone in high school band in the fall of 1975. I bought my own F-E dependent double-rotor bass trombone (a Reynolds TO-01) in the fall of 1976 and have been playing it ever since. The only training I ever got on how to use the valves was from an article by Allen Ostrander from the late 1960s on how to use the F-attachment, and from Reynolds marketing literature on how to use the dependent F-E rotor system on my new TO-01.

The easiest way to understand the position system of a bass trombone is to understand it as two or three (or even four) different trombones. The Bb trombone has seven positions, the first-trigger F trombone has only six, and the second-trigger horn usually has only five. If you are playing an independent-system horn, you actually have four trombones at your disposal.

The physics of producing sound using a pipe are such that the change in the length of pipe is inversely proportional to the change in frequency produced. High notes need less tubing length than low notes. For each pipe in an organ a half-step longer or shorter than its neighbor, the difference in length is a PERCENTAGE of the total length of pipe. This is why, when one observes a rank of organ pipes, the differing lengths of the pipes form graceful curves, and not straight lines. The more tubing you add to the trombone, whether by slide or by trigger, the farther apart the positions are.

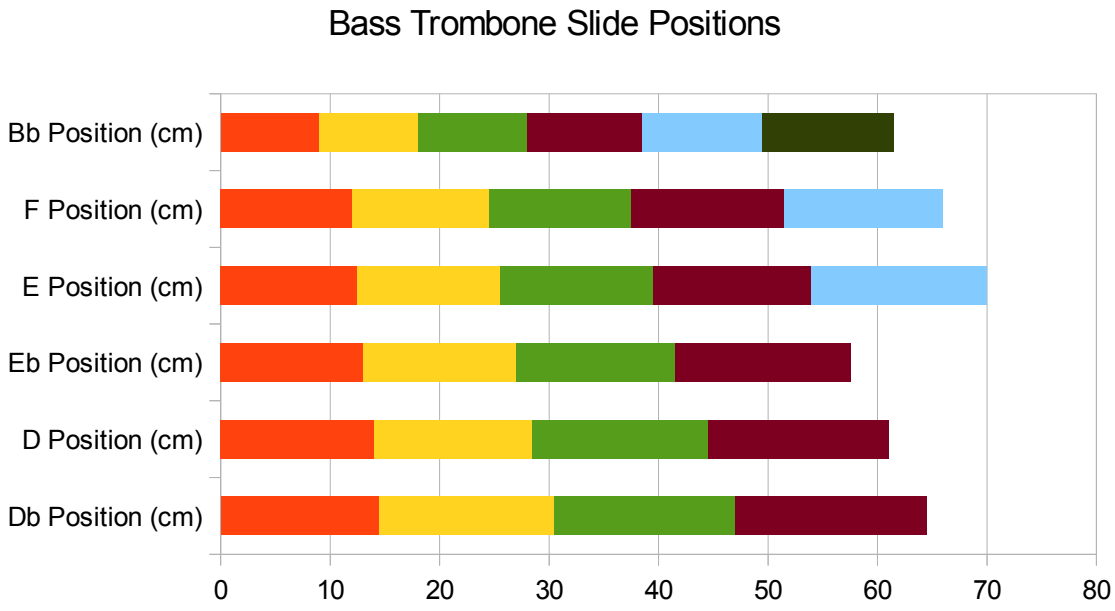
A beginning trombonist learns the positions on the Bb instrument without really being conscious of these differences. It is not until the F-attachment comes into play that some thought process is required.

The following chart works out the position lengths of each fundamental note in the harmonic series for the open horn and each of the most common trigger pitches from the actual frequency of the note.

Note	Frequency (Hz)	Wavelength (cm)	Cumulative Position (cm)	Bb Position (cm)	F Position (cm)	E Position (cm)	Eb Position (cm)	D Position (cm)	Db Position (cm)
A#2/Bb2	116.54	296	0	0					
A2	110	314	9	9					
G#2/Ab2	103.83	332	18	18					
G2	98	352	28	28					
F#2/Gb2	92.5	373	38.5	38.5					
F2	87.31	395	49.5	49.5	0				
E2	82.41	419	61.5	61.5	12	0			
D#2/Eb2	77.78	444	74		24.5	12.5	0		
D2	73.42	470	87		37.5	25.5	13	0	
C#2/Db2	69.3	498	101		51.5	39.5	27	14	0
C2	65.41	527	115.5		66	54	41.5	28.5	14.5
B1	61.74	559	131.5			70	57.5	44.5	30.5
A#1/Bb1	58.27	592	148					61	47
A1	55	627	165.5						64.5

It is highly unlikely that the main slide on any standard Bb trombone can be extended to or beyond 66cm without risking damage, so even though the literature would suggest that the basic F-E trombone could obtain a B2 in tune, without a tuning slide pull it can't be done. In actual practice, I pull the E tuning slide as far as it can go on my Reynolds and leave it there, and the B2 is usually the only note for which I use it.

F-D systems are quite a bit more common now, but require a significant mental adjustment to get from the Bb system to the D system. The following is a graphic representation of the calculations above.



The zero at the left of the chart is first position-- the fully closed slide. There are then six additional positions available on the 66cm or so of slide extension available on the Bb trombone. On the F trombone, there are six positions, and I learned was to think of them as long versions of the Bb positions, which has served well. C3 is then available in “sixth” position on the F trombone (C4 is available in normal sixth position on the Bb trombone) even though that long “sixth” position is longer then seventh position on the Bb horn.

Learning the D trombone requires learning five new harmonic series that are loosely related to the positions for the fourth harmonics on the Bb trombone (D5 in first position down to Bb4 in fifth).

Because the tone of the trombone changes pretty significantly when a lot of extra tubing is added, it is generally recommended that in the minds of most players, the extra tubing available through the valves is considered primarily a means to obtain lower notes, and not as shortcuts for the slide.

I studied trombone under Dr. Julius Whitinger in college, and he was very much of the mind that one should learn to play the straight Bb tenor horn first without using the triggers as any sort of shortcut, and that is basically how I play the bass trombone today. The Reynolds TO-01 has, by modern standards, small valves and tight tubing turns, so it makes sense on that horn to avoid the triggers unless they are needed for the low notes. But the tone quality on every trombone will be more even, particularly when playing slow passages, if the triggers are avoided.

Who am I to write such recommendations? Well, I started playing tenor trombone in the fall of 1969,

and as I mentioned before, did not touch a trigger until the fall of 1975. I came up in an era when the F attachment was seen as unnecessary on a tenor trombone. My high school band director, a trumpeter, handed me the bass trombone and Ostrander's article and told me to figure it out (I was not taking lessons at the time, and did not know anyone who knew anything about it). I was later trained by a man who had played the trombone for a living for close to 50 years. In addition to that, I worked for 25 years in an industry where an understanding of the physics of sound was crucial. To me, then, gaining an understanding of the physics of placing the slide in the correct position for each note in each of the configurations my trombone can take is crucial to being a good player.

For our metric-challenged friends:

Note	Frequency (Hz)	Wavelength (in)	Cumulative Position (in)	Bb Position (in)	F Position (in)	E Position (in)	Eb Position (in)	D Position (in)	Db Position (in)
A#2/Bb2	116.54	116.5	0	0					
A2	110	123.6	3.55	3.55					
G#2/Ab2	103.83	130.7	7.1	7.1					
G2	98	138.6	11.05	11.05					
F#2/Gb2	92.5	146.9	15.2	15.2					
F2	87.31	155.5	19.5	19.5	0				
E2	82.41	165	24.25	24.25	4.75	0			
D#2/Eb2	77.78	174.8	29.15		9.65	4.9	0		
D2	73.42	185	34.25		14.75	10	5.1	0	
C#2/Db2	69.3	195.1	39.3		19.8	15.05	10.15	5.05	0
C2	65.41	207.5	45.5		26	21.25	16.35	11.25	6.2
B1	61.74	220.1	51.8			27.55	22.65	17.55	12.5
A#1/Bb1	58.27	233.1	58.3					24.05	19
A1	55	246.9	65.2						25.9

A sharp eye will note that the difference in wavelength is twice the difference in position length. This is because we get twice as much tubing length change as the change in slide position.

Calculations are for a straight tube. The bell of the horn and bends in the tubing have some impact on the apparent pipe length and probably affect these calculations to some degree, but the measured length of most Bb trombones does not differ from the calculated wavelength of Bb2 by more than about 2-3%. Whether the math is absolutely correct or not, the concept still holds, and we really ear-tune a trombone note by note anyway, do we not?