

Notes for players of Simple system flutes (including “Irish” flutes)

Simple System Flutes are defined as having at least some tone-holes that are covered directly by the fingers. In addition to the finger covered holes there are often keys that the fingers can operate to cover or un-cover other tone-holes indirectly. The necessity for the fingers to be able to cover at least some of the holes directly, and for the instrument to have reasonable intonation over a compass of three octaves, determines the shape of the bore (cylindrical head bore and reverse conical body bore) and the combined influences of the size of the finger holes and the bore shape determine the tone and volume of the instrument.

Tuning

There are three aspects to the tuning of any instrument – the temperament, the pitch centre, and the intonation.

Temperament

Temperament is a very complex issue but put *very* simply it is the relative size of each semitone going up a chromatic scale. Since 1917 the vast majority of (West European) instruments have been tuned to the “equal tempered” scale (also called equal temperament) - that means that as the instrument is played from its lowest note to its highest note each semitone step *sounds* the same size. Prior to 1917 many instruments were tuned to *unequal* tempered scales; this meant some semitones sounded “bigger” or “smaller” than others. It is not the case that equal temperament is better than unequal temperament but equal temperament is now dominant in Western music except in some folk traditions and areas of classical music.

Today, the vast majority of players expect their instruments to be tuned to equal temperament; this assumption is so great that most people are not even aware they are making this assumption! However Flutes made prior to 1917 (and copies of these instruments) may well have been tuned to one of the many unequal tempered scales used by instrument makers.

Note that in equal temperament each semitone is said to be equal to 100 cents and therefore an Octave is equal to 1200 cents. Unequal tempered scales also have 1200 cents in the Octave but any one semitone step may be smaller or larger than 100 cents.

Pitch Centre

The pitch centre refers to the tuning of the Flute as a whole. The pitch centre of modern Flutes is usually tuned in reference to the frequency of A = 440 hertz, which is referred to as “concert pitch”. This means the (theoretical) positions of the tone holes are determined by a mathematical formula that multiplies or divides the figure 440 and that if you test your Flute against a tuning meter calibrated to A 440(hz) then each note within the normal compass of the Flute (i.e. Low D to 2nd register b) should be within +/-20 cents of zero (assuming your Flute has been set up correctly and is tuned to equal temperament).

If your flute was designed with a pitch centre of A=335 hz the positions of the tone holes are determined using the same mathematical formula but this time based on the figure 435; if you test the Flute against a tuning meter calibrated to A 435 then again, assuming your Flute has been set up correctly and is tuned to equal temperament, each note should be within +/-20 cents of zero (within the normal compass of the flute - Low D to 2nd register b). If your Flute was designed with a pitch centre of A 335 (and has been set up for this and is tuned to equal temperament) and you test it against a tuning meter calibrated to A 440 then your Flute would sound consistently flat, though in fact it the Flute would be in tune with itself.

The modern concert pitch of A 440 has only been widespread since 1945, prior to that date the actual frequency for A could be anywhere between 392 hz (French Baroque pitch) and 466 hz (Baroque church pitch).

Intonation

Intonation is the tuning of the individual notes. If your Flute has been set up correctly, is tuned to equal temperament, and its pitch centre is modern concert pitch; then when you test your Flute against a tuning meter calibrated to A 440 you will still find some notes exactly in tune and others slightly out of tune – this is normal and is the result of inevitable compromises that have to be made when building the instrument (that is why the mathematical formula can only describe theoretical positions for tone-holes rather than the actual positions). The normally accepted tolerance for a modern instrument is +/- 20 cents from zero for each note. The player is expected to bring notes into tune by subtle variations in their embouchure.

When testing the tuning of older Flutes (and exact copies) against a tuning meter at A 440 there are often notes that are significantly out of tune (more than +/- 20 cents). Apart from the possibility that the Flute has a different pitch centre other than A440 and/or because it was tuned to unequal temperament there is yet another cause for poor intonation: most Flutes were originally designed to play over three octaves, to achieve this makers often compromised the intonation of some notes in the lower two octaves of the instrument. Nearly all these older Flutes had an intonation tolerance greater than +/- 20 cents: the maker expected the player to use cross fingerings for particular notes, to tune other notes by holding open particular closed keys (most commonly the Low Eb), and to bring other wayward notes into tune with their embouchure.

Note that when you are tuning to a note you are effectively calibrating your embouchure. You must always tune to a note that is at zero on a tuning meter; for instance if you tune to A, and it happens to be 10 cents sharp on your instrument, then you will use your embouchure to flatten the note 10 cents, if you maintain this underlying bias you will also flatten all other notes 10 cents – if some of those notes are already 20 cents flat then you will be playing them 30 cents flat - therefore outside the +/-20 cents tolerance. In practice you would probably subconsciously sharpen these flattened notes to some extent, but the point is you will find keeping in tune more difficult than is necessary.

Traditional Irish Flutes

There is no such thing as a traditional Irish Flute but there is a traditional style of playing (defined by rhythm, articulation, tone, and ornamentation) that is much easier to achieve on some instruments compared to others.

With study and close attention to detail the rhythm and articulation of traditional Irish music can be replicated on any Flute, it is the tone and ornamentation which is more problematic. A wooden Flute is considered to produce a more traditional tone and certainly at least a wooden head-joint should be used when playing traditional Irish music. The ornamentation used in traditional Irish Flute playing ought to mimic the ornamentation used when playing the Tin whistle and Uilleann pipes; not only is this different from modern ornamentation but it is acoustically impossible to achieve on all but true Simple System Flutes. Unfortunately not all Simple System Flutes are suitable for traditional Irish music. The C19 English 8 keyed concert Flutes are considered the most desirable Flutes, but like other C19 Simple System Flutes they often tuned to unequal temperament, have a pitch centre other than A440, and the intonation has been further compromised in order for the instrument to play over a compass of three octaves.

Today, most players of simple system Flutes want an instrument that has a pitch centre of A440 and is tuned to equal temperament; also players do not want to open closed keys to tune particular notes or use cumbersome cross fingerings. In short, most players want a Simple System Flute that has the fingering pattern of the (two Octave) Tin whistle and therefore some modern makers design their Simple System Flutes to be played like this rather than copying an original C19 century instrument.

Because players of traditional Irish music are only interested in using the first two octaves of the instrument there is some leeway for an instrument maker or specialist repairer to "re-tune" an old Flute (or a copy of one). By adjusting the position of the head cork and slide (if fitted), and physically altering some of the tone-holes and/or the bore, the pitch centre and intonation of an instrument can be modified and the need for cross-fingerings reduced, this is usually at the sacrifice of the 3rd octave but if this octave is not used then this not an issue for the player.

Obtaining an instrument

A complete beginner should start with the Tin Whistle. The player does not have to develop an embouchure (a controlled mouth shape) to play the Tin Whistle and can concentrate on developing finger technique. Once the player has some mastery of the Tin Whistle they should buy a Dixon plastic Flute (in D) for approximately £25 (available on-line from Hobgoblin). Initially it will be awkward for the player to cover all the finger holes (tone-holes) but in most cases the player will learn to do so. The chief concern is for the player to develop her/his embouchure so s/he can reliably produce stable notes on the Flute. Once the player has made some progress on the Dixon Flute s/he can start to try better instruments. If the player has a stable embouchure s/he can test other Flutes for tuning, intonation, and tone. The player can also compare the spacing of the finger holes to see if some Flutes are easier for them to play.

Problems with Simple System Flutes

Tenons and cracks

Most older Flutes have or have had cracks. These are usually glued but they may be pinned if the wood is thick enough and the crack substantial. Most cracks occur in the sockets; constant monitoring of the tenons and sockets is required. Where cracking is an issue the best set-up is a tenon that has been corked to just under the thickness required and then lapping thread is wound on to make the joint just tight enough not to leak; the player must judge if thread should be added or removed each time they assemble the instrument. Generally the joints will be tighter or looser in different seasons of the year. On Flutes where the socket wall is thick and cracking is not an issue there is less need for lapping thread and it is generally best to have corked tenons.

Make sure each joint is reasonably warmed before assembly, and once assembled continue to warm the instrument in your hands before playing it; never blow down the instrument to warm it up – this will just cause condensation problems as well as initially distorting the tuning. Playing outdoors in cool evenings when the instrument keeps cooling down is best avoided but in these instances keep the Flute in your hands to help keep it warm when you are not playing it.

Pads and leaks

Leaking pads will affect the tuning, intonation, tone, and response of the Flute. If you find that certain keys are never used and they also leak, it may be as well to have the tone-hole sealed with wax (which can be easily removed later if required) or to wedge the key shut.

The foot-joint

Pre-Boehm style foot-joint key mechanisms for low C and C# are unreliable and the touch-pieces are often awkwardly located. If you do use the C key for a particular tune then it is acceptable to rotate the foot-joint to the best position for the note required. Likewise the foot-joint can be rotated to another position for the C# and Eb if required. Obviously if the tune requires 2 or more foot-joint notes this won't work.

The extent the slide is pulled out

Whatever the pitch centre of the instrument there will be an optimum position the slide (if one is fitted) to be pulled out to; you *must not* alter this position (except during assembly). The reason the slide (and sometimes the head cork) were originally designed to be adjustable is because in the past players sometimes had to change the pitch centre of their instrument because there was no commonly agreed concert pitch (unlike today) – the slide no longer serves a useful function (and it has always distorted the intonation of the Flute anyway!). Any movement of the slide (or head-cork) from its optimum position will adversely alter the intonation of the Flute! The slide is not there to be altered as the instrument warms up – the instrument should be warmed up *before* you start playing.

Location of the Head-cork

Whatever the pitch centre of the instrument there will also be an optimum position for the head-cork; you *must not* alter the position of the head-cork. The head cork will deteriorate over time and occasionally slides out of position – if possible measure and record the distance from the face of the head cork to the centre of the embouchure hole so that from time to time you can check it has not slipped. The Head-cork will only slide out of position gradually so initially the player subconsciously compensates for the adverse tuning effects; eventually the player becomes consciously aware the flute has a problem but is unable to identify it.