

# The guitar intonation mystique

By Christopher Pepler



**When Luthiers or players talk about ‘intonation’, they mean the elusive art of getting the notes on all six strings and at all fret positions to be at perfect pitch.**

This is a near impossible feat and so for practical purposes intonation is usually only tested at the 12th fret where the fretted string is exactly half the length of the unfretted string. A luthier has to ensure that he has placed each fret exactly where it should be to produce the required note or intonation will be off right from the start. Players, on the other hand, can only really address any intonation problems by adjusting the point on the saddle, or sometimes the nut, where the string makes contact. This short article is strictly from a player’s perspective.

To check intonation properly, first tune each string to pitch. The strings must not be new and need to be past the point where they constantly stretch and require retuning. Then, fret each string at the 12th fret and compare the sound to a harmonic produced over the same fret. An audible difference in sound means that you have an intonation problem on that string. However, make sure that you press exactly behind the fret and that your finger is pressing down exactly 90 degrees to the fret i.e. straight down. If you do not have a well-trained ear, then you might like to use a digital tuner to check the exact deviation from perfect pitch.

This is where I made my first mistake. I seldom play with other musicians, let alone those who have pitch-perfect hearing, and using a digital tuner sent me off on an unnecessary and painstaking process of minutely adjusting the saddle under each string to eliminate the intonation problems. I have since realised that this was misguided because perfect intonation at the 12th fret does not guarantee that notes played anywhere else on the guitar will be true. I also realised that if the guitar sounded in tune to me then that was all I needed.

If the note at the 12th fret is sharp, you need to adjust the saddle to increase the string length. You do this by carefully filing matter off the front of the saddle edge facing the keyboard so that the point of contact with the string moves backwards and thus minutely increases the string length between saddle and nut. You do the opposite if the note is sounding flat. You have to file the saddle very carefully, with several checks against the up-to-pitch note at the 12th to ensure that you do not overcompensate.

When I built my classical guitar, I spent time adjusting the saddle for each string only to find that when I changed strings the intonation was suddenly a problem again. String type and tension play a major role and, in my case, I changed from Augustine hard tension to D’Addario medium tension. So, I made adjustments to the saddle again only to find out that relative humidity also plays a role, and by then my saddle was looking very wavy. Eventually, I had to replace it, sand it down, and use it on another guitar.

I learned later that intonation problems can also be caused by poor or worn strings as well as alterations to saddle height. So, if your strings are getting old then the intonation will go out a little and if you change your guitar's action by lowering or raising the saddle then the intonation will also go out. Neck relief can also affect intonation, and intonation down the length of the keyboard can also be addressed by compensating at the nut, but this is of little practical value to a player who is not also a luthier of sorts.

Here is what I eventually decided is the way to do it:

Settle on action, the make of string and tension, and only then check intonation. Then, make minimal adjustments to the saddle. I only adjust the saddle under the G-string, as this is usually the most problematic.

The result for me is a guitar that sounds very good to my ear wherever I play it... but I do not have perfect pitch and my ears are nearly 70 years old. But, I believe that all that really matters, for a non-professional, is that the guitar sounds in tune to the player.