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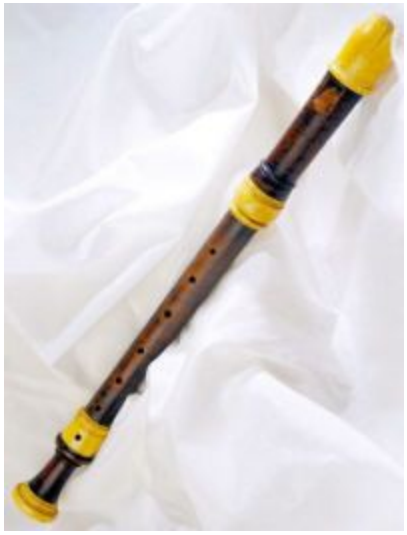
What is a=440Hz Pitch?

by Eric Haas

If you've shopped for a recorder, you've probably seen somewhere in the description "a=440." What does that mean? Does it matter?

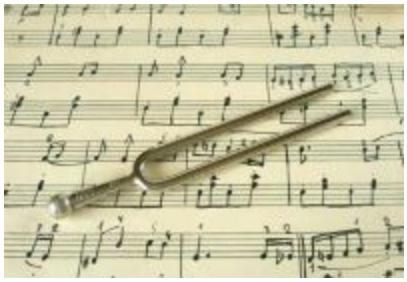


The History of Pitch

In the modern era, we're accustomed to thinking of pitch as being fixed or absolute: middle C sounds the same whether played on a piano, tenor recorder, violin or any other "concert pitch" instrument. But prior to the 20th century there was no standard of pitch. Early notation, particularly vocal music, really indicates only relative pitch relationships. Local standards for tuning keyboards, winds and strings varied widely, usually taking their cue from the pitch of the organ in the principal church in town. As musicians traveled, the difficulties multiplied, particularly for the wind players. For example, recorders from the workshop of French-born London maker Bressan (*pictured*) range from about a=395 to a=418, while instruments from the Nuremburg maker Denner cluster from about a=406 to a=430. In 1859 the French government legislated a standard of a=435, which was adopted by many orchestras and opera houses across Europe.

What is sound? Sound is vibrations traveling through the air, which are heard when they strike the eardrum. On a recorder, air blown into the windway is split on the edge of the labium (*see photo*) which sets the air column inside the bore vibrating. The greater the volume of air (that is, the larger the recorder and the more holes that are covered), the lower the pitch. Pitch is measured by the number of times per second that the air column vibrates; the unit of measurement is called "Hertz" (abbreviated Hz) after Heinrich Rudolf Hertz who proved the existence of

electromagnetic waves. One vibration per second (one cycle) = 1 Hz. Musical pitches are identified by note name plus a number to designate the octave. The lowest pitch on a piano is A0, the highest is C8; Middle C is C4. Pitch is usually designated using A4 (the standard orchestral tuning note). Finally, the octave above any note vibrates exactly twice the speed of the lower pitch.



1926: Creating the a=440 standard

The earliest appearance of a=440 as a standard is from 1834, when the Stuttgart Deutsche Naturforscherversammlung (Conference of Physicists) of 1834 suggested this pitch, based on the recommendation of Johann Scheibler's studies with his Tonometer (52 tuning forks at 69° F). Not until 1926 did the American music industry settle on an informal standard of a=440; the pitch was adopted by the American Standards Association in 1936 and by the International Organization for Standardization in 1955!

Pitch Inflation: Just to confuse matters more, there is a long-standing and ongoing phenomenon called "pitch inflation" -- many players tend to tune slightly sharp for a more "brilliant" sound. Many US orchestras tune sharper than a=440 and in the EU most orchestras tune to a=442 or a=443. This is about 8 cents (that is 8/100 of a half-step) higher than a=440. All recorders from European makers are pitched at a=442. Why does this matter when a recorder at a=442 can be played with a=440 instruments by pulling out the head about 2 mm? Pulling out the center section from the head socket will lower the pitch, but the internal intonation of the instrument may suffer. Agreeing on pitch is therefore very important for recorder players.

The birth of historically based recorders: In the 1970's, recorder makers began to produce copies of surviving baroque instruments in order to reproduce the sound and response of the original recorders. However, the original instruments were at wildly different pitches. Friedrich von Huene wrote an article (published in *American Recorder*, August 1971 Volume XII:3) advocating the acceptance of a=415Hz as the standard for *historical performance*. It may have been William Dowd (with whom Friedrich shared workshop space in Waltham, MA at the time) who suggested that a=415

would be a logical standard, as there are surviving harpsichords with transposing keyboards at this pitch.

Yikes! Still more pitches! Besides a=440 (or 442) and a=415, some makers produce instruments at a=392 (a whole step below modern pitch), approximating a pitch which was in use in 18th century France and at the Berlin court of Frederick the Great. Renaissance recorders are sometimes made at a=466 (a half-step above modern pitch); the higher pitch means smaller instruments and therefore recorders that are more comfortable to play.

Breath pressure and temperature: Other factors besides recorder design that affect the pitch of a recorder are breath pressure (which can change the pitch by as much as a full semi-tone) and temperature (each degree increase in temperature raises the pitch by small percentage). Recorders will play sharper when they're warmed up.

The long and short of it is that at most chapter play-ins the common pitch will be somewhere around a=440, referred to as "modern pitch."

***Eric Haas** is a popular coach at early music workshops, including Amherst Early Music, the Long Island Recorder Festival, Pinewoods, and the Mideast Workshop. His many arrangements and transcriptions for recorders are played worldwide. He manages the Early Music Shop of New England in Brookline, MA.*

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