

### Notes on the Scordatura Tuning

This string quartet is written in an 11-limit just intonation system based on a Bb fundamental. To facilitate this a scordatura system has been designed wherein the strings of each instrument are tuned to harmonics of the Bb overtone series. The base ratios for each pitch are listed in the table below with their corresponding cent values relative to the fundamental. They are ordered by their distance from the fundamental.

<b>Pitch</b>	Bb	Db	D	E <sup>1/4</sup> b	F	Ab
<b>Ratio and Cents (c)</b>	1/1 = 0 c	7/6 = 266.8 c	5/4 = 386.3 c	11/8 = 551.3 c	3/2 = 702 c	7/4 = 968.8 c

To further facilitate the scordatura tuning the following chart shows the desired frequency values in Hertz (Hz) for each string on each instrument.

<b>Instrument</b>	<b>String IV</b>	<b>String III</b>	<b>String II</b>	<b>String I</b>
Cello	Bb 1 = 58.27 Hz	F 2 = 87.405 Hz	D 3 = 145.675 Hz	Ab 3 = 203.945 Hz
Viola	Bb 2 = 116.54 Hz	F 3 = 174.81 Hz	Db 4 = 271.927 Hz	Ab 4 = 407.89 Hz
Violin II	F 3 = 174.81 Hz	Db 4 = 271.927 Hz	Ab 4 = 407.89 Hz	E <sup>1/4</sup> b = 640.97 Hz
Violin I	F 3 = 174.81 Hz	D 4 = 291.35 Hz	Ab 4 = 407.89 Hz	E <sup>1/4</sup> b = 640.97 Hz

The Cellist should tune their C string down to the desired Bb fundamental. Then they should tune the other strings to the 3rd (F), 5th (D), 7th (Ab) and 11th (E<sup>1/4</sup>b) harmonics of the "Bb string." Once all of the players have tuned their strings which correspond to harmonics of the Bb overtone series the second Violin and the Viola may tune the D string down to the 7/6 Db minor third by tuning it as a perfect 5th below the Ab string (7/4). The instruments should be tuned using the patch approximately one hour before a performance of the piece. The tuning should then be checked and adjusted as needed immediately before entering the stage for the piece's performance to ensure the highest level of accuracy possible for the scordatura system. Once on stage it is useful for the cellist to play the needed harmonics on the B-flat string so that strings which correspond to those pitches may be tuned again in the space. If possible, the instruments should be tuned a full 24 hours prior to the performance to give the strings time to truly settle into the necessary tuning.