

# **String Harmonics**

**by Cliff Colnot**

## PREFACE

The major purpose of this treatise is to provide extensive examples of natural harmonics and of artificial harmonics which are produced on the bowed string instruments by lightly touching a third, fourth, or fifth above a stopped tone. The goal has been to provide a comprehensive reference while realizing that instrument size and hand size may make some of the examples impractical.

A string set into vibration will vibrate not only along its full length but also along fractions of its length. At least ten identifiable pitches are simultaneously produced, giving a tone its characteristic color. These tones are the harmonic series, the natural foundation of musical acoustics, and each tone can be isolated by preventing smaller string lengths from vibrating.

I recommend that composers and arrangers write bass harmonics at real pitch with a note of explanation; otherwise, the standard 8va transposition should be shown with a small accompanying notehead indicating the sounding pitch. Whatever notation is used, explanatory notes should be provided at the beginning of the score and the parts.

Special thanks to Dan Armstrong, Stephen Balderston, Loren Brown, Tom Hall, Peter LaBella, Everett Zlatoff-Mirsky, Brad Opland and Collins Trier for their invaluable advice.

### GENERAL OBSERVATIONS ABOUT HARMONICS

A diamond indicates finger location, a round note with a circle above it indicates sounding pitch.

When harmonics are played, the string's fundamental is canceled.

Using artificial harmonics allows greater control of pitch.

Natural harmonics ring longer than tones produced by stopping the string.

## NATURAL HARMONICS

Touching one octave above the open string produces a tone one octave higher than the open string.

Touching a fifth above the open string produces a tone one octave and a fifth higher.

Touching a fourth above the open string produces a tone two octaves higher.

Touching a major third or a major sixth above the open string produces a tone two octaves and a major third higher.

Touching a minor third above the open string produces a tone two octaves and a fifth higher.

Diamonds alone always refer to natural harmonics.

Some higher natural harmonics tend to be flat, and the use of artificial harmonics may be preferable.

## ARTIFICIAL HARMONICS

\*Touching a minor third above a stopped pitch produces a tone two octaves and a fifth higher than the stopped pitch.

\*Touching a major third above a stopped pitch produces a tone two octaves and a third higher.

Touching a fourth above a stopped pitch produces a tone two octaves higher.

Touching a fifth above a stopped pitch produces a tone one octave and a fifth higher.

*\*These touch points have limited application and are not illustrated.*

# Violin - G String Natural Harmonics

	Touch Point	Sounding Pitch	
<b>Less Reliable</b>			} <b>Most Commonly Used</b>
<b>Mid String</b> (sounds where written)			
<b>Unreliable</b>		} <b>Sound Where Written</b>	

# Violin - D String Natural Harmonics

	Touch Point	Sounding Pitch		
<b>Less Reliable</b>				
<b>Mid String</b> (sounds where written)				<b>Most Commonly Used</b>
<b>Unreliable</b>				

# Violin - A String Natural Harmonics

	Touch Point	Sounding Pitch	
Less Reliable			}
Mid String (sounds where written)			
Unreliable			

# Violin - E String Natural Harmonics

	Touch Point	Sounding Pitch	
Less Reliable			} Most Commonly Used
Mid String (sounds where written)			
Unreliable			} Sound Where Written

# Viola - C String Natural Harmonics

	Touch Point	Sounding Pitch	
<b>Less Reliable</b>			}
<b>Mid String</b> (sounds where written)			}
<b>Very Unreliable and Impractical</b>			}

# Viola - G String Natural Harmonics

	Touch Point	Sounding Pitch	
<b>Less Reliable</b>			}
<b>Mid String</b> (sounds where written)			
<b>Very Unreliable and Impractical</b>		}	
		<b>Sound Where Written</b>	
	</		

# Viola - D String Natural Harmonics

	Touch Point	Sounding Pitch		
<b>Less Reliable</b>			} <b>Most Commonly Used</b>	
<b>Mid String</b> (sounds where written)				
<b>Very Unreliable and Impractical</b>				} <b>Sound Where Written</b>

# Viola - A String Natural Harmonics

	Touch Point	Sounding Pitch		
Less Reliable			} Most Commonly Used	
Mid String (sounds where written)				
Very Unreliable and Impractical				} Sound Where Written

# Cello - C String Natural Harmonics

Touch Point

Sounding Pitch

Unreliable

Tends To Be Flat

Most Commonly Used

Mid String  
(sounds where written)

Sound Where Written

Unreliable

# Cello - G String Natural Harmonics

	Touch Point	Sounding Pitch	
<b>Unreliable</b>			
<b>Tends To Be Flat</b>			
			} <b>Most Commonly Used</b>
<b>Mid String</b> (sounds where written)			
			} <b>Sound Where Written</b>
<b>Unreliable</b>			

# Cello - D String Natural Harmonics

Touch Point

Sounding Pitch

Unreliable

Musical notation showing the touch point (B2) on the D string and the sounding pitch (D3) in the bass clef.

Tends To Be Flat

Musical notation showing the touch point (D3) on the D string and the sounding pitch (F#3) in the bass clef.

Musical notation showing the touch point (D3) on the D string and the sounding pitch (A3) in the bass clef.

Musical notation showing the touch point (D3) on the D string and the sounding pitch (B3) in the bass clef.

Musical notation showing the touch point (D3) on the D string and the sounding pitch (C#4) in the bass clef.

Most Commonly Used

Mid String

(sounds where written)

Musical notation showing the touch point (D3) on the D string and the sounding pitch (D4) in the bass clef.

Musical notation showing the touch point (D3) on the D string and the sounding pitch (E4) in the bass clef.

Musical notation showing the touch point (D3) on the D string and the sounding pitch (F4) in the treble clef.

Musical notation showing the touch point (D3) on the D string and the sounding pitch (G4) in the treble clef.

Musical notation showing the touch point (D3) on the D string and the sounding pitch (A4) in the treble clef.

Musical notation showing the touch point (D3) on the D string and the sounding pitch (B4) in the treble clef.

Musical notation showing the touch point (D3) on the D string and the sounding pitch (C5) in the treble clef.

Sound Where Written

Unreliable

# Cello - A String Natural Harmonics

	Touch Point	Sounding Pitch	
<b>Unreliable</b>			
<b>Tends To Be Flat</b>			
			} <b>Most Commonly Used</b>
<b>Mid String</b> (sounds where written)			} <b>Sound Where Written</b>
<b>Unreliable</b>			

# Bass - E String Natural Harmonics

Touch Point

Sounding Pitch

$\sharp$

↑ = up 1/8 step  
↓ = down 1/8 step

Less Reliable

Most Commonly Used

Mid String

Sound Where Written

Unreliable

# Bass - A String Natural Harmonics

Touch Point

Sounding Pitch

↑ = up 1/8 step  
↓ = down 1/8 step

Less Reliable

Mid String

Unreliable

The musical notation is organized into three main sections, each with a vertical line separating the 'Touch Point' (left) from the 'Sounding Pitch' (right).

- Less Reliable:** Contains five rows of notation. The first row shows a touch point on the 1st string, 1st fret, resulting in a sounding pitch of G2. Subsequent rows show touch points on the 2nd, 3rd, 4th, and 5th frets, with arrows indicating 1/8 step adjustments. The sounding pitches are G2, G2, G2, G2, and G2.
- Mid String:** Contains five rows of notation. The first row shows a touch point on the 1st string, 1st fret, resulting in a sounding pitch of G2. Subsequent rows show touch points on the 2nd, 3rd, 4th, and 5th frets, with arrows indicating 1/8 step adjustments. The sounding pitches are G2, G2, G2, G2, and G2.
- Unreliable:** Contains five rows of notation. The first row shows a touch point on the 1st string, 1st fret, resulting in a sounding pitch of G2. Subsequent rows show touch points on the 2nd, 3rd, 4th, and 5th frets, with arrows indicating 1/8 step adjustments. The sounding pitches are G2, G2, G2, G2, and G2.

Most Commonly Used

Sound Where Written

# Bass - D String Natural Harmonics

Touch Point

Sounding Pitch

↑ = up 1/8 step  
↓ = down 1/8 step

Less Reliable

Mid String

Unreliable

Most Commonly Used

Sound Where Written

# Bass - G String Natural Harmonics

Touch Point

Sounding Pitch

↑ = up 1/8 step  
↓ = down 1/8 step

Less Reliable

Mid String

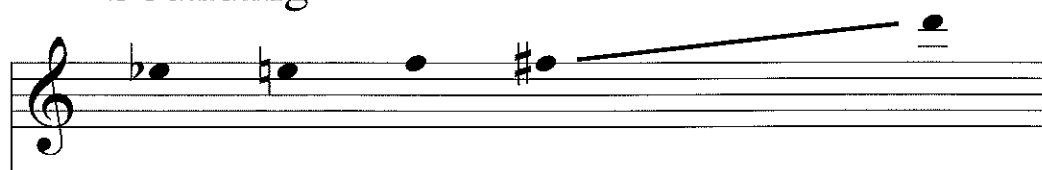
Unreliable

Most Commonly Used


Sound Where Written

# Violin - G String Artificial Harmonics

Sounding

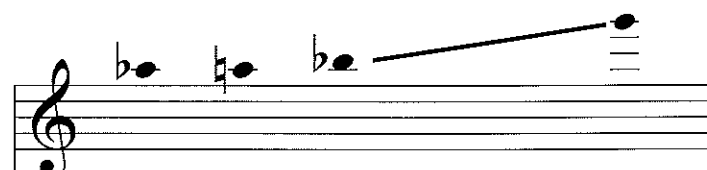


Touch 5

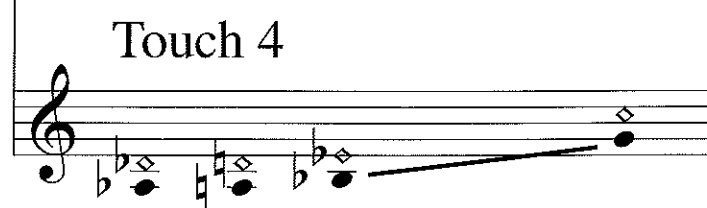


The diagram shows two staves of music. The top staff, labeled 'Sounding', contains a treble clef and a sequence of four notes: Bb, B, C, and C#. A long horizontal line with an upward-pointing arrow starts from the C# note and extends to the right, ending above a final note on the G line (G4). The bottom staff, labeled 'Touch 5', contains a treble clef and a sequence of four notes: Bb, B, C, and C#. Each of these notes has a diamond-shaped symbol above it, representing the touch point for the artificial harmonic. A long horizontal line with an upward-pointing arrow starts from the C# note and extends to the right, ending above a final note on the G line (G4).

Sounding



Touch 4



The diagram shows two staves of music. The top staff, labeled 'Sounding', contains a treble clef and a sequence of three notes: Bb, B, and C. A long horizontal line with an upward-pointing arrow starts from the C note and extends to the right, ending above a final note on the G line (G4). The bottom staff, labeled 'Touch 4', contains a treble clef and a sequence of three notes: Bb, B, and C. Each of these notes has a diamond-shaped symbol above it, representing the touch point for the artificial harmonic. A long horizontal line with an upward-pointing arrow starts from the C note and extends to the right, ending above a final note on the G line (G4).

# Violin - D String Artificial Harmonics

Sounding

Touch 5

Sounding

Touch 4

# Violin - A String Artificial Harmonics

Sounding

8<sup>va</sup>

Touch 5

Detailed description: This musical notation shows two staves. The top staff, labeled 'Sounding', features a treble clef and a dashed line above it labeled '8<sup>va</sup>'. The notes are G4, A#4, B4, and C5, with a slur over the last two notes. The bottom staff, labeled 'Touch 5', features a treble clef and a key signature of one flat (Bb). The notes are G4, A#4, B4, and C5, with diamond-shaped markers above the notes. A slur covers the last two notes, which are also marked with diamond shapes.

Sounding

8<sup>va</sup>

Touch 4

Detailed description: This musical notation shows two staves. The top staff, labeled 'Sounding', features a treble clef and a dashed line above it labeled '8<sup>va</sup>'. The notes are Bb4, B4, and C5, with a slur over the last two notes. The bottom staff, labeled 'Touch 4', features a treble clef and a key signature of one flat (Bb). The notes are Bb4, B4, and C5, with diamond-shaped markers above the notes. A slur covers the last two notes, which are also marked with diamond shapes.

# Violin - E String Artificial Harmonics

Sounding

8<sup>va</sup>

Musical notation for E string artificial harmonics, Touch 5. The notation consists of two staves. The upper staff is labeled "Sounding" and features a dashed line with "8<sup>va</sup>" above it. It contains four notes: E4, F#4, G4, and A4, with a slur over the last two notes. The lower staff is labeled "Touch 5" and contains four notes: E4, F#4, G4, and A4, with diamond-shaped markers above the first three notes and a slur over the last two notes.

Sounding

8<sup>va</sup>

Musical notation for E string artificial harmonics, Touch 4. The notation consists of two staves. The upper staff is labeled "Sounding" and features a dashed line with "8<sup>va</sup>" above it. It contains four notes: E4, F#4, G4, and A4, with a slur over the last two notes. The lower staff is labeled "Touch 4" and contains four notes: E4, F#4, G4, and A4, with diamond-shaped markers above the first three notes and a slur over the last two notes.

# Viola - C String Artificial Harmonics

Sounding

Touch 5

Sounding

Touch 4

# Viola - G String Artificial Harmonics

Sounding

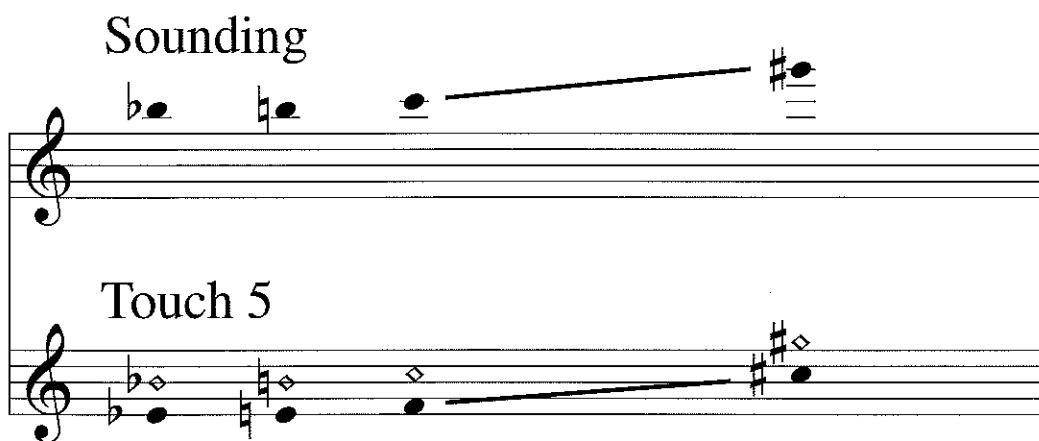
Touch 5

Sounding

Touch 4

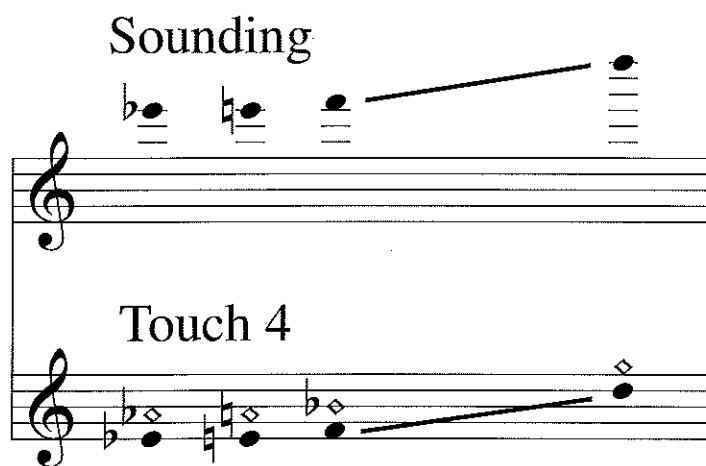
# Viola - D String Artificial Harmonics

Sounding



Touch 5

Sounding



Touch 4

# Viola - A String Artificial Harmonics

Sounding  
*8va*-----

Touch 5

Sounding  
*8va*-----

Touch 4

# Cello - C String Artificial Harmonics

Sounding

Do not use Touch 5

Practical, but rarely used

Sounding

Touch 4

# Cello - G String Artificial Harmonics

Sounding

Do not use

Practical, but rarely used

Touch 5

Sounding

Touch 4

# Cello - D String Artificial Harmonics

**Sounding**

**Do not use Touch 5**

**Practical, but rarely used**

**Sounding**

**Touch 4**

# Cello - A String Artificial Harmonics

Sounding

Do not use  
Touch 5

Practical, but rarely used

Sounding

Touch 4

# Bass - E String Artificial Harmonics

Sounding

Not Practical Practical

Touch 5

Sounding

Not Practical Practical

Touch 4

# Bass - A String Artificial Harmonics

Sounding

Not Practical

Practical

Touch 5

Sounding

Not Practical

Practical

Touch 4

# Bass - D String Artificial Harmonics

Sounding

Not Practical

Practical

Touch 5

Detailed description: This musical example illustrates artificial harmonics on the D string using the 5th finger. The top staff, in treble clef, shows the sounding notes: B2, C3, D3, and E3. The bottom staff, in bass clef, shows the fingering. The first two measures are labeled 'Not Practical' and show the 5th finger touching the 5th fret. The last two measures are labeled 'Practical' and show the 5th finger touching the 4th fret. A dashed vertical line separates the 'Not Practical' and 'Practical' sections.

Sounding

Not Practical

Practical

Touch 4

Detailed description: This musical example illustrates artificial harmonics on the D string using the 4th finger. The top staff, in treble clef, shows the sounding notes: B2, C3, D3, and E3. The bottom staff, in bass clef, shows the fingering. The first two measures are labeled 'Not Practical' and show the 4th finger touching the 5th fret. The last two measures are labeled 'Practical' and show the 4th finger touching the 4th fret. A dashed vertical line separates the 'Not Practical' and 'Practical' sections.

