How to Tune Your Guitar Like a Pro:
Essential Tips and Techniques for Perfect Guitar Tuning

By Douglas Niedt

Frequently Asked Questions

What are the best methods to tune a classical guitar?

1. The reference or master string method is the best.
2. Tuning methods that use octaves, digital tuners, tuning apps, and digital keyboards are very good.
3. The old-fashioned unison method is only acceptable for beginners.

What are some basic principles to remember when tuning a classical guitar?

1. Test your strings for correct intonation.
2. If you cannot hear fine gradations of pitch, use an electronic digital tuner.
3. Tuning machines respond with more precision if you start below the target pitch and bring the string up to pitch.
4. Never vibrato when you tune.
5. Damp the other strings you are not tuning.
6. Use light finger pressure to press down the string.
7. Tune using unisons and octaves only.
8. After you have tuned the guitar once, check it again.

What can I use as a reference pitch?

1. A tuning fork is the most accurate and easy to hear.
2. A tuning app pitch, metronome-generated pitch, or other electronic pitch generator is accurate but sometimes contains confusing harmonics.
3. An electronic keyboard. An acoustic piano is not recommended.

How do I hear the pitches?

1. Listen for beats.
2. Sing the pitches as you tune.
3. If you cannot hear fine gradations of pitch, use an electronic digital tuner or app.

A QUICK NOTE:

I enjoy writing these tech tips for many reasons. But one reason is that even with the seemingly most basic topics, even I learn something new when I do the research to write the tip. Such is the case with this month's tip on how to tune a classical guitar.

You would think that someone who has played the guitar for over 50 years, made recordings, studied with some of the most famous classical guitarists in the world, and concertized for over 40 years would know everything about tuning his guitar. But as I put this article together, I discovered several things I never knew. So don't think that just because you've been around a while and can tune your guitar perfectly fine thank you, that you know everything there is to know about tuning. You don't!

For instance, do you know why you should never tune when there is a fan running in the room? Do you know why you can NEVER be in tune playing with a pianist? Do you know that even when you think you're playing in tune you are nowhere close? Read on.

FIRST THINGS FIRST

Your Strings

If you have trouble getting your classical guitar in tune, 99% of the time it is the fault of the strings. Change your strings! Strings have a limited lifespan. You cannot get a guitar in tune if the strings are old. Strings age from a number of factors including the collection of dirt and oils between the windings of the wound bass strings, corrosion from left-hand finger acids, indentations from the frets, and wear from the right-hand fingernails plucking the strings. The strings develop uneven diameters along their length causing them to play out of tune. They also sound dull.

Even brand new out-of-the-package strings can be defective. Any deviation in diameter or material properties along the string length, or rough spots on the string surface will cause a string to play out of tune in some areas of the fretboard. It is usually especially noticeable at the octave. The treble strings are usually the problem, but even the wound bass strings will sometimes be defective.

Problems usually occur as the string is stretched as it is brought up to pitch. If the string stretches unevenly, the diameter will vary along the length of the string. Once the string has stretched unevenly it is ruined—it won't play in tune. That is why it is a very bad idea to pull or tug on strings to stretch them or "help them settle in." Here is a bit of "common advice" to NEVER follow:

> "When putting new strings on your guitar you must always make sure you stretch them as you tune them to pitch. Grab the string at the soundhole and pull it away from the guitar body. A few firm tugs should do the trick."

It will do the trick all right. It will often ruin the string by stretching it unevenly. Such a string will not play in tune at the 12th-fret octave and will be impossible to tune with the other strings. Don't do it! In fact, bring new strings up to pitch fairly slowly to help prevent uneven stretching. I usually take about a half hour to bring strings up to pitch when I first put them on.

Some brands are worse than others in regard to defective strings. I use Savarez strings because I love how they sound on my Ramirez. But sometimes I have to put on 4-7 strings to find one good one! Yes, it can get expensive. D'Addario strings are noticeably superior in quality control of string diameter. Many years ago, a friend of mine had the opportunity to watch Segovia put new Augustine strings on his guitar. He was treated to hearing Segovia spew a string of profanities at the strings as he put on one after another that turned out to be defective as it was brought to pitch.

You must conduct two tests to determine if a string is good or bad.

Test #1:

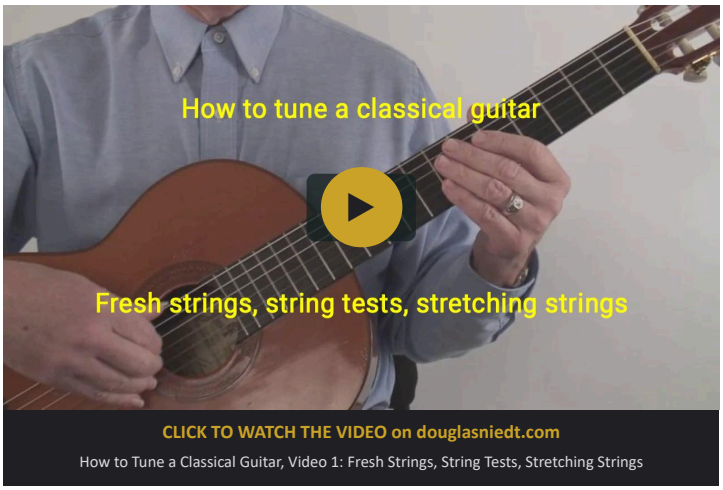
First, play the string as a natural harmonic at the 12th fret. Listen to the pitch. Then press the same string down at the 12th fret and play the normal note. Be very careful when doing this test. Be sure that you don't press too hard (which stretches the string sharp). Also be certain your finger is landing absolutely vertically onto the string. If you land the finger at an angle, it will stretch the string sharp or slacken the string flat. And of course, don't vibrato. If the pitch of the harmonic and stopped note isn't the same, the string is old or defective. Toss it out and put on another. If the pitch of the pressed down note perfectly matches the pitch of the harmonic, the string has passed its first test. Proceed to test number two.

But, if every string is off, your guitar may be at fault. However, once or twice I bought a set of strings where all six strings were defective! Also, if you buy several sets of strings at the same time, if one set has a bad string they may all have the same bad string because all the sets came from the same manufacturing run. I have had that happen several times when I bought three or four dozen sets of strings for a concert tour. I no longer do that—I buy at most six sets at a time from one supplier.

Test #2:

Pluck the string above the 12th fret and watch it vibrate. You should see a very smooth vibration pattern that is relatively free of flutters. If you see wild or irregular fluttering as the string vibrates it is defective. Get rid of it.

If you enjoy watching paint dry, you will enjoy watching me demonstrate these tests in this riveting video:



If the string passes both tests, it is good and will play in tune very well for you. I should mention that there are degrees of defectiveness. If the pitches of the harmonic and the fretted note don't match perfectly but are very close, depending on how sensitive your ear is, you may be able to tolerate the string. Or, if you are a beginner and are only playing within the first five frets of the guitar, you may be able to get it to play in tune as long as you stay within those first five frets. If you are a perfectionist it can be expensive throwing out a dozen or more strings to come up with six perfect ones.

When a string isn't perfect and you don't want to replace it or don't have time to change it, you may have to "average out" the intonation. For example tune your 3rd string open G to your 1st string G at the 3rd fret. Then play your 1st string open E and the 3rd string E at the 9th fret. If your strings are defective, one of the pairs will be in tune but the other will be out of tune. If the 3rd string E at the 9th fret is uncomfortably sharp, you will have to flatten it a bit. That will make the 3rd string open G sound flat compared to the 1st string G at the 3rd fret. In other words, you have to compromise. Neither interval will be in tune but by compromising, your guitar has a chance of being closer in tune overall. If the song you were going to play stayed below the first five frets you could tune the G's and be okay. Or, if it stayed above the 7th fret you could tune the E's and the guitar would sound fine. But if the range of the song covers more than 5 frets or so, you will have intonation problems.

Is It Your Guitar's Fault?

Apart from some souvenir guitars made in Mexico and the Costa Brava in Spain, rarely is it the fault of the guitar itself that it doesn't play in tune. It takes a skilled luthier to make a nice guitar and even the least competent manage to get the basic dimensions correct. As I said above, 99% of the time it is the fault of old strings or defective new strings.

However, if you are sure the strings are good and you are still having problems, here are a few things to check out. Unless you are an expert, don't try to adjust these things yourself. Take the guitar to a qualified luthier/repairman to have any work done.

The condition of the frets will affect whether or not a guitar plays in tune. Frets are crowned with the highest point being in the center. If the frets are worn, or a poor fret job has been performed on the guitar, the break point may not be where it is meant to be and this will cause the guitar to play out of tune.

It is important that the nut and saddle are in good condition and do not cause damage to the strings as they pass over them. If either the nut or saddle is rough or incorrectly shaped, it can damage the strings which will cause tuning difficulties.

Many guitars play slightly sharp at the first few frets. Lowering the nut as far as it will go without causing string rattle minimizes this effect but does not eliminate it.

HOUSTON, WE HAVE A PROBLEM: THE ELEPHANT IN THE ROOM.

The guitar, keyboards, and many other instruments use a system of tuning called equal temperament. You could call it the official tuning system of modern western music. It was designed to enable us to play in any key pretty much in tune. There is a reason I use the words "pretty much" in tune. In reality, in equal temperament no interval except the octave and unison is truly in tune.

Let's back up. If we try to tune to what are called *pure* perfect intervals, we run into serious problems. For instance, say you begin on C and tune through the circle of fifths (C, G, D, A, E, etc.) by *pure* perfect 5ths. After you go through all 12 steps and return to C, that C will be noticeably out of tune with the C you began with.

One way to fix this is to slightly flatten each fifth. After 12 steps you will arrive back exactly on the pitch on which you began. This is called tempering. The system of Equal Temperament slightly compromises every interval (except unions and octaves) so that everything and every key sounds acceptably in tune.

Most listeners today are comfortable with equal temperament. But the fact remains that the intervals are not exactly in tune according to the laws of physics and what we call the harmonic series. They are all a little off from the *mathematically pure* intervals they should be. Perfect fifths in equal temperament are a little smaller than the pure perfect fifth. Major thirds are noticeably sharp in equal temperament. Do you ever tune your guitar and then play a D major chord in first position and promptly flatten the first string to make it sound better? Or an E major chord in first position and flatten the third string because it sounds sharp? What you are experiencing is equal temperament (the thirds are sharp) versus your ear wanting to hear the pure interval. Indeed, vocalists, woodwind, brass, and string players (violin, viola, cello, string bass) often make adjustments to their pitch to play pure intervals if they aren't playing along with an equal temperament instrument such as the piano, guitar, marimba, etc.

People ask, "If equal temperament is not really in tune, why use it? Why not tune to pure intervals?" Some guitarists argue that since guitar music favors certain keys like A, C, D, E, and G for major and A, D, and E for minor that equal temperament is not necessary. Sorry folks. Your frets are permanently positioned for equal temperament. If you only play very simple music in one key using just a few chords that stay in one area of the fretboard you may get away with tweaking your tuning to play purer intervals. But as soon as more chords are introduced in different areas of the fretboard it will become unbearably out of tune.

You will find in general that if you fine tune one chord to be more pure, it will throw another chord out. Tweak that one and yet another is thrown out of tune. There is no winning. For example, just try and tune the E major or D major chords in first position to more pure intervals. Those chords will sound very nice but other chords will be unbearably out of tune.

Therefore, the fact that your instrument is built for equal temperament (by virtue of the mathematical positioning of the frets) means you must tune your strings according to the equal temperament system. Guitarists can't opt out of equal temperament. If you want to employ the type of pure interval tuning used in 'Just Intonation' or 'Meantone Intonation' you need to take up the cello or violin instead.

In equal temperament, intervallic purity is sacrificed for the ability to play relatively in tune in all keys and all areas of the fretboard. Depending on your viewpoint, equal temperament either makes every key equally in tune, or makes every key equally out of tune! Although every key is very slightly out of tune, our ears accept it so every key is useable. No key sounds worse than any other key. The same applies to all chords. Yes there are problems. As I pointed out above with the D chord and E chord, we guitarists know that thirds are troublesome.

The cent is the standard unit of measurement when describing gradations of pitch. A semitone or half step (one fret to the next fret on a guitar) is 100 cents. The even-tempered major third is 14 cents sharp of the "correct" pure interval. The even-tempered minor third is 16 cents flat to the pure minor third. The equal-tempered major sixth is 16 cents sharp, and the equal tempered major seventh is 12 cents sharp.

Some guitarists try to tune their guitar by playing pairs of open strings. The problem with that is they are tuning to pure 4ths. It doesn't work because the guitar must be tuned to tempered intervals. I explain how it fails in "Tuning Methods That Don't Work".

One must also be aware that ALL harmonics are pure intervals, and that ONLY the octave harmonics (at the 12th and 5th frets) should be used when tuning. In equal temperament tuning, the 3rd and 7th fret harmonics are slightly sharp and the 4th and 9th fret harmonics are very flat. Therefore, do not use 3rd, 4th, 7th, or 9th fret harmonics to tune your guitar. Yes, 7th-fret harmonics are out of tune! Again, more on this later when I discuss "Tuning Methods That Don't Work."

PRELIMINARIES AND A FEW ODDS AND ENDS

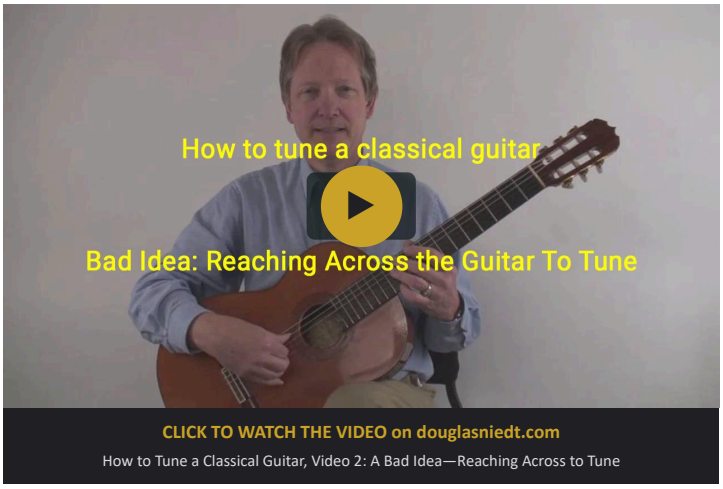
Many people will never be able to improve their ability to hear fine gradations of pitch. If you are one of those people, use an electronic tuner.

Always tune UP. When you tune a guitar string, it is usually best to start below the desired note and tune up to pitch. Because of string tension, most tuning machines work better making small adjustments upward. Their response is poor when loosening (flattening) the string. If you are using expensive tuning machines that cost several hundred dollars (such as Rodgers) you can tune up or down. For several hundred dollars I should hope so.

Never vibrato while you tune. Vibrato sharpens and flattens the note.

Being made of wood, guitars have a bit of give to their structure. The strings exert a substantial amount of pressure on the bridge and neck. As you tune and vary the tension on one string, you affect the tension of the other strings. This changes their pitch. Depending on how far your guitar is out of tune, make two or more passes through the tuning process.

When you tune, don't keep the left-hand fingers on the neck and then reach across the guitar with your right hand to turn the tuning keys. Not only does it look amateurish and awkward, but you will probably stretch the string with your finger (pulling it slightly out of tune) as you reach across with your right hand. Watch as I demonstrate this egregious faux pas:



When you are comparing the pitch of two strings, try to damp (mute) as many of the other strings as possible. Their sympathetic vibrations can confuse your ear. I will demonstrate how to do this in "The Right Ways to Tune Your Guitar."

Too much finger pressure on fretted notes can cause problems in tuning. The guitar is intonated to produce the correct pitch when the string is pressed down to touch the fret wire. If you press harder than that and press the string all the way to the wood of the fretboard or close to it, the note will be sharp. On guitars with high frets, the potential for stretching the strings is greater. High frets are sometimes easier to play, especially for beginning players who have trouble playing barres. But again, if the player presses too hard, the string will be stretched and will play sharp. Press just hard enough to get a clear tone, no harder.

HEARING THE PITCHES

Many guitarists have difficulty tuning their guitar. Listening to pitches very closely, hearing the differences between them, and then fine tuning the guitar is a skill that takes practice. Many guitarists can hear that an interval between two strings is out of tune, but they cannot tell which string is higher or lower. I recommend using an electronic tuner as a teaching aid. Get your tuner out and play a unison or octave. Listen to the two notes. If you cannot tell which note is higher or lower, look at your tuner to give you the answer. Listen again so you recognize what the tuner is telling you. If this is done conscientiously on a regular basis, many guitarists can greatly improve their pitch discrimination and awareness.

Beats

Some teachers highly recommend listening for beats to tune a guitar. Two notes sounded together form an interval. An out-of-tune interval produces pulsating sounds which are called beats. For example, play the 6th string open E with the 4th string E at the second fret. Let them ring. If they are not in tune you will hear a pulsation or tremolo effect (variation in volume). Those are the beats. If you tune one of the strings and hear an increase in the speed of the beats you are going the wrong way. As you turn the tuning key the other way the beats will slow down and eventually stop completely when the two notes are perfectly in tune.

However, listening to beats can present a problem. In equal temperament, the only intervals that do not beat are the unison and the octave. Eliminating beats from any other interval will make certain chords sound good but will make the rest of your chords worse.

More about Beats

Unfortunately, there is another source of beats, even in a perfectly tuned unison. For example, the 6th string A at the 5th fret might be in perfect unison with the 5th string open A, yet still produce audible beats. The reason is that the strings are not vibrating independently.

The vibrations of the two strings are connected by the guitar's bridge. Vibrational energy is passed back and forth between the two strings. This exchange of energy between the two strings can cause audible beats. This type of beat is different from the beats produced by out-of-tune strings. But it takes experience and a very good ear to hear the distinction. The effect is far less obvious in solid body electric guitars where the bridge does not vibrate.

Singing the notes to hear the pitches

Another method that works well for many is to sing the notes of an interval:

1. Play the first note and while it is still ringing, sing the pitch. Continue playing the note until you match your voice to the pitch.
2. Play the second note and sing that pitch. Keep playing the note until you match your voice to the pitch.
3. Repeat. Play the first note and sing it. Play the second note and sing it. Go back and forth several times.
4. Now, sing the first note and then the second note without stopping or taking a breath. Could you feel your voice go up or down? Obviously if your voice went up the second note is high in pitch. If it went down, the second note is lower in pitch.
5. Make an adjustment to the string.
6. Sing the two notes again. Repeat the process until you feel and hear your voice singing the same pitch.

It may seem like a lot of trouble to go through and some players may be reluctant to sing, but it does help develop pitch discrimination. It is then a short step to be able to hear differences between pitches without singing them.

FIRST, YOU NEED A REFERENCE PITCH

In order to begin tuning the guitar, you will need a reference pitch from another source. Modern guitars are constructed to play and sound their best at what we call A-440 tuning. What that means is that the note on the first string at the 5th fret sounds an A at the frequency of 440 hertz (vibrations per second). This is the A above middle C on the piano. Your reference pitch could be from a tuning fork, pitch pipe, another guitar you know is in tune, an electronic tuner, a metronome that generates an A=440 pitch, or in the United States even the dial tone of a traditional telephone. Once you have a reference pitch you will be able to tune the rest of your instrument by using that one note.

Interesting fact: Although A=440 is the international pitch standard and is widely used around the world, it has fluctuated through the years. Some modern orchestras don't use it. The New York Philharmonic and Boston Symphony Orchestra use A=442. Many European orchestras use A=442 or A=443.

PITCH PIPES

In a pinch you could use a pitch pipe for a reference pitch. The problem is they aren't very accurate. And, their pitch changes depending on how you blow into them. Pitch pipes can be purchased online or at a music store for $5-30. Those that are made for guitarists play the pitch of each of the six strings. All you have to do is tune a string to the matching pipe. They are easy to use and fun for young beginners. But again, because of their inaccuracy, I wouldn't use one to tune the entire guitar.

TUNING FORKS

Tuning forks are great for getting one string in tune as a reference pitch. Most tuning forks sound the A at 440 hertz (vibrations per second). This is the international standard. If you play with other musicians who don't use A=440 a tuning fork is not a good choice.

Tuning forks that play the A=440 are the most common. Forks that sound the pitch of our open first-string E (329.6 hz) can also be found and are perhaps easier for guitarists to use.

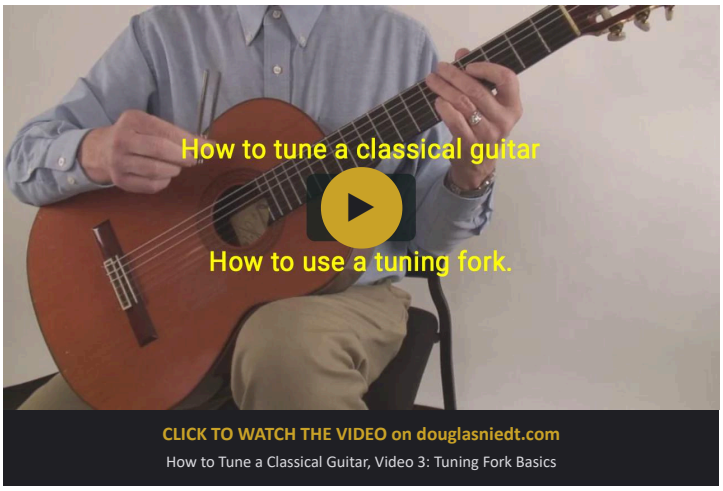
A tuning fork is very accurate, inexpensive, and portable. Another advantage is that many people find it easier to tune to the pure tone color of a tuning fork than the sound of a pitch pipe, metronome, or electronic tuner.

Using a tuning fork

A tuning fork can be a little cumbersome to use, so I don't recommend it for beginners. Like many other things, learning to use a tuning fork requires some practice.

1. Hold the fork by the stem only, leaving the tines free to vibrate.
2. Rap one of the tines once against something that is hard enough to start the fork vibrating. But don't hit something that they will dent or mark; tapping it on your knee works very well.
3. Immediately (but without touching the tines) set the stem lightly on the body of the guitar. Tune the string to the pitch that resonates from the guitar. It is a good idea to damp (mute) as many of the other strings as possible to prevent them from resonating.
4. It's also kind of fun to hit the tines and then place the stem of the fork between your teeth or on almost any point of your head and neck. Sound conduction through the teeth, jaw, and skull allows you to hear the fork. Kids love this.

Watch my spellbinding video on how to use a tuning fork.



METRONOMES

Most digital metronomes generate an A=440 pitch to tune to. Some have the ability to generate a variety of A's from 435-445 hz. They are usually very accurate. However, some people find the electronic tone difficult to tune to.

THE RIGHT WAYS TO TUNE YOUR GUITAR

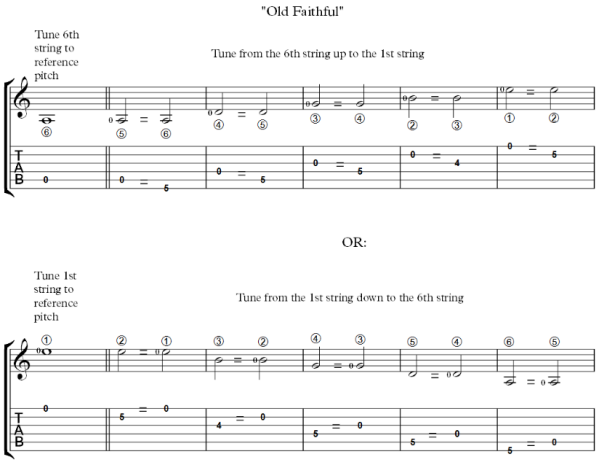
Many different methods may be used to tune your guitar. Some of the most commonly used methods are actually the most flawed scientifically or mathematically. However, for the beginning guitarist, sometimes these methods produce better results than the more mathematically correct methods. Ease and convenience are sometimes more important than being scientifically correct.

WHEN YOU TUNE YOUR GUITAR, FOLLOW THESE BASIC RULES:

- DON'T USE ANY 7TH FRET HARMONIC WHEN TUNING. IF YOU DO, THE NOTE YOU TUNE TO THE HARMONIC WILL BE SHARP.
- DO TUNE BY UNISONS AND/OR OCTAVES. DO NOT USE ANY OTHER INTERVALS.
- DON'T USE METHODS OF TUNING THAT COMPOUND ERRORS.

The Old-Fashioned Way

This is old faithful. It is easy for beginners to understand and easy to learn. It is also correct in principle since only unison intervals are used. Although it may be okay for very early beginners, it isn't the best way to tune the instrument. The bugaboo of propagation of error rears its ugly head with this method. As you progress from one pair of strings to the next, any slight error in tuning is propagated to the next string. If you are just slightly off with the first or second pair of strings, the error compounds as you proceed. You will end up with only 2 or 3 strings in tune…maybe. The strings can be tuned from low to high or high to low:

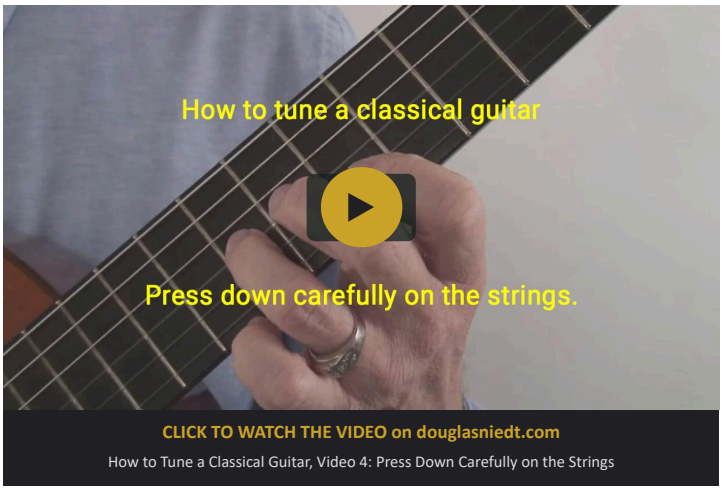


THE BEST WAY: The Reference or Master String System

The absolute best way to tune your guitar is to TUNE ALL THE STRINGS TO ONE REFERENCE OR MASTER STRING. This method of tuning is more accurate than others because it avoids cumulative errors by always tuning each string to a single reference or master string. By tuning everything to one string you eliminate the propagation of error. If you mess up the tuning of one pair of strings the other five will still be in tune.

Many people prefer tuning pairs of strings using natural harmonics because the sound sustains, making it easier to compare pitches. Also, natural harmonics have fewer overtones to confuse the ear. Because of the clarity and higher pitch of harmonics, it may be easier to hear gradations of pitch of harmonics better than fretted notes. If you use natural harmonics, be sure to pluck the string about two inches from the bridge. They will come out more clearly. But, as you will see in the examples, unisons and octaves may also be used.

Don't press too hard (which stretches the string sharp). Also, when using fretted notes, be certain your finger is landing absolutely vertically onto the string. If you land the finger at an angle, it will stretch the string sharp or slacken the string flat. And of course, never vibrato. If you have insomnia, try watching this video demonstrating these points:



Whenever possible, as you are checking the intonation on one pair of strings, damp (mute) as many of the other strings as possible. Otherwise, the sympathetic vibrations of the other strings will interfere with the strings you are trying to tune. They may also confuse your ear. What are sympathetic vibrations and how can you damp them? Watch.

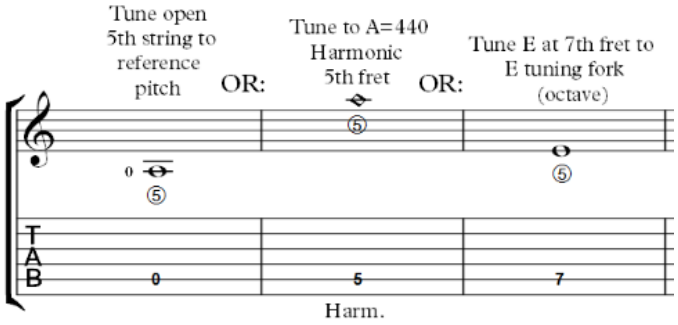
Any string can be used as the master string. However, the 5th, 6th, and 1st strings tend to be favored since it is a bit more convenient to tune them to an A=440 or E=329.6 reference pitch.

Using the 5th string as the master string

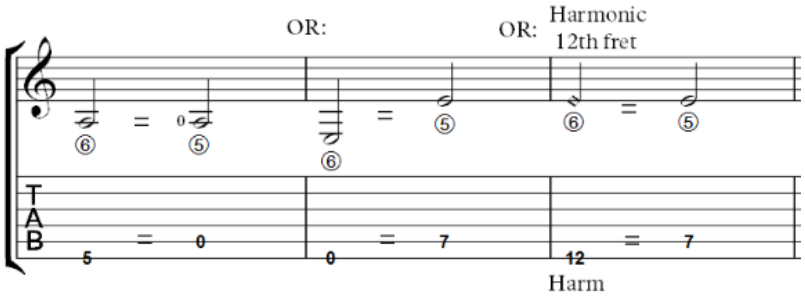
Many prefer using the 5th string as the master because metronomes, tuning forks, and tuners generate the standard A=440 pitch. Although the open 5th string is two octaves lower than A=440, it is still fairly easy to hear if it is tune with the reference pitch. Or, you can play the 5th string natural harmonic at the 5th fret which is A=440.

Tune the 5th string to a reference pitch. Once the master 5th string is in tune, DON'T CHANGE IT!

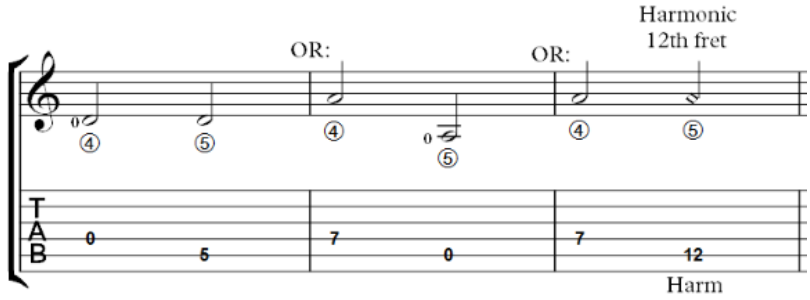
THE MASTER STRING METHOD
Using the 5th string as the master string

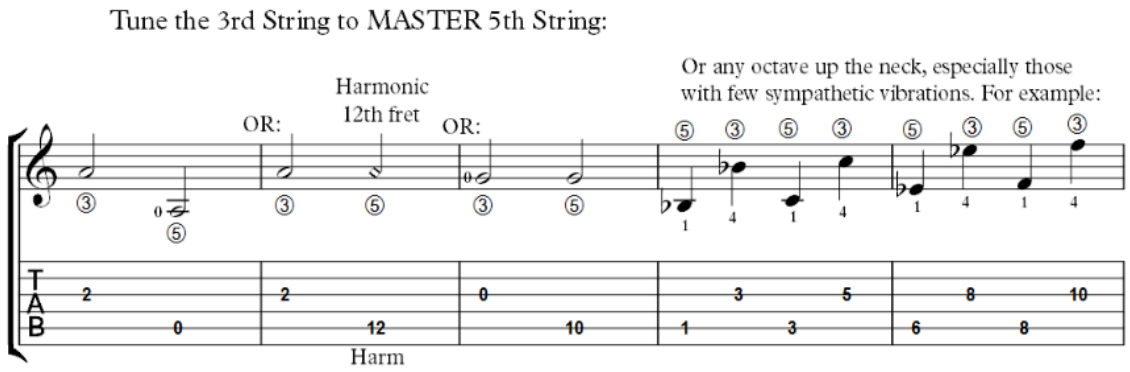


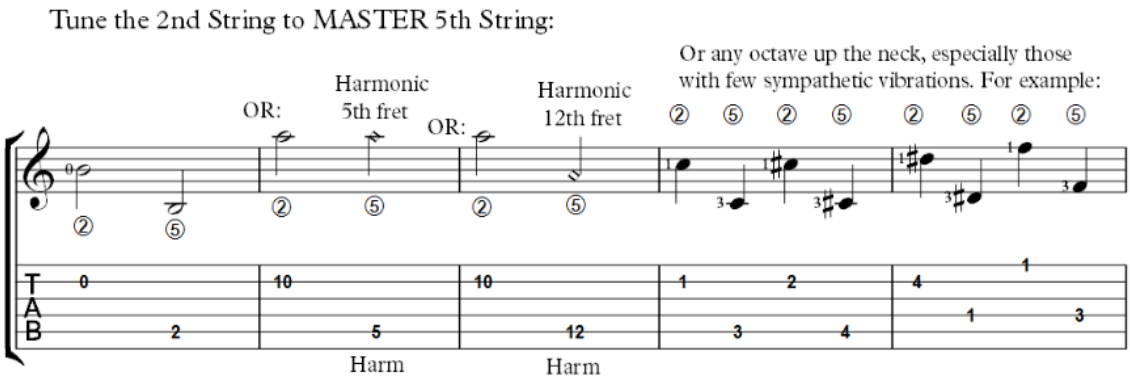
Tune the 6th String to MASTER 5th String:

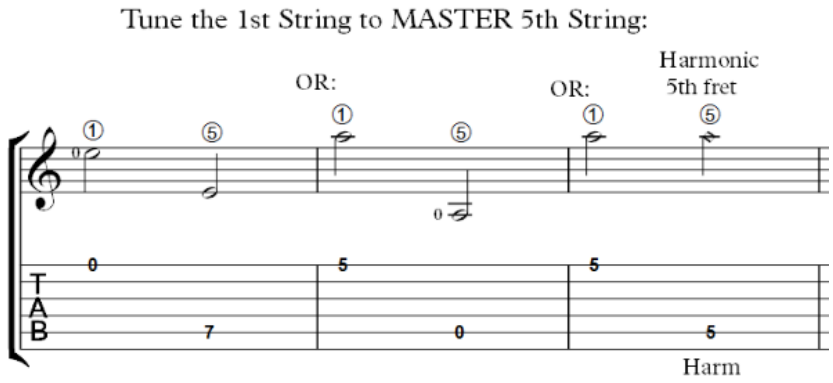


Tune the 4th String to MASTER 5th String:





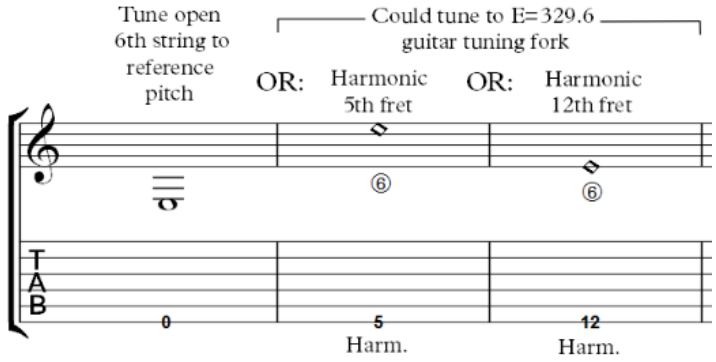




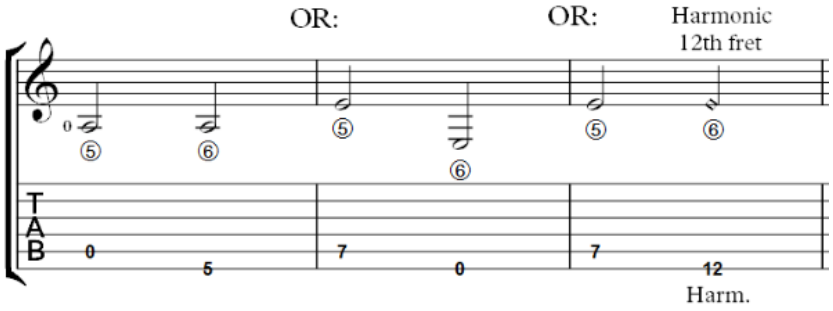
Using the 6th string as the master string

The 6th string also works very well as the master. Tune the fretted A at the 5th fret to your tuner. This 6th string A is two octaves lower than A=440. Or, if you have an E=329.6 tuning fork, the harmonic at the 5th fret will match it. Once the master 6th string is in tune, DON'T CHANGE IT!

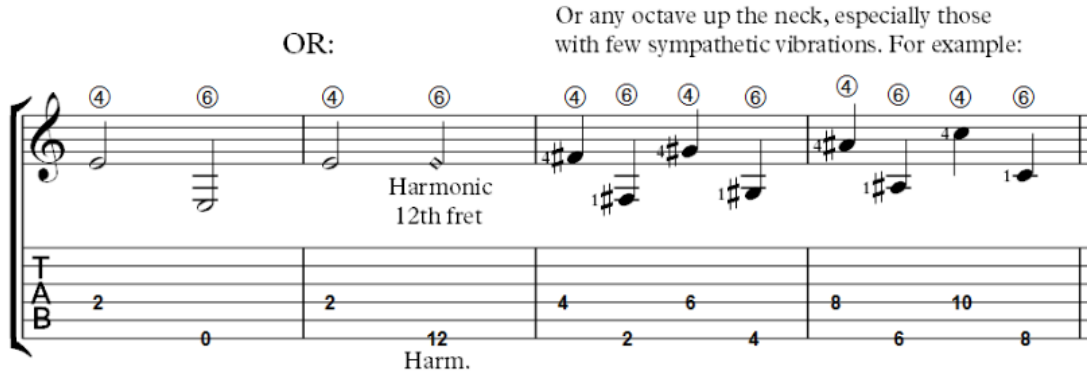
The Master String Method
Using the 6th string as the master string

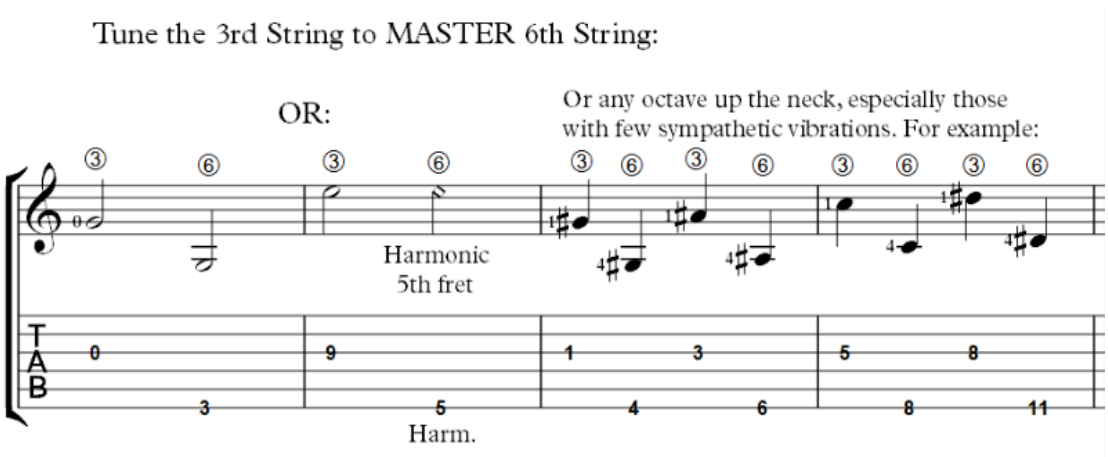


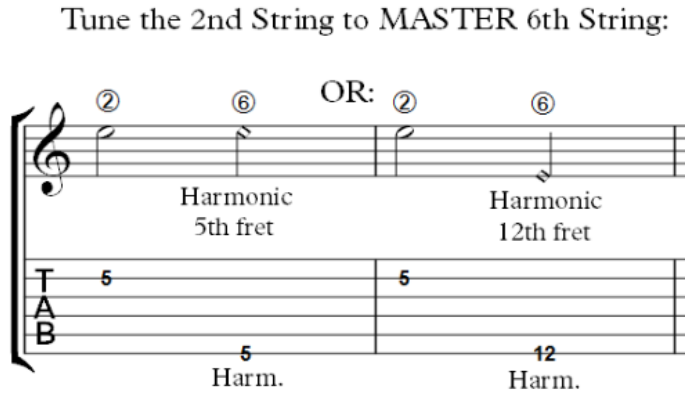
Tune the 5th String to MASTER 6th String:

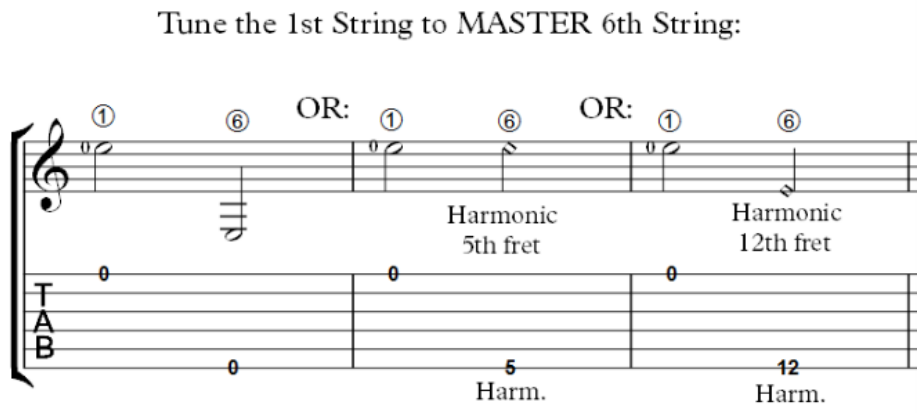


Tune the 4th String to MASTER 6th String:







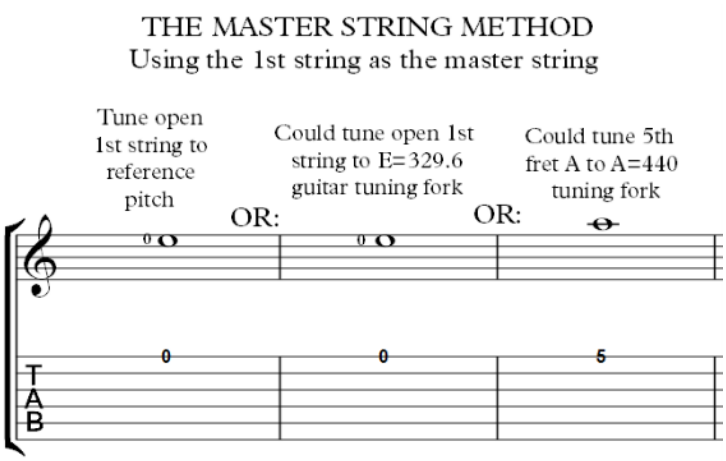


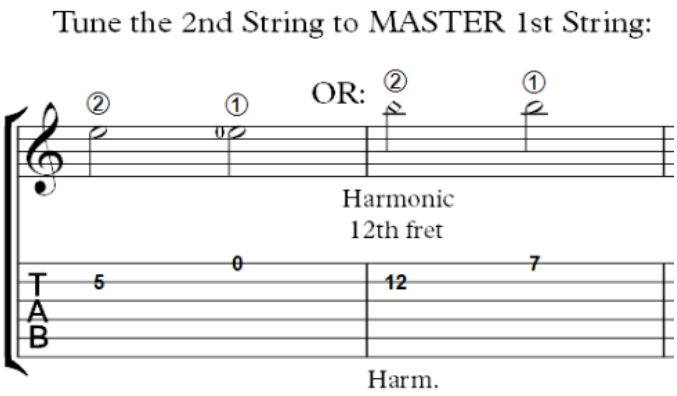
Using the 1st string as the master string

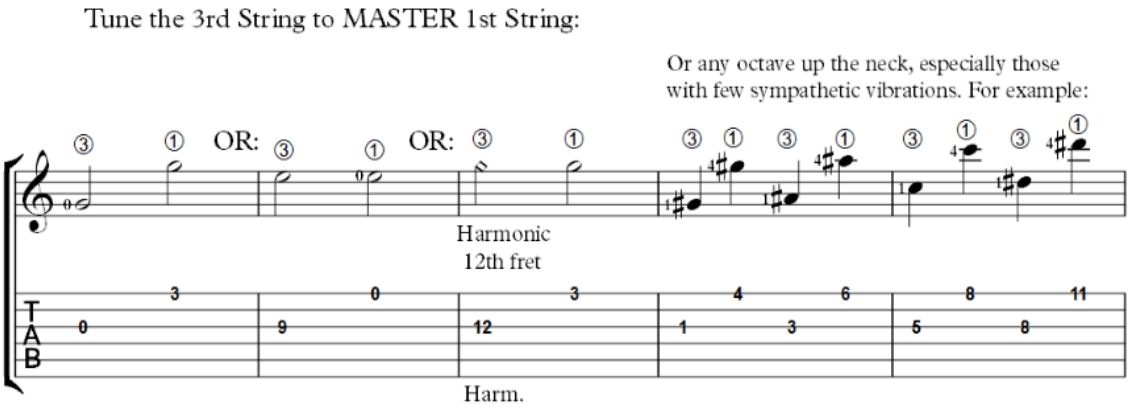
Many people like to use the 1st string as the master because A=440 is the 1st string fretted at the 5th fret. You don't have to play a harmonic and the pitch is a unison, not one or two octaves away.

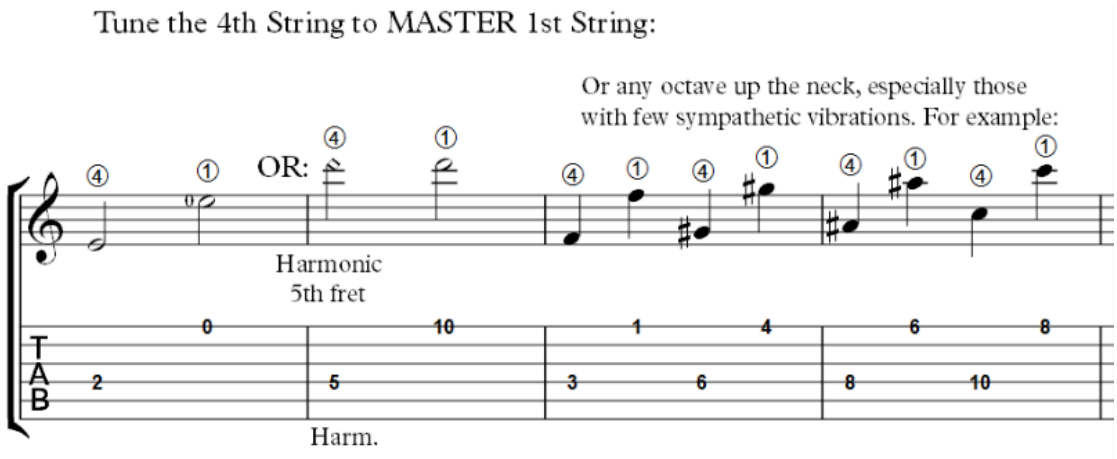
It's also convenient if you decide to use an A=440 or E=329.6 tuning fork to give the reference pitch. You can hold the fork between your thumb and index fingers, touch it to the soundboard of the guitar and pluck the first string with your ring finger.

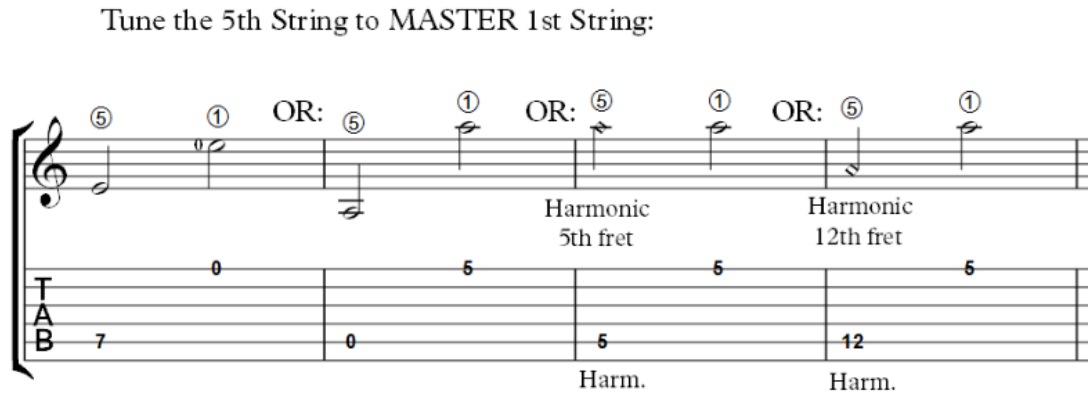
Once the master 1st string is in tune, DON'T CHANGE IT!

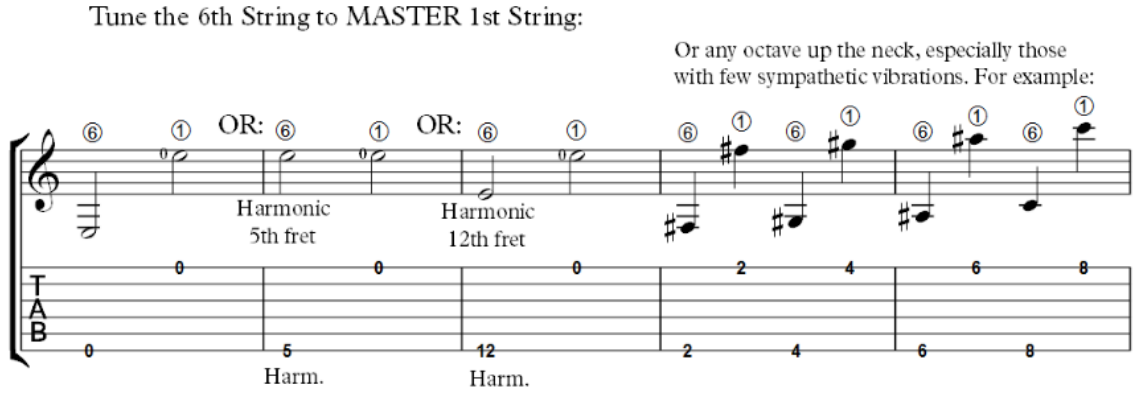








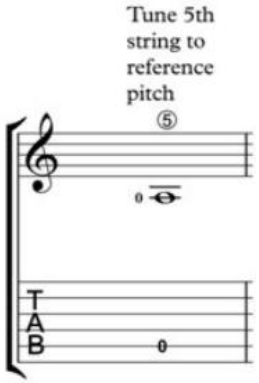




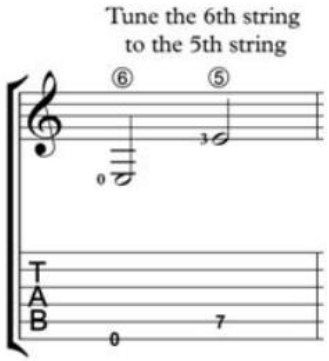
Tuning With Octaves

This method tunes the E and A octaves. It's easy to use, but will not work well for people who have trouble hearing octaves.

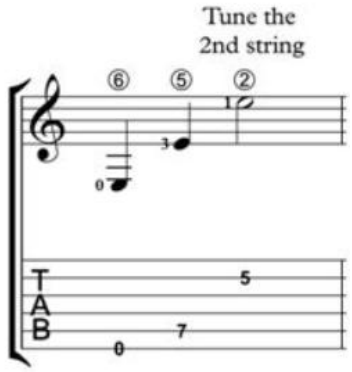
Begin by tuning the 5th string to a reference pitch. Once the 5th string is in tune, it is your reference for the rest of the strings. DON'T ADJUST IT!



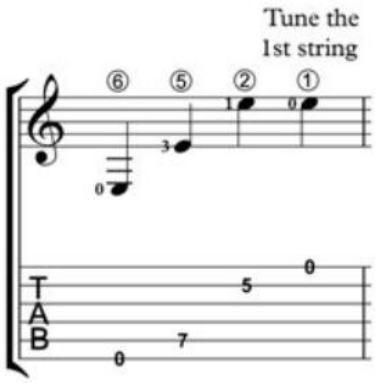
Hold the 5th string E at the 7th fret with your 3rd finger. Tune the 6th string open E to that 5th string 7th fret E.



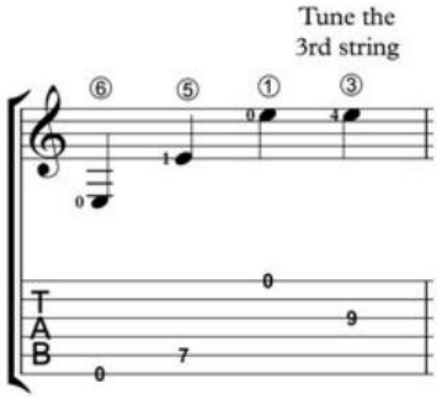
Still holding the 5th string E at the 7th fret with your 3rd finger, add your 1st finger to the 2nd string E at the 5th fret. Play the 6th string E, the 5th string E, and tune the 2nd string E to those.



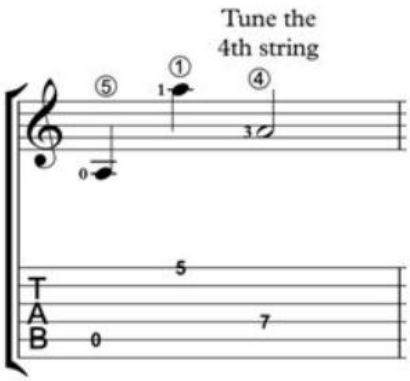
Keep holding the 3rd finger on the 5th string and the 1st finger on the 2nd string. Play the 6th string open E, the 5th string E, the 2nd string E, and tune the first string open E to those.



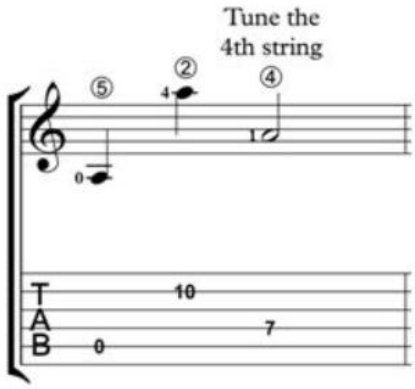
Now, hold the 5th string E at the 7th fret with your 1st finger. Add your 4th finger to the 3rd string E at the 9th fret. Play the 6th string open E, the 5th string E, the first string open E and tune the 3rd string E at the 9th fret to those.



Finally, place your 3rd finger on the 4th string A at the 7th fret. Add your 1st finger to the first string A at the 5th fret. Play the 5th string open A, the 1st string A, and tune the 4th string A to those.



Or, an alternative: place your 1st finger on the 4th string A at the 7th fret. Add your 4th finger to the 2nd string A at the 10th fret. Play the 5th string open A, the 2nd string A, and tune the 4th string A to those. NOTE: if your strings aren't perfect you will have difficulty getting the 4th and 2nd string A's in tune.



Electronic Tuners

Electronic tuners are very popular among all styles of guitarists. They are particularly useful when you have to tune in a noisy environment. They cost $20 to several hundred dollars depending on many factors. You can download tuning apps for you smartphone that work very well. Some tuners have lights, pointers, or both to show if the note you are playing is sharp, flat, or in tune. Some emit a beep when the note is in tune. Electronic tuners require batteries or an electrical outlet but are usually very portable. The cent is the standard unit of measurement referred to when describing a tuner's accuracy. A semitone or half step (one fret to the next fret on a guitar) is 100 cents. The standard style of tuner with needle or lights is usually no more accurate than +/- 1 cent. Most are only accurate within +/- 3 to 5 cents which means a 6-10 cent swing to either side of the in-tune pitch. It may not sound like it on paper, but that is a lot and will result in a very poorly-tuned guitar. Some electronic tuners are no better than a pitch pipe.

Each model of tuner varies in how well it "hears" a pitch. If you find your tuner isn't responding to a particular note try another note. Usually they "hear" harmonics very well. Also, you might find they respond better when the string is plucked with all flesh (classical players may have to use their thumb to play all flesh) than with the nail, especially strobe tuners.

More expensive models like the Peterson Strobe Tuners (my favorite) have strobe displays and choices of tuning systems such as Equal temperament, Pythagorean Tuning, Just Intonation-Major Mode, Just Intonation-Minor Mode, Quarter Comma Mean-Tone, Werckmeister-111, Kimberger-Iii, and Young Temperaments. They are very accurate.

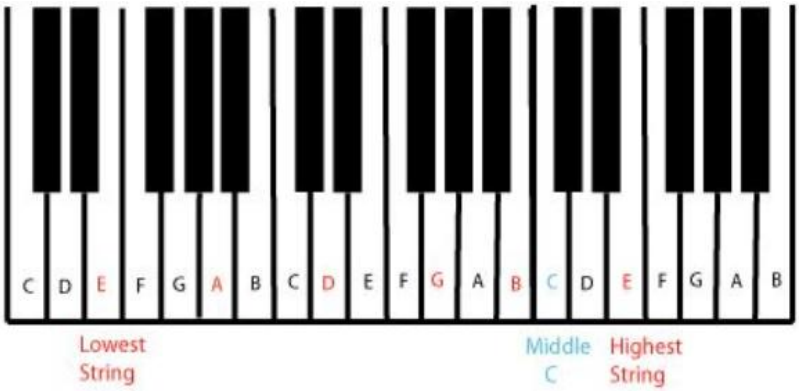
I am partial to Peterson Strobe Tuners. They make stand alone models, a clip-on model, and a computer software version (especially useful in the recording studio). All Peterson tuners are accurate to within +/- 1/10 of a cent throughout their range. That is pretty amazing. But I have to boast a little—my ear and that of others with good pitch discrimination can tune a guitar far better than any tuner.

Purchase a quality tuner. Although you usually get what you pay for, some cheap tuners (often combined with metronomes) do a remarkably good job.

Electronic Keyboard (NOT acoustic piano)

If an electronic keyboard is available, this can also be an easy way to tune the guitar. Be aware that the guitar sounds one octave lower than written, so the highest-pitched open guitar string (the 1st string) is the E above middle C.

The open strings of the guitar (the six red notes) span two octaves from the E above middle C to the E two octaves below that:

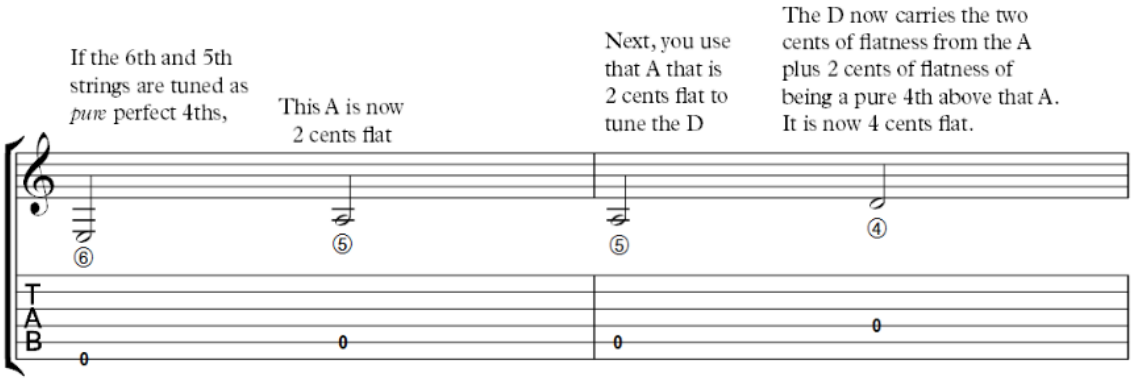


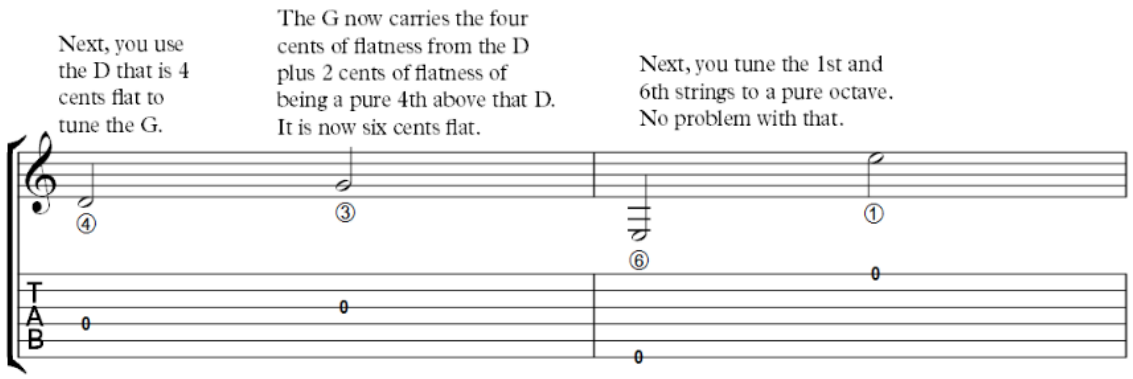
Electronic keyboards can be a good choice for beginners who have a keyboard available, or for guitarists who are going to be practicing or performing with an electronic keyboard player. But what about all the times you are out and about and don't have a keyboard available? You will need to be well-versed in the other tuning methods.

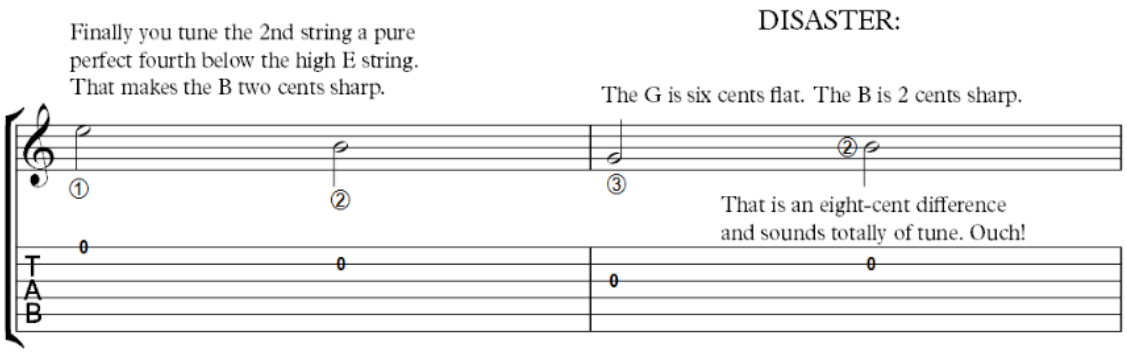
TUNING METHODS THAT DON'T WORK

Tuning pairs of open strings

Some guitarists try to tune their guitar by playing pairs of open strings. The problem with that is they are tuning to pure 4ths. The interval of a pure 4th is 2 cents too narrow in equal temperament. It doesn't work because the guitar must be tuned to tempered intervals. If you use this method, here is how you end up with an out-of-tune guitar:

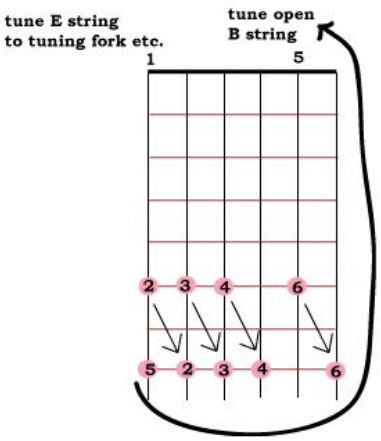






5th fret/7th fret Harmonics

Below is an absolutely horrible tuning method I picked off the Internet:



Not only does it propagate errors but also uses 7th fret harmonics which are all slightly sharp in equal temperament. If you want to hear this, play the natural harmonic on the 6th string at the 7th fret. Now, stop the string at the 7th fret and play the artificial harmonic at the 19th fret (effectively the new 12th fret). This note will sound very slightly flatter than the 7th fret harmonic. In Equal Temperament tuning, the slightly flat note is the correct pitch.

You might say, "But I know a lot of people who use this method." Well then, you know a lot of people who play out of tune!

If you want to know why this method doesn't work, read the following. Otherwise, skip over to the next part.

Okay, here we go.

Step #1: The first step illustrated in the diagram above is to tune your 6th string to a reference pitch.

Step #2: If you tune the 5th string 7th fret harmonic to the 6th string 5th fret harmonic, the 5th string ends up very slightly flat. This is because 5th fret harmonics are in tune but 7th fret harmonics are sharp in equal temperament. Therefore you have to flatten the 7th string harmonics to get them in tune with the 5th fret harmonics.

Step #3: You now compound this error as you tune the 4th string 7th fret harmonic down to the already slightly flat 5th string 5th fret harmonic.

Step #4: The error is compounded once again as you tune the 3rd string 7th fret harmonic down to the now definitely flat 4th string harmonic at the 5th fret.

Step #5: Next, you tune the 2nd string open to the 6th string harmonic at the 7th fret. Because that harmonic is sharp, your 2nd string is now sharp.

Step #6: Finally, you use your now slightly sharp 2nd string to tune the first string 7th fret harmonic. Or, some people tune their open 1st string to the 5th-string slightly sharp harmonic at the 7th fret making their 1st string sharp.

You end up with a very sharp 2nd string and out-of-tune 1st string. Try playing a C chord in first position. The resulting mess sounds terrible, especially when you play chords that use the flat 3rd string and sharp 2nd string together. Players who use this method may try to make adjustments to the 2nd and 3rd strings to make it work, but such efforts are doomed to failure.

Do NOT attempt to tune your guitar to an acoustic piano

Tuning your guitar to an acoustic piano is actually impossible. The overtones of a piano note clash with those of the guitar. Try this test: tune your first string flat. Then, sit at a piano and play the E just above middle C. Hold the sustain pedal so the piano note keeps ringing. Slowly bring your guitar E up to pitch. If you need to, play the piano E again. Your ear will tell you the guitar E doesn't perfectly match the piano E and you will keep tuning upward until it is obviously very sharp. Bring it down and your ear will tell you to keep lowering it until it is obviously flat. You will not find a pitch that precisely matches the piano E.

As if that isn't a good enough reason not to tune to a piano, there is also the phenomenon of stretch tuning. You can read about the details and math here.

In a nutshell, piano tuners tune the octaves progressively flatter beginning an octave below middle C and proceeding downward and progressively sharper beginning an octave above middle C and proceeding upward to compensate for the extreme stiffness and high tension of piano wire strings. This minimizes clashes of the high overtones in low notes with the low overtones in high notes. This means if you play with an acoustic piano, the notes on your bass strings up to about the 3rd fret on the 4th string will be noticeably flat compared to the notes on the piano. On the high end the problem is minimal. Only the high A, A#, and B on the first string (17th, 18th, and 19th frets) will be affected. They will be slightly flat.

INTERESTING TIDBITS AND THINGS TO REMEMBER:

- Tune your guitar every time you pick it up to play. It is a law of the universe that a guitar goes out of tune whether it is in your hands or not. We all know how quickly guitars go out of tune. Make sure your guitar is in tune when you begin to play and check the tuning frequently as you play. Even the act of playing the guitar makes it go out of tune.

- Avoid exposing your guitar to large changes of temperature. In general, as the room temperature goes up, so does the pitch of your guitar. When it gets cooler, the pitch of the guitar goes flat. This may be the opposite of what you would expect. You may think, but if the temperature goes up, the strings will expand and go flat, and if the temperature goes down the strings will contract and go sharp. The explanation is that nylon strings are relatively impervious to temperature change. The temperature has the most effect on the woods of the guitar, not the strings. When the temperature rises, the wood parts expand and contract with each other in such a way that the strings go sharp. When the temperature falls, the woods interact and the strings go flat.

- Bumping the guitar whether it is in the case or out will make it go out of tune.

- Many teachers say it is best to develop your ear by using traditional guitar tuning methods when you can. They recommend using a guitar tuner to tune one string and then tune the rest by ear. Go a step further and use the tuner to help train your ear. When you tune a unison or octave by ear, check it with the tuner afterward to see if you got it right or not.

- Sometimes you will be playing a song and notice a chord is not in tune. Before you adjust the string you think is out of tune, check it against your reference string first (the string you tuned to your tuner when you first tuned up). The string you think is out of tune may not be the culprit.

- Never try to tune your guitar while a fan (especially overhead fans) is running. The fan blades produce oscillations or waves in the air which produces flutter in the pitch of your strings. You won't be able to tune.

- If you are a novice, it may take you five minutes or more to get your guitar in tune. But it is just like learning to play the guitar. The more you practice at it the better you will get.

- People with perfect pitch are not necessarily able to hear fine gradations of pitch.

- Don’t despair if you can’t seem to hear the difference between pitches and can’t tune. Use an electronic tuner. Some very well-known players can’t tune by ear. I have attended many master classes and was astonished to discover that without an electronic tuner, several well-known guitarists (who play very well) couldn’t tune their guitar. Not even close. It was amazing to witness.