

## Tuning matters (Jun 2017)

Players are often concerned as to whether they are playing 'in tune', by which they usually mean: are they in tune with another instrument? The advice below may help deal with common tuning problems (the information sheet 'Tuning matters too' is a more in-depth article with particular relevance instruments the tuning of instruments prior to 1945).

### Firstly – is your instrument in tune with itself?

This is referred to as 'intonation' and is measured using 'cents'- there are a hundred cents in each semitone and an instrument's intonation can be tested against a tuning meter: if the instrument plays A and the meter reads zero then the note is perfectly in tune; if the meter reads 20 then the A is 20 cents sharp; if the meter reads 50 then the instrument is either playing the note A natural 50 cents sharp, or the note A# 50 cents flat! All notes on the instrument can be tested this way.

When you do such a test on a woodwind instrument (whilst trying *not* to bring the instrument in tune with your embouchure) you will *always* find that most notes are several cents sharp or flat. This is normal and is a result of a compromise, when the instrument was made, between tone, response, volume, and intonation, (this compromise is what gives each model of instrument its' own 'sound'). If the notes within the normal compass of the instrument are each within 20 cents of zero this is acceptable. The player has to use his/her ear and embouchure to bring the instrument exactly in tune. (Note that if the pads are leaking this will affect the intonation – and an instrument with a lot of leaks will have a lower pitch centre - that is the whole instrument will sound flatter than it should.)

The normal compass of the instrument is from all six fingers down without the speaker key(s) or the little finger keys - up to all fingers off but with the speaker key(s) on. Notes below and above this range may deviate more than 20 cents, but it is expected that the player will bring them into tune by means of their embouchure.

### Secondly – is your instrument in pitch?

Your instrument may be in tune with itself - i.e. it has reasonable intonation, but the whole instrument (the pitch centre) might be flat or sharp compared to another instrument. Tuning meters are calibrated to A=440 Hz; this is the internationally agreed frequency for the note A. When a modern orchestral woodwind instrument is designed, the positions of the tone holes are determined by a mathematical formula that multiplies or divides the figure 440 (or 442 - see below).

However, some instruments are not tuned to A=440 Hz, this is particularly the case for instruments made before the year 1945. For example some are tuned to A=435 Hz, the positions of the tone holes are determined using the same mathematical formula but this time based on the figure 435; the instrument is in tune with itself but each note would be flat in comparison with an instrument tuned to A=440 Hz.

Many modern instruments are tuned to A = 442 Hz which would seem to contradict the notion that A 440 is the international standard. The reason for this is that ensembles tend to drift sharp over the course of a performance and although the performance might start at A 440 it can easily end up at A 444 - it is relatively easy for a woodwind player to bring their instrument in tune by 2 Hz by slight manipulation of their embouchure so if their instrument is pitched at A 442 they can comfortably play between at A 440 and A 444, whereas if their instrument is pitched at A 440 they will have difficulties trying to play in tune above A 442. It is always good practice to regularly check the tuning of 'A' throughout a concert (although this rarely happens).

## Tuning to another player

If you have problems tuning to another player then test your instrument against a tuning meter (regardless of whether your instrument is pitched at A 440 or A 442 you should use your tuning meter set to A 440 because you will be expected to at least start a performance at A 440 even if the performance drifts sharp). Make sure the instrument is well warmed up (*not* by blowing into it – see below)- but by holding it in your hands for a few minutes until it does not feel cold to touch (if it is a metal instrument you can hold the instrument over a radiator or use a quick blast from a hair-dryer)and then playing it for a few minutes - then test throughout the normal compass. If your instrument is in pitch and has good intonation then it could be that it is the other player's instrument that is out of tune. If your instrument appears to be out of pitch or have bad intonation the first thing to do is have it serviced because leaks on an instrument affect the pitch centre and the intonation.

## Further tuning issues

**Calibration:** when a woodwind player tunes to a note what she/he is calibrating is her/his embouchure. Conventionally players tune to the note *sounding* A 440 (players of instruments in Bb will call this note B, and players of instruments in Eb will call this note F#) - if your instrument naturally plays an A that is exactly in tune this is fine, but if your instrument plays an A that is, say, 10 cents sharp then you will be manipulating your embouchure to bring this in tune. If you maintain this underlying bias for all the other notes then they will all be 10 cents sharper - if some of these notes are already 15 cents sharp then they will now be 25 cents sharp! It would be better to tune to another note on your instrument that you know is exactly in tune.

**Warming up the instrument:** make sure the instrument is thoroughly warmed up before tuning to another player – *do not blow into it* - this will cause instant condensation at the top of the instrument and initially distort the tuning (it will also eventually lead to water gathering in the tone-holes near the top of the instrument). Wooden instruments can be warmed up by holding the instrument in your hands for a few minutes until it does not feel cold to touch; Saxophones and metal flutes can be held over a radiator or warmed with a quick blast from a hair-dryer). If there is no time to warm up the instrument then it is best to swab out the instrument at the first opportunity. Instruments are tuned at 20 degrees Celsius, so when playing in a room that is several degrees below 20, the woodwind instruments need to be kept warm when not being played (hold them rather than put them on a stand); in a room significantly warmer than 20 degrees place the instrument on a stand on the floor (where the air is cooler) when it is not being played.

**Playing in tune:** having tested your instrument you will know some notes play a bit sharp or flat but you should be able to bring them in tune by means of your embouchure. You subconsciously alter your embouchure to compensate for tuning anomalies when you play. When you are playing along side other players you won't notice a few cents deviation between instruments, but with greater deviations you might consciously sharpen or flatten notes to try to blend with the other players. Obviously the better the intonation and the closer the pitch centres of the individual instruments in an ensemble the easier it is for the whole to play in tune. The more an instrument is in tune the less hard the player's embouchure has to work (either consciously or subconsciously) to bring the instrument in tune, and so the more the player can concentrate on other musical aspects.

Another important factor when playing in tune is arranging the position of various players in an ensemble in such a way that the 'fixed pitch' instruments can be heard by as many players as possible. Keyboard instruments and tuned percussion (Piano, electric keyboards, accordions, marimba etc) are fixed pitch (in the sense that the player cannot alter the pitch of the notes) so in an ensemble where keyboards and winds are mixed – it is best to locate these instruments at or near the centre of an ensemble (either at the front, centre, or back of the performance area)

## Notes for particular instruments

**Flutes:** Boehm flutes are usually designed so that the head-joint should be pulled out 2 mm to bring the instrument into correct pitch, although some head-joints need to be pulled out considerably more than this so check how far the head-joint should be pulled out by playing the note 'A' in the lower and middle registers against a tuning meter (players should occasionally check the head-cork has not moved from its intended location by inserting the tuning rod into the head-joint and checking that the tuning mark is in the centre of the embouchure hole). The harmonic fingerings in the 3<sup>rd</sup> register can produce notes that are unstable or a bit out of tune.

**Bb/A Clarinets:** intonation suffers particularly at the low bell notes and in the third register. If left hand notes seem sharper or flatter than right hand notes investigate the barrel. Harder reeds play sharper.

**Saxophones:** a great deal is dependent on the design of the mouthpiece; and an instrument has to be matched with a suitable mouthpiece. Also each mouthpiece that you use on the instrument will have its own optimum position on the crook in terms of pitch and intonation, so do NOT move a mouthpiece further on or off the crook to tune to another player (the one exception to this can be when playing outside). Most Saxophones, that are in good condition and fitted with a suitable mouthpiece, play with good intonation and a good response throughout the normal compass, but it is common to alter your embouchure to bring Bell notes, Palm key notes, and high E and F# notes, into tune. Few players play the harmonic fingerings required for the 3<sup>rd</sup> register but if they do then the relationship between the G and A keys on the instrument can be critical. Harder reeds play sharper.

**Alto and Bass Clarinets, and Baritone Saxophones:** lower quality instruments are usually reasonably in tune in the lowest register because that is what the instruments are mostly required for, but the middle register and above has poor intonation and tone.

**Oboes and Bassoons:** a great deal depends on the reed. With Bassoons, often pitch and intonation can be made more reliable by reducing leaks and ensuring a suitable crook (bocal) is used. On an Oboe there are particular tuning issues related to the setting of the 'roll' plate for Left hand finger 1 – see info sheet Oboe 1).

## Playing outdoors

Playing outdoors is particularly problematic for Woodwind instruments. Aside from the issues of possible damage caused by strong sunlight or rain, there is the problem of the temperature affecting the tuning; unless it is a warm (20 deg C) and windless day the instruments will not warm up properly - they will play flat, and what is more the flattening effect will be greater on the right hand notes of each register than on the left hand notes. Because the instruments will not warm up properly they are also likely to have more water collecting in the bore due to the water in the player's breath continually condensing on the cold bore (which effectively narrows the bore at the top of the instrument compounding the tuning problems).

To reduce the condensation in the bore the player must hold the top section of their instrument in their hands when they are not playing it i.e. Flute players keep their hands on the head-joint; Sax players keep their hands on the crook; Clarinet players keep their hands on the barrel and upper part of the top-joint.

Different woodwind instruments use different methods to help compensate to some degree for the flattening effect of playing outside:

**Flutes:** Flute players can push the head-joint fully into the body of the flute and twist the head-joint slightly away from them – they will lose some tone and control but the instrument will be easier to keep in tune, also the sharpening effect of twisting the head-joint is the same throughout the compass of the instrument.

**Clarinets:** Clarinet players sometimes have a second shorter barrel for these occasions (although this will sharpen left hand notes more than right hand notes). Players can also try a slightly harder reed which may make it easier to keep the instrument in tune or perhaps have a second mouthpiece with a wider tip-opening which again might help keep the instrument in tune.

**Saxophones:** Saxophone players sometimes have other mouthpieces (perhaps with a wider tip opening) that normally play a bit sharp and will help compensate for the flatness; also they can try a slightly harder reed. In extreme circumstances the player can move the mouthpiece further onto the crook cork (only if the bore of the mouthpiece is parallel) however this will sharpen the left hand notes more than the right hand notes as well as adversely affecting the response of the Bell notes and Palm key notes).

**Mixed ensembles:** If the woodwind instruments are playing as part of a mixed ensemble (such as in a Jazz band) it might be best for the stringed instruments to tune slightly flat to match the woodwinds and brasses lowered pitch centres.

### Notes for ensembles

Ensembles often have problems maintaining tuning, and the greater the mix and size of the ensemble the more true this is. Here are a number of ways to reduce tuning problems.

1. Encourage players to keep their instruments warm (and water free) by instructing them to hold their instruments correctly when not playing.
2. Locate wind players in a performance area in such a way that they can easily hear the 'fixed pitch' instruments. The fixed pitch instruments are ones that cannot easily alter the pitch of the notes e.g. piano (but also other keyboards, tuned percussion, accordions etc). Give priority to the wind players followed by bowed string players (their instruments are 'semi fixed' because the open strings are fixed in pitch). If there is only one fixed pitch instrument it is best to locate it at or near the centre of the ensemble (either at the front, centre, or back of the performance area). If there is more than one fixed pitch instrument place them apart from each other to maximize the number of players who can hear them.
3. Always locate non-pitched percussion away from winds and strings – otherwise the wind and string players might have difficulty hearing the fixed pitch instrument.
4. Tune everyone to the dominant fixed pitch instrument – usually this is a piano and if it is slightly sharp or flat then it will constantly be out of tune so everyone must tune to it. String instruments such as violins and guitars can tune their open strings to match (the piano) and the winds would have to calibrate their embouchures. It does not matter if everyone is playing flat or sharp of A 440 as long as they are all playing flat or sharp together – (very few audience members will be cursed with 'perfect pitch' but probably all of the audience will have a sense of 'relative pitch').
5. If there are no fixed pitched instruments then get everyone to tune to a tuning meter or tuning fork.
6. In school ensembles the wind section often plays flat and therefore it might be worth flattening the strings to tune to the wind section. If the wind section constantly plays flat against a correctly tuned piano it might be better to instead use an electronic keyboard that can be set tuned to play flatter to match the winds.
7. Throughout a concert regularly get everybody to check their tuning against whatever is being used as the tuning reference in a concert.

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