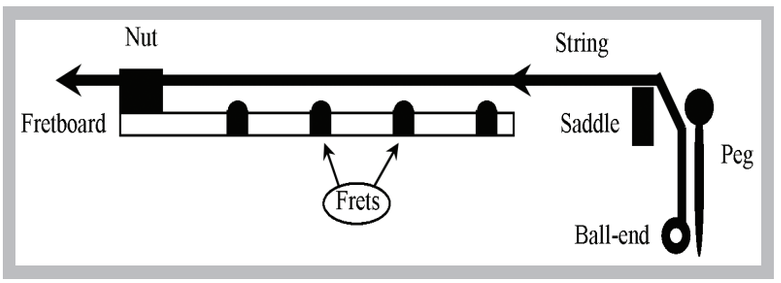
1 - *Guitar Maintenance*

---The Perfect Guitarist, Duncan L. Wood copyright 2008

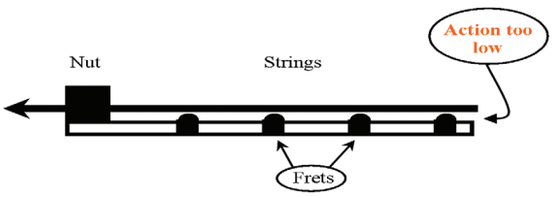
Guitar maintenance consists of:

(1) "Set-up" of your guitar
(2) Changing the strings
(3) Polishing
(4) Maintaining humidity/aridity
(5) Maintaining the electronic and mechanical components

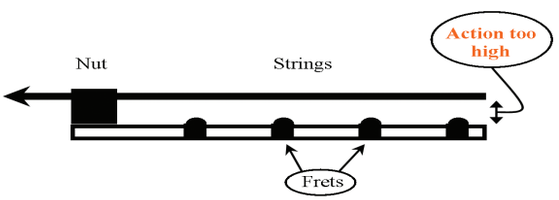
To "set-up" your guitar means to adjust those things on the guitar that can affect your playing. Learning what these things are and how they work will help you make your instrument much easier to play. Essentially, our goal is to keep the strings at just the right height above the frets to facilitate easy playing with great sound. This is accomplished by careful rotation of the *truss rod*, a steel rod that runs the length of the neck of the guitar. It is adjusted by turning it either clockwise or counter-clockwise from either the soundhole side or up at the point where the neck meets the headstock. Only those who are familiar with both ***how*** to do this and ***when*** to do this should make such adjustments. It is easy to confuse humidity/aridity problems with the neck being "out of whack". The diagrams listed below should help to visualize possible different set-up scenarios.



To be properly set-up, the strings should be like the diagram above: just high enough at the saddle that the strings, when pressed at a given fret, will not brush the edges of the other frets en route to the saddle. At the same time, the strings should be low enough at the nut that the strings do not feel difficult to push against the metal frets with your fingers. Guitar strings are attached at the bridge (not shown, but it is the large flat piece that holds the saddle) and pass over the saddle, the fretboard, and the nut on their way to the tuning machines on the headstock. The height of the strings above the frets is called the *action*.



If the strings are too high, it will be difficult to push them down to contact the frets. On the other hand, if the strings are too close to the frets, there will be "fret-buzz", an irritating sound caused by the strings flapping against the frets after being plucked.



Wooden instruments are much affected by changes in temperature and humidity in the atmosphere. If those changes are extreme, it can warp or even break the neck of your guitar. To remedy this problem, many guitars have truss rods built into their necks. These rods will need to be adjusted at some point. The best person to do this is a luthier. A "luthier" is someone who specializes in the care and construction of stringed instruments.

The thickness of a string is called the "gauge" (pronounced as"GAYJ"). The gauge

of a string affects how hard it is to push that string down to contact the fret (string-tension). Heavier strings pull harder than lighter strings against the tuners and saddle. *Lighter* gauge strings are easier to push down, but you'll be sacrificing volume and tone. *Heavier* gauge strings are harder to push down, but give more volume and better tone. Try different gauges and find the compromise you prefer.

String-changing should be done as often as is necessary to maintain the brilliance and flexibility of the strings. That said, there can be quite a difference in how long your strings last. Factors influencing the life of your strings are:

- The material from which they are made.
- Whether they are coated or not with a special preservative.
- Which gauges you use (heavier gauges last longer than lighter gauges and have better tone).
- The chemistry of the oils from your skin—I've had teenaged students whose regular non-coated phosphor bronze acoustic strings were eaten up in merely days by their harsh skin-chemistries.
- How much you play---the more you play, the more worn, duller and work-hardened the strings become.

Author's note: My favorite acoustic strings are ***Elixir Phosphor Bronze*** custom lights (.011-.052") with the Nanoweb coating because of their long life and terrific sound. They generally last about 5 times longer than the non-coated strings, so they are actually less expensive in the long run. I also use ***Elixir Electric Nanoweb*** light gauge (.010-.046") strings for the same reasons. My favorite classical strings are ***Augustine Blue Imperials*** with a nylon core and sterling silver-wrapped basses. These are the strings endorsed by Andres Segovia and, if you listen to the sound he gets with them in his recordings, you'll understand why he used them. They are rich and powerful strings, also tending to last longer than their competitors.

How to Change the Strings of the Guitar

There are 3 types of guitar to cover as regards string-changing—-*acoustic*, *classical* and *electric*. There are many similarities between the different types of guitars, but a few significant differences. The desired tools in each case consist of the new strings, wire-cutters, peg-winder, polishing cloth and guitar polish, as well as fretboard oil. The fretboard (also called *fingerboard*) oil used here is Gibson's ***Luthier's Choice***. The polish used is ***Lizard Spit***.

Tools (left to right): Lizard Spit polish & cloth, Luthier's Choice fretboard oil, Peg-winder, 3-in-1 Oil, Square-jawed pliers, Wire-cutters

Strings (left to right): Elixir Electric Nanoweb light-gauge, Augustine Classical Nylon Blue Imperials, Elixir Phosphor Bronze Nanoweb Acoustic custom lights

Tools for string-changing and maintenance

Removal: *All types*

- First, you must loosen the old strings in such a way as to relieve the tension on the neck gradually—first one side, then the other.

- Alternate loosening of the strings, such as 6th then 1st, 5th then 2nd, 4th then 3rd, until all strings are completely slackened. **{Remember: *BIG* number = BIG string, *small* number = small string}.**

- Cut the old strings in half with wire-cutters to facilitate removal from each end of the guitar. Next, pull the severed end out of the post at the neck-end of the guitar and dispose of the old strings by coiling in a circle, wrapping the ends around themselves to prevent uncoiling when you dispose of them.

- Next, remove the peg (if there is one) from the saddle-end of the guitar, and remove the ball-end of the severed string from the peg-hole, then dispose of the old string in like manner as before. If classical, unwind the strings' knots and remove.

Cleaning:

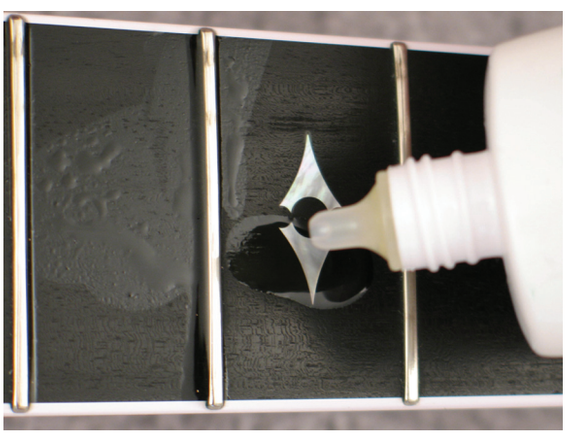
Now is your chance to clean your guitar prior to installing the strings.

- First, remove all dust with a rag, wiping gently so as to not scratch the guitar finish.

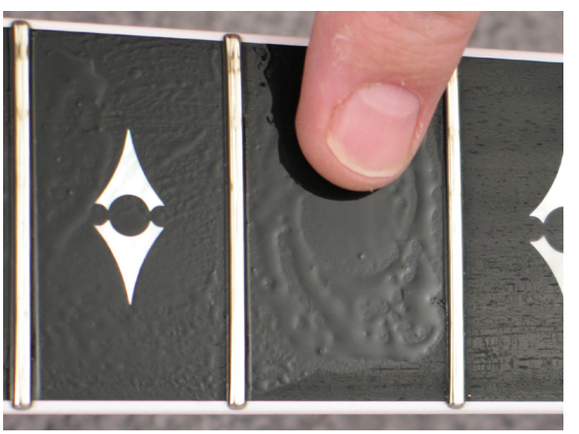
- Then use a guitar polish, applying in circular buffing fashion. Follow the directions according the particular polish you have.

- Buff with a fine cloth of some kind to achieve the glossiness you desire.

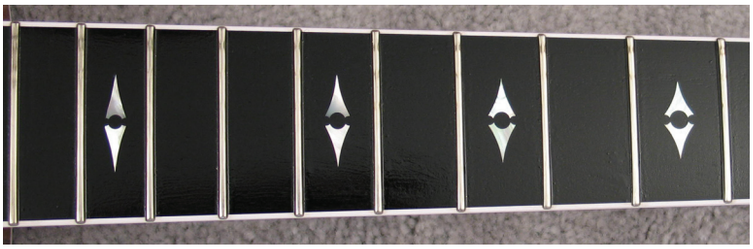
- Next comes applying a fingerboard oil (vegetable-based, not petroleum!) to any bare wood fretboard and any other untreated surface, such as the bridge, if needed. Such application should be done perhaps 2 or 3 times per year.



(1) Applying fretboard oil



(2) Rubbing in the oil



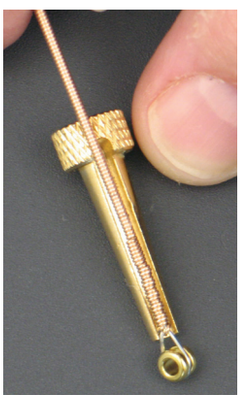
(3) After application of fretboard oil

(4) Also apply oil to the bridge, if untreated.

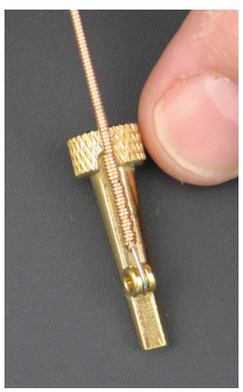
(5) After application of oil to bridge

String Installation: *Acoustic guitar*

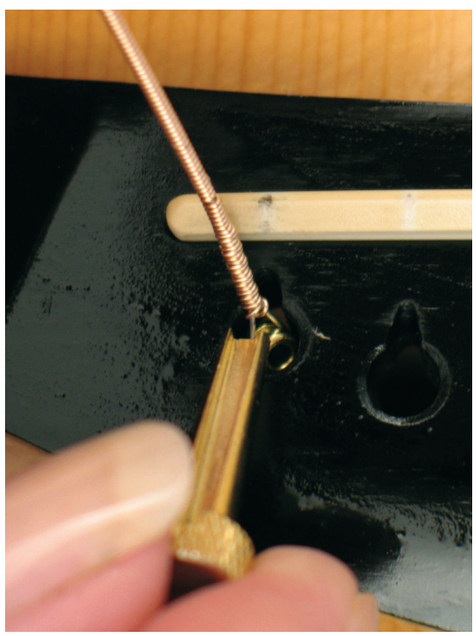
■ The guitar used in these pictures is a custom-built Taylor 814 CE, for those who'd like to know. The fingerboard is $1^{7/8}$ inches wide, like a 12-stringed guitar, but slotted for 6 strings at my request. First, take the tip of the peg and use it to push the ball-end of the string into the hole in the bridge (called the *peg hole*). The concave side of the peg should be facing towards the soundhole.



(1) Tone Pin with ball-end before inserting into peg hole



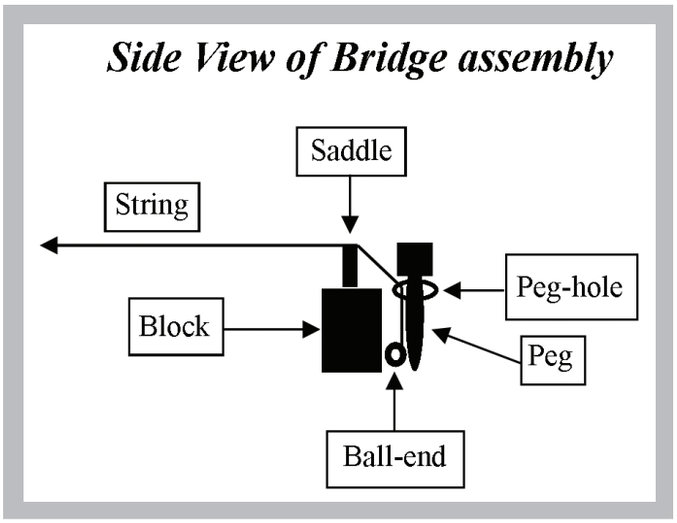
(2) Make sure the ball-end is freed from the tip after insertion into peg hole



(3) Insertion into peg hole

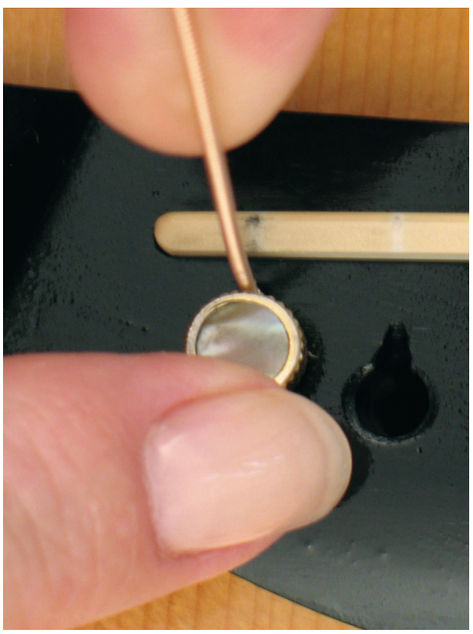
Author's note: Tone Pins are brass bridge pins that accentuate the higher frequencies and increase sustain.

■ Once the string is inserted about an inch into the hole, wiggle the peg and pull back on the string so as to free the tip of the peg from the ball-end, thus wedging the ball-end between the side of the string and the supporting block on the inside of the guitar. If the peg pulls back out when you pull on the string, the ball-end was not properly dislodged, meaning that the wedging of the peg with that ball-end has not taken place. If repeated attempts fail to dislodge the ball-end from the tip of the peg, simply reach inside the soundhole and push the ball-end off the peg-tip with your finger, all the while pulling back on the string.



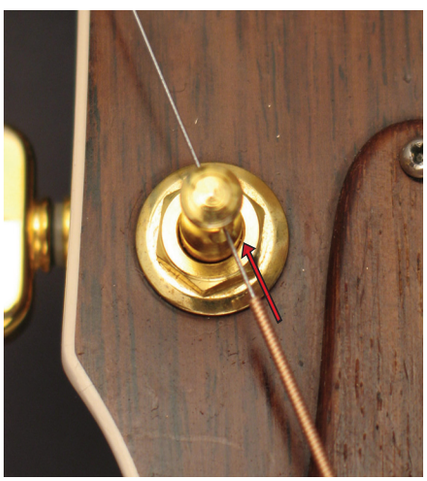
(4a) Side view of inserted peg in peg hole

■ Press down on the peg to seat it securely, but *don't push too hard*. Only push until you meet some slight resistance while still pulling back on the string. If the peg comes up, the ball-end has hung up on the tip of the peg *(see step #2)*. By the way, it is normal for the 6th string's peg to stick up a little higher than the rest of the pegs due to the greater diameter of the 6th string.



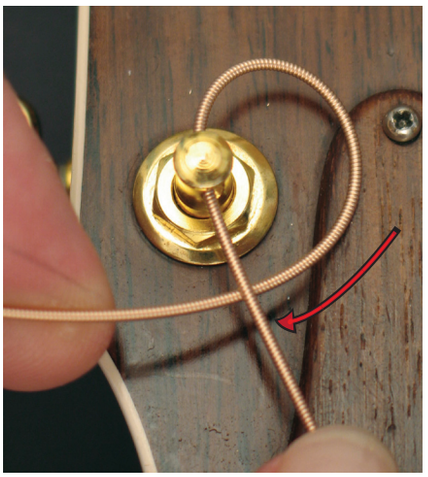
(4b) Tamping down peg

■ Take the other end of the string and insert it through the hole in the post as the example to the right shows. Pull through until there is only about 4 inches of slack left as measured by pulling the string away from the body of the guitar at the 12th fret point on the neck.



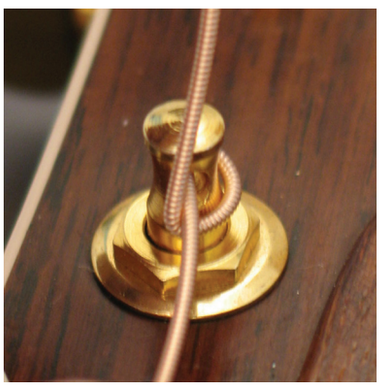
(5) String through post

■ Pull the string *towards the center* of the headstock, regardless of which side you are on—if the post you are stringing is on the *left side* (like the picture), *pull to the right*, then go *underneath* the string,



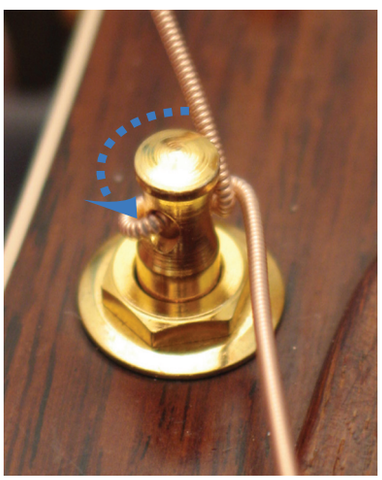
(6) Initial pull-through

■ Cinch the string (the "lockdown") by pulling sharply upwards.



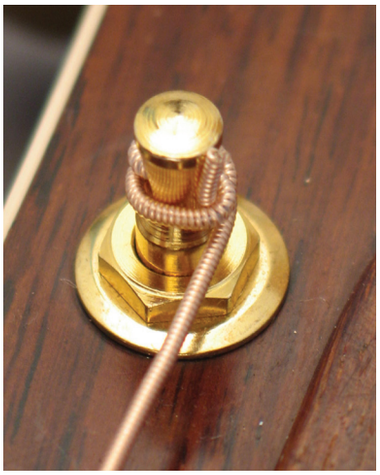
(7) Lockdown

■ Turn the tuning gear counter-clockwise so that the *string goes over itself,* thus creating a lockdown (half-hitch) with the winding on the *inside* of the post.



(8) Turn post counter-clockwise so that string winds over itself.

■ After winding the string to the point where there is some tension on the string (but not enough to be in tune), check to be sure both ends of the string are secure. If they are, you can now feel free to cut the string at the post with wire-cutters—NOT fingernail clippers or scissors, just in case you were thinking about "making do" with what you had lying around.



(8a) Close-up view of lockdown and wraps around the post

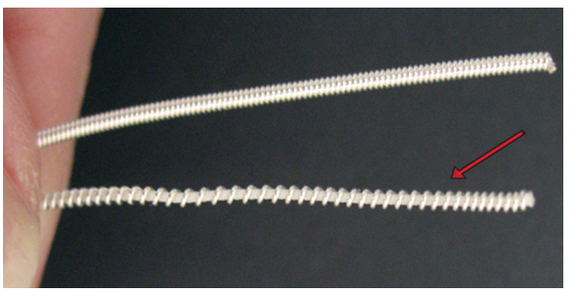
(8b) Finished stringing!

{Remember: *BIG* number = BIG string, *small* number = small string}.

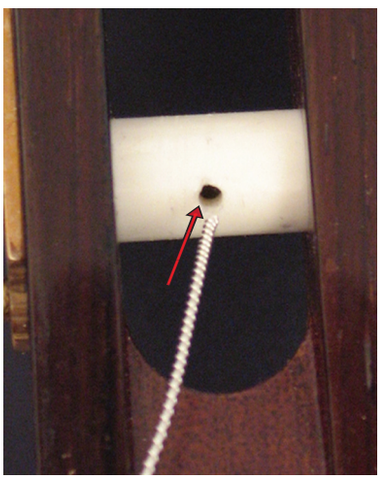
Author's note: Don't forget to reverse the directions for cinching to get the lockdown when doing the treble strings because they are usually on the opposite side of the headstock. All the strings should come off the inside of the post so that the direction of turning the gear is the same for all strings. Also, a few wraps around the post are plenty. Since the original pull of the string away from the body in step #5 (about 4 inches) was the same for all six strings, the number of wraps will be a little different for each different gauge of string (about 2 or 3 wraps around for the 6th and 5th strings, 3 or 4 for the 4th and 3rd strings, and 5 to 7 for the 2nd and 1st strings).

String Installation: *Classical guitar*

Author's note: The classical guitar used in these pictures is a real beauty, constructed from Indian Rosewood for the back & sides, Western Red Cedar for the top, Mahogany for the neck and meticulously crafted to produce a rich, full tonal palette that is nothing short of amazing. The luthier who made it is *William Del Pilar, Jr.*, of Brooklyn, NY. (see another guitar made by him in the ***Addendum***, page 147).



(1a) Choosing the correct end to insert through the post hole.



(1b) Inserting end of the string through the post hole.

(1) The first step in stringing the classical guitar is to find the end which looks different from the rest of the string. If it is a bass string, it will likely have fewer windings, thus exposing the nylon core underneath. This allows greater flexibility to create the half hitch lock-down to follow. If it is a treble string, the end you are seeking may be differently colored than the rest of the string. The reason for these differences is to identify the end which should be at the headstock and wound on the post. If there is no difference between one end and the other, pick one. Insert this end of the string through the post-hole as shown in the picture 1b.

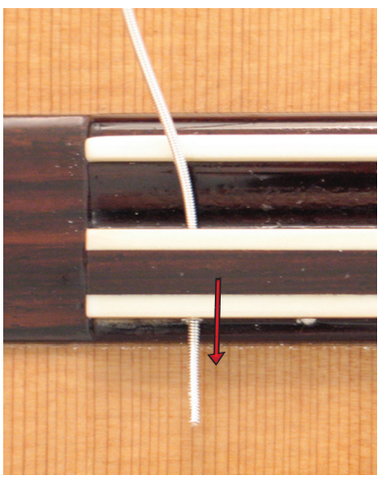
(2) Rotate the post so that the long end of the string is on the near side to you. Take the short end that has been put through the hole and come back over the top with it, passing underneath the body of the long end and through, thus creating a half hitch with the end facing *away* from the center of the headstock for the 6th string and the 1st string, but *towards* the center of the headstock for all the other strings. The reason for this is that you want to reduce the angle from the nut to the post, thus reducing string-friction in its slot on the nut (making tuning easier and reducing wear on just one side of the slot).

(2) Creating lockdown at post.

(3) Rotate post counter-clockwise so as to wrap string over top of itself.

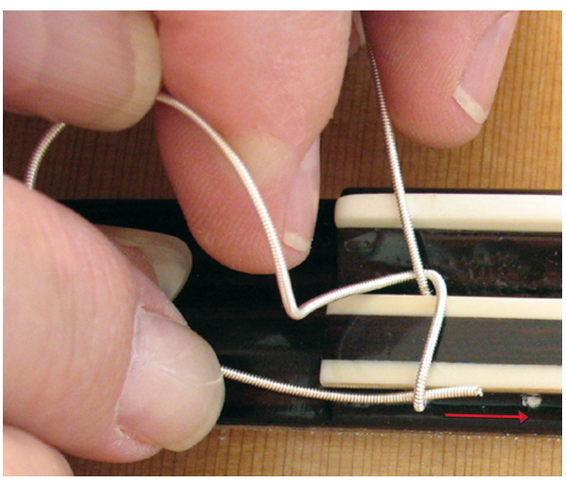
(3) Rotate the post in counterclockwise fashion by turning the tuning-gear so that the string will wrap over itself, effectively locking itself in place with each successive rotation. Please notice that the string is on the *inside* of the half hitch, wrapping towards the center of the headstock. One to three revolutions of the post are all that is necessary at this point, depending on the string. Try to maintain tension on the string so that it will remain taut.

Author's note: Don't forget to reverse the direction of cinching for the lockdown on the treble strings since they are on the opposite side of the headstock. Instead of the end of the string pointing *left to right* (see picture #3), it would be reversed, pointing *right to left*.



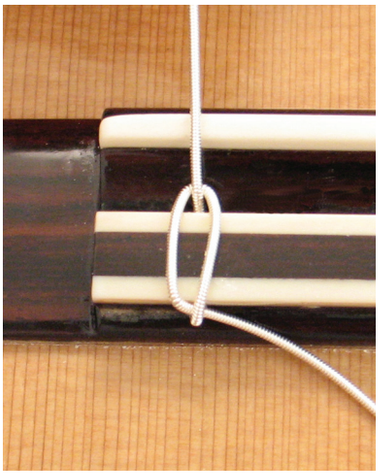
(4) String through saddle-hole

(4) While continuing to maintain the tension on the string already on the post, take the other tight-wound end and insert it through the hole in the bridge at the butt-end of the classical guitar.



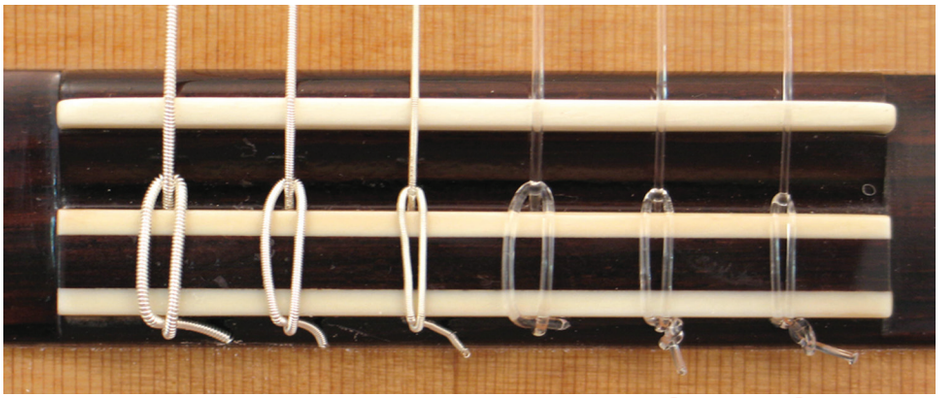
(5) Forming lockdown

(5) Next, take the end and insert it on the inside of the protruding string, then pull the extra through, thus forming a half hitch.



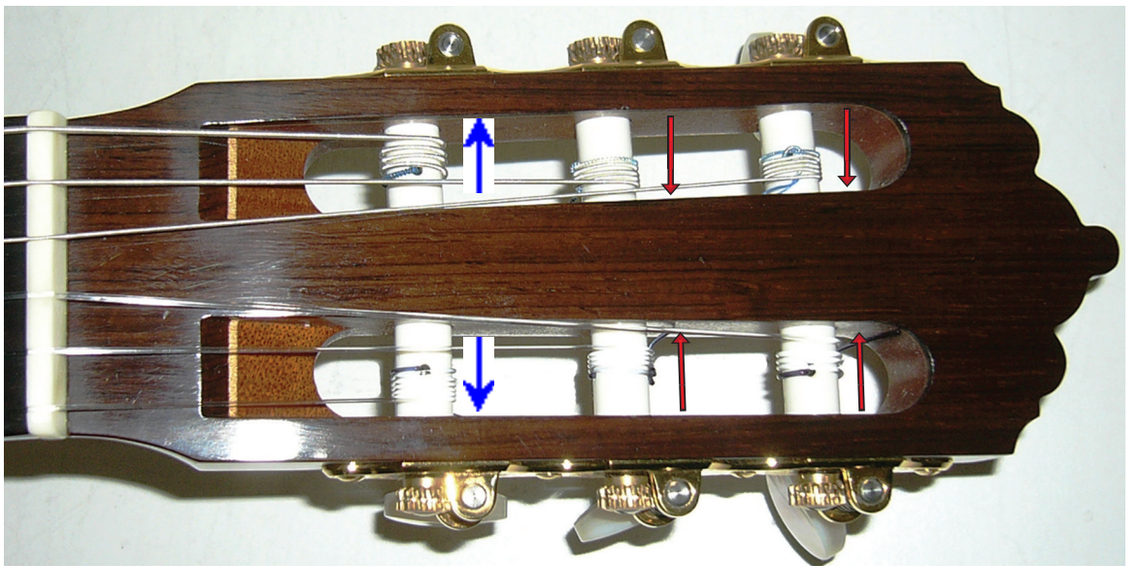
(6) Finished lock-down

(6) After pulling through the excess string (picture #5), again turn the tuning gear counterclockwise to take up the slack. Only put partial tension on the string so as to hold it in place, then proceed to the next string and repeat the afore-mentioned steps. When all strings are on, bring them up to playing tension one at a time, alternating sides of the guitar (6th string, 1st string, 5th string, 2nd string, and so on). This prevents putting undue torque on the neck and makes tuning easier..



(7) Finished stringing!

(7) Lastly, cut off the excess string. The red arrows point to small "granny" knots at the end of the 1st and 2nd strings as a precautionary measure to prevent slippage. *{ I freely admit this last knot might seem a bit superstitious, but the 1st and 2nd strings are the only strings I've ever seen come undone without a knot, so I* like *to knot just in case}.*



Fully strung headstock: Blue arrows wind OUT, Red arrows wind IN

Final note about stringing for the classical guitar: Our goal is to allow the string to move freely in its slot on the nut as straight as possible. To this end, please notice that strings 6 and 1 are oriented differently (inside-out) on the rollers than the other strings, 5-2 (outside-in).