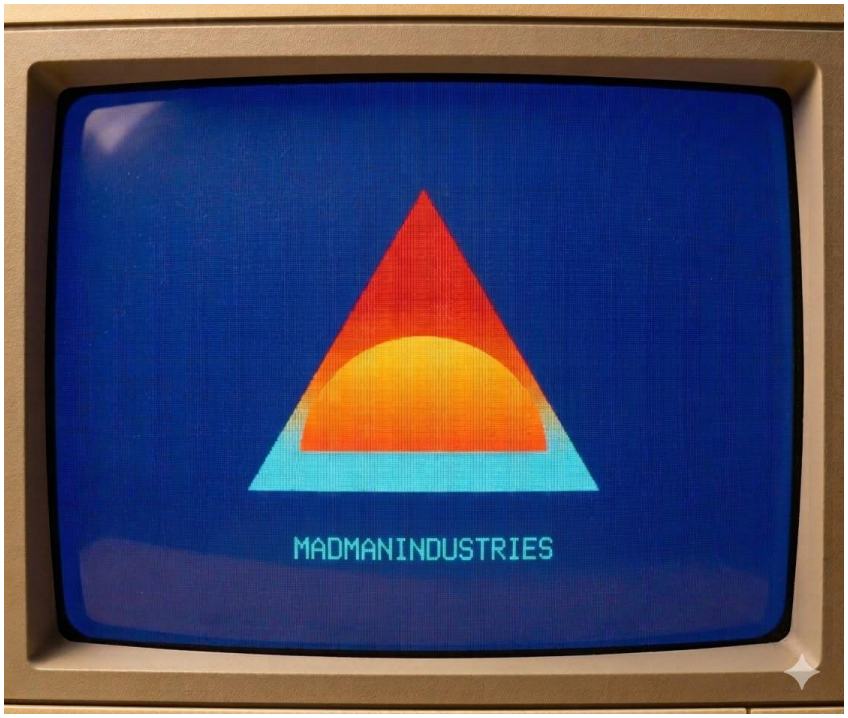


Guitar Setup/Repair/Maintenance Procedure-Electric

Version 1.0 (Official Build) around 5/1/24
Version 2.0 (Official Build) around 5/17/24
Version 2.1 (Official Build) around 7/20/24
Version 2.2 (Official Build) around 7/27/24
Version 2.3 (Official Build) around 8/3/24

NOTES ----------

Wishlist:

1. Link to invoice
2. Finish detailing and tuning

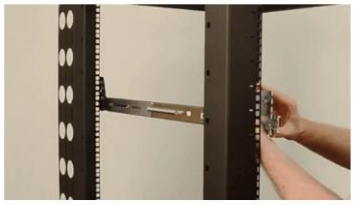
formatting:

I like that the text spans the entire page and that the graphic or table or figure is in the middle

Adjust server rack shelves or rails to fit depth. Many rails and shelves produced in the past few years have adjustable depth. Unlike non-adjustable mounting equipment, these have a sliding mechanism that allows you to get an exact fit for your server. You will need to slide the rear bracket across the outer bracket of your rail or shelf to adjust the mounting depth.

How to rack a server

Mount the server rail or shelf in the rack. Once your depth is adjusted, you will now be able to mount your rails and shelves. Depending on the hole type of your rack and mounting mechanism of the equipment, instructions will be different. Here, we will link instructions on mounting with threaded, tool-less and square hole with cage nut variants.



Install inner rail into server via shoulder screws (for server specific rails). Rails that are specifically designed to work with servers like HP and Dell will have shoulder screws. These stick out of the sides of servers and look like little knobs. They attach to the j slot of the server rail to lock it in place and make it so that there is no metal on the top or bottom of the server.

—----------

Patrick Benson EQ Devices Blog reference: link

1. Tune up Instrument to desired tuning

2. Play instrument and make note of any peculiarities

Set link to where to take notes

Guitar Setup

3. Guitar setup (3 parts)

3 Parts of Setting up an Electric Guitar:

Part 1: Truss Rod Evaluation and Adjustment

Sweetwater ref link

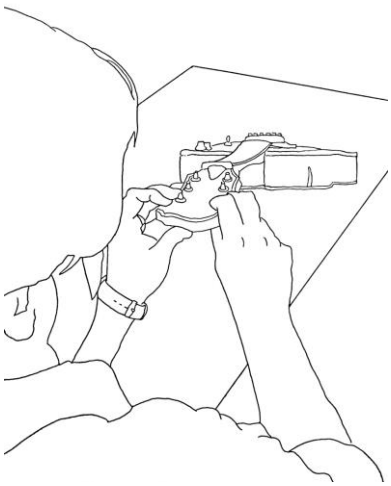
Description: The truss rod, which runs along the neck of the guitar, is adjusted to ensure the neck is properly straightened. This is crucial for maintaining the correct string action (distance between the strings and the fretboard) and preventing fret buzz.

a. Sight guitar neck

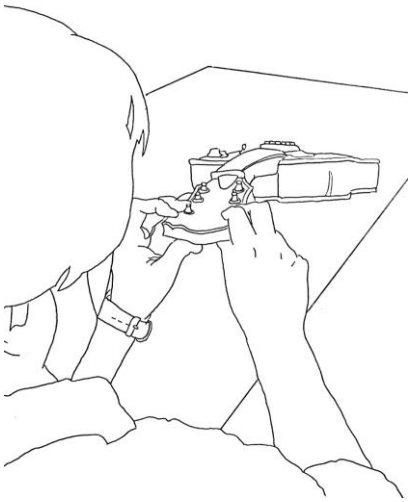
i. Tune guitar

ii. Turn the guitar on its side, close one eye, and look down the neck from the headstock towards the bridge (left).

iii. Look down the profile of the fretboard on both the bass and treble sides of the neck. Is the neck straight, or is there a curve? (**Because the truss rod will affect the middle of the neck most, be sure to pay special attention to upbow or backbow in the area between the 3rd and 9th fret.)



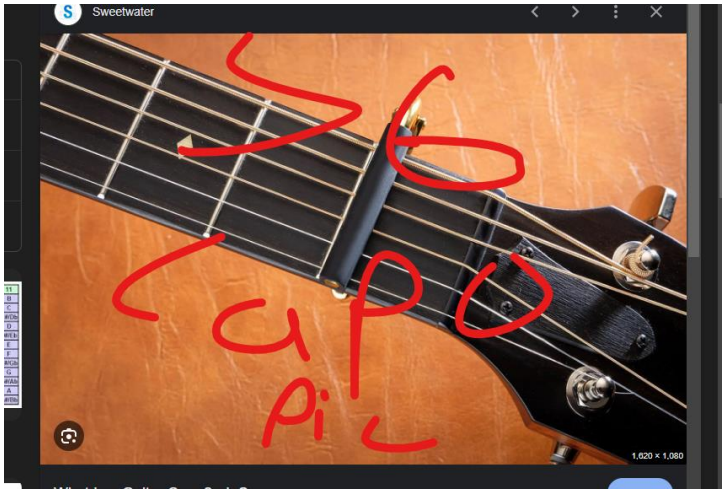
UPBOW
(too much relief)



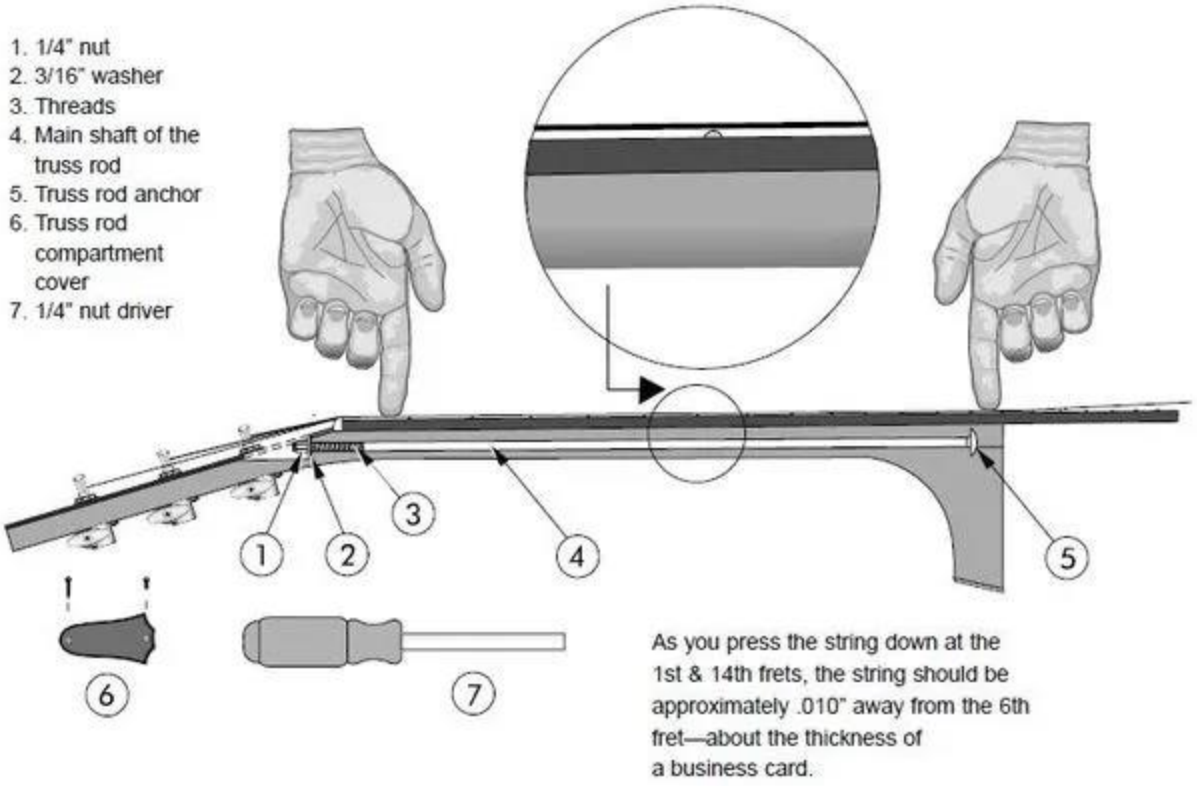
BACKBOW
(too little relief)

b. Tap test

i. Depress strings at the first fret with capo



ii. Depress the 15th fret, close to where the neck joins the body. Use the pinky finger or thumb of your strumming hand. The string now acts as a straightedge. More on this later.

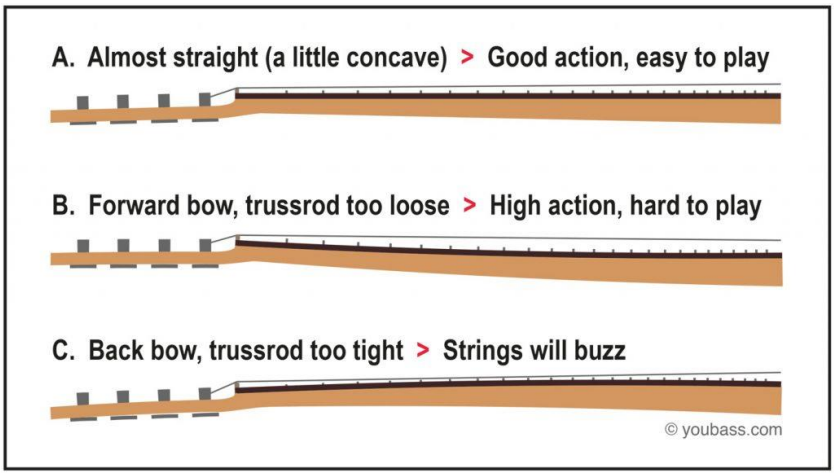


iii. Now, let's see how much or how little relief we have by extending our pointer finger to one of the frets in the middle of the neck. The mid point between your pinky and the first fret (usually around the 7th fret) will reveal the maximum amount of relief across the entire fretboard. Take a look and see if there is any gap between the top of the 7th fret and the bottom of the string. If you tap the string above the 7th fret, can you hear the string click against the top of the fret?

iv. If the string doesn't click at all, you'll either have a very straight neck, or, it could potentially be backbowed as well. If you were experiencing abnormal fret buzz on any of the lower frets near the nut, this was likely the cause and you'll want to loosen the truss rod in order to add some relief.

v. If there is a barely visible gap between the fret and the string, your truss rod may be set correctly and there's probably no need to adjust it -don't ruin a good thing. Most players want a bit of neck relief to avoid fret buzz.

c. Record your findings



Fret buzz

i. A guitar that buzzes at the first five frets will likely need more relief.

ii. A guitar that buzzes above the 12th fret or across the entire fretboard will likely need the action raised if the neck relief is properly set.

iii. If your guitar buzzed in the middle of the neck and now buzzes above the 12th fret, you've likely added too much relief.

iv. Was there any fret buzz?

v. Where was the fret buzz?

vi. What was the gap between the top of the 7th fret and the bottom of the string

vii. Etc….

viii. Remember that electric guitars dont need to be completely buzz free. If there is a slight buzz but it is not perceivable when playing through an amp it is ok. But if the guitar will be used to play clean through an amp you may have to increase action and forward bow. Acoustic are a different story….

d. Truss Rod Adjustment

**Remember that neck relief should be adjusted only when it needs it.

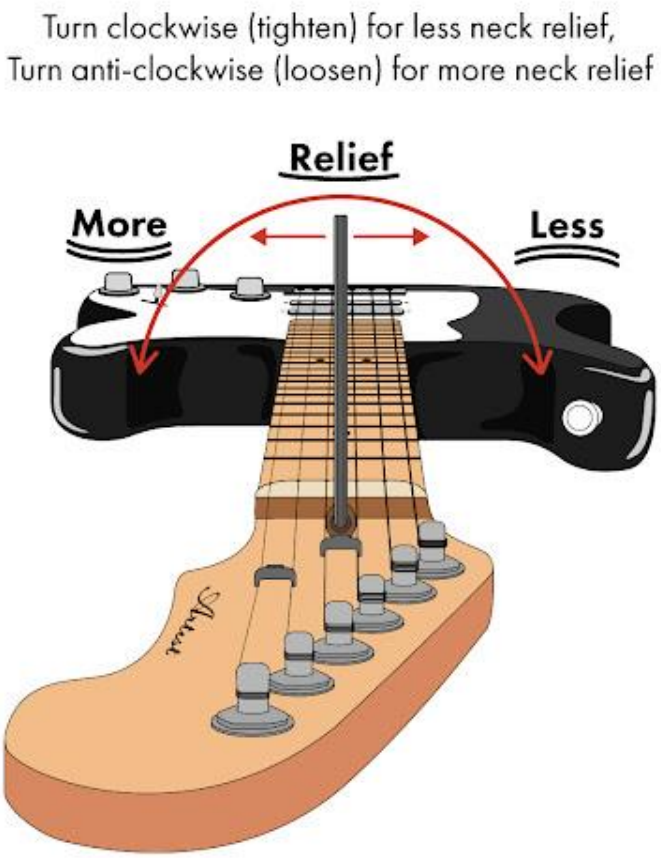
Correcting backbow	Correcting upbow
To add relief to the neck, you'll want to loosen the truss rod or turn the truss rod nut counter-clockwise.	To reduce the amount of relief and make your guitar a little easier to play, you'll want to tighten the truss rod or turn the truss rod nut clockwise.

Always re-tune the guitar before checking your adjustment.

Don't adjust too much at once. You'll want to turn the truss rod about a quarter of a turn at a time until you're familiar with how your truss rod will react.

Check your instrument's specifications. If you feel that you're loosening the truss rod and it isn't making any adjustment, you may have a dual-action truss rod. If you do, your truss rod will eventually catch, and you'll be able to make the proper adjustment.

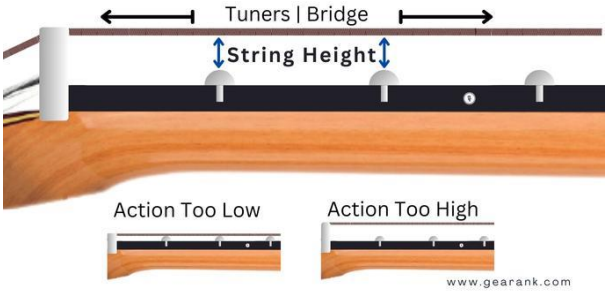
Some necks will not adjust right away. In some cases, it's better to make adjustments and let the neck settle overnight to ensure you don't over-adjust.



Part 2: Action Evaluation and Adjustment

Sweetwater ref [link]
Stewmac suggested action settings: [link]

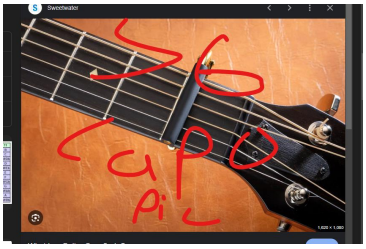
The term ‘action’ refers to the distance between the top of your frets to the bottom of your strings. This distance plays a crucial role in your setup because it determines how easy it is to fret each note and how aggressive you can play the instrument before causing fret buzz. When measuring action, you’ll want to keep in mind some target numbers, but ultimately, your playing style and personal taste will determine the string height.



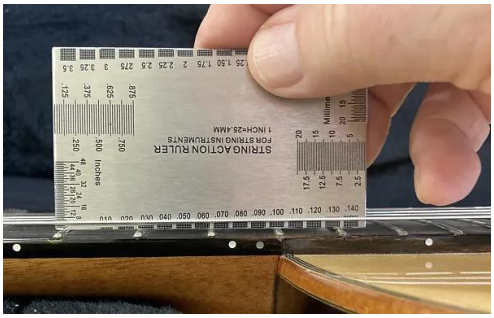
Action Measurement

- Note fingerboard radius
- Make sure that you are satisfied with the neck relief and that it has been properly adjusted.
- Tune guitar to pitch

- Apply a cap on first fret (keep consistent throughout setup)
    - Capo prevents nut height from affecting set up



- Place the ruler on the 12th fret, making sure the ruler ticks are parallel to the string

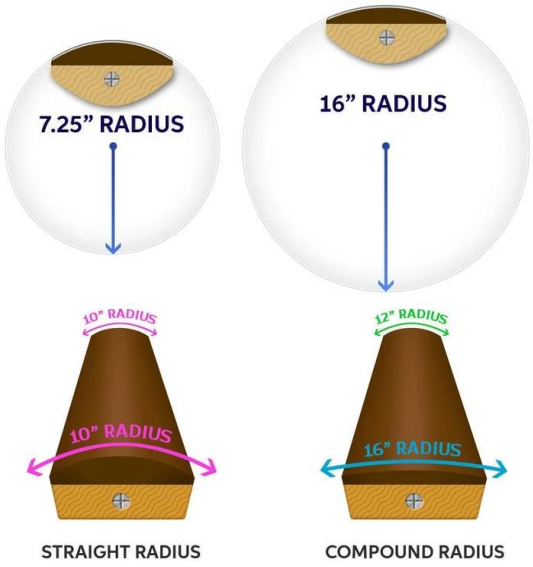


- Measure and record the gap from the top of the fret to the bottom of the low E- string. If the action is too low or too high an adjustment will need to be made.

Action Adjustment

Background info

The neck radius of an electric guitar refers to the curvature of the fretboard, measured as the radius of a circle. A smaller radius (e.g., 7.25") means a more curved fretboard, which is great for comfortable chording but can cause string buzzing during bends. A larger radius (e.g., 12" or 16") has a flatter fretboard, making it easier for fast playing and string bending but can be less comfortable for chords. Some guitars use a compound radius, which gradually flattens from the nut to the higher frets, offering a balance between both.



Gibson (hard tail piece)

A Gibson-style bridge has two bridge posts that allow you to adjust only the bass and treble side of the bridge. The radius of the saddle slots on a Gibson bridge should have already been set when the bridge was initially installed.

GUITAR STYLE	STRING HEIGHT	
	LOW SIDE	HIGH SIDE
ELECTRIC	6/64”	4/64”
ACOUSTIC	7/64”	5/64”
BASS	7/64”	5/64”

*Gibson stopbar specs

STOPBAR TIP: Be sure that the stopbar is not causing the strings to make contact with the back of the bridge. This will inhibit vibrations and reduce overtones.

The radius of a Gibson Tune-o-Matic bridge is set at the factory and should not be changed. For all other Gibson bridges, do the following:

- Measure the action at the 12th fret and determine whether you’d like to raise or lower the string height.
- Adjust the bridge height by turning the slot-head screw on the bridge post or whichever method applies to your bridge style. Always be sure to tune your guitar back to pitch before taking any further measurements.
- We like to set our treble side action about 1/64th of an inch lower on the treble side but feel free to experiment and find the height that best suits your playing style.

While there are no specific rules to set the height of the stopbar tailpiece, you may wish to fine-tune it while setting up your guitar. Keep in mind that lowering the stopbar will increase the string tension and make them a little harder.

Fender (Stratocaster synchronized tremolo bridge)

Fender-style bridge allows you to adjust each saddle height individually.
When adjusting these, it's up to you to maintain or adjust them to the proper radius.

NECK RADIUS	STRING HEIGHT	
	LOW SIDE	HIGH SIDE
7.25"	5/64"	4/64"
9.5" - 12"	4/64"	4/64"
15"- 17"	4/64"	3/64"

**fender Stratocaster synchronized tremolo bridge specs

- First, adjust your Low E-string height by raising or lowering the saddle. Always ensure that you're using the correct wrench size.
- Adjust both set screws, re-tune your guitar to pitch, and take another action measurement at the 12th fret. You may want to play that string a little to see if the playability has improved for you. If so, accurately measure the action height and adjust the rest of the strings to that same distance. This will give you the correct radius.
- Many of the Technicians here at Sweetwater prefer to have a slightly lower action on the treble strings since these strings' vibrational pattern is tighter and requires less clearance. If you'd like to try this, set the action of your high E string (1st) 1/64th of an inch lower than your low E string (6th). You can cascade your measurements from tallest to lowest, or you can more accurately set your strings to the proper radius by verifying with a radius gauge.

Tele ….

Jazz master….

Part 3: Intonation Evaluation and Adjustment

Sweetwater ref [link]

to intonate your guitar properly.

1. **Guitar intonation explained**
2. **How to intonate your electric guitar**
   - **Compare pitches**
   - **Adjust the string length**
   - **Repeat the process for every string**

● Guitar Frets & Their Notes vs Frequencies

E — Note Name
329 — Frequency [Hz]

	OPEN	1F	2F	3F	4F	5F	6F	7F	8F	9F	10F	11F	12F	13F	14F	15F	16F	17F	18F	19F	20F
1st	E 329	F 349	F# 370	G 392	G# 415	A 440	A# 466	B 494	C 523	C# 554	D 587	D# 622	E 659	F 698	F# 740	G 784	G# 831	A 880	A# 932	B 988	C 1047
2nd	B 247	C 262	C# 277	D 294	D# 311	E 329	F 349	F# 370	G 392	G# 415	A 440	A# 466	B 494	C 523	C# 554	D 587	D# 622	E 659	F 698	F# 740	G 784
3rd	G 196	G# 208	A 220	A# 233	B 247	C 262	C# 277	D 294	D# 311	E 329	F 349	F# 370	G 392	G# 415	A 440	A# 466	B 494	C 523	C# 554	D 587	D# 622
4th	D 147	D# 156	E 165	F 175	F# 185	G 196	G# 208	A 220	A# 233	B 247	C 262	C# 277	D 294	D# 311	E 329	F 349	F# 370	G 392	G# 415	A 440	A# 466
5th	A 110	A# 117	B 123	C 131	C# 139	D 147	D# 156	E 165	F 175	F# 185	G 196	G# 208	A 220	A# 233	B 247	C 262	C# 277	D 294	D# 311	E 329	F 349
6th	E 82	F 87	F# 92	G 98	G# 104	A 110	A# 117	B 123	C 131	C# 139	D 147	D# 156	E 165	F 175	F# 185	G 196	G# 208	A 220	A# 233	B 247	C 262

Guitar intonation refers to the accuracy of the pitch of notes along the fretboard. Proper intonation means that when a string is played open, fretted, or at various harmonics, the notes are in tune.

Cent: In musical terms a cent is 1/100 of a semitone. Cents are a common and convenient way of describing very small increments of pitch in musical terms. Keep in mind that the relationship between frequency and pitch is not linear so describing small pitch differences or changes in terms of frequency can be very confusing.

Guitar intonation explained

If your guitar or bass is not playing in tune, especially as you play up the neck, it might be time to adjust your intonation. An excellent way to check that is to play an open string and then play the same string at

the 12th fret. If the note at the 12th fret is out of tune (more than a few cents off) from the open note, you probably need to adjust your intonation.

Compare pitches

Play the lowest open string, or, for a more accurate reading, play the 12th fret harmonic. Now, depress the string at the 12th fret and compare the two pitches.

Remember, play with a soft-to-medium attack for the most precise reading. If both notes are perfectly in tune on all strings, then you lucked out and are done! The more likely case is that the two notes are slightly sharp or flat. To correct this, you'll need to adjust the saddle.

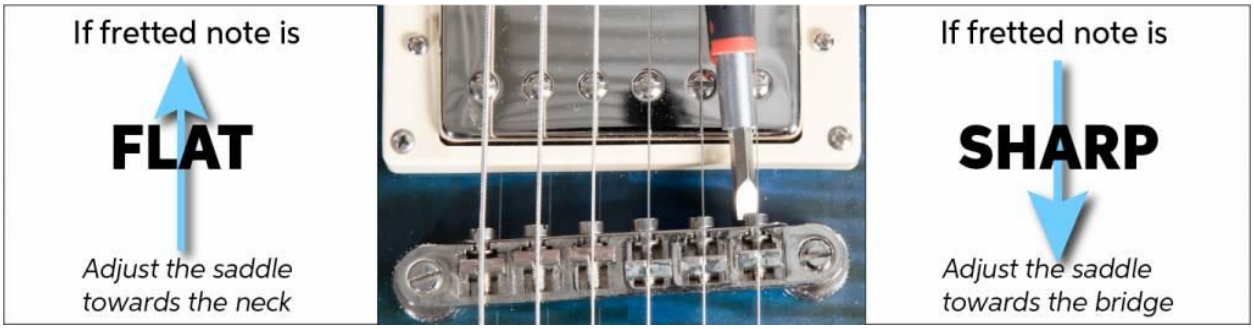
Adjust string Length

Now that you've compared pitches, the next step is to make the changes to get the string perfectly in tune. This is accomplished by using a flathead screwdriver to adjust the string length.

If the fretted note is flat, adjust the saddle (towards the neck). If the fretted note is sharp, adjust the saddle back (towards the bridge). A good trick to remember which way to adjust can be memorized by this phrase:

Flat forward, sharp back

⚡TIP: When adjusting your saddle, make minor, 1/4 turn adjustments until you have a good idea of how much the saddle must move to affect the tuner. If the intonation is too far out, it may take several complete rotations before you reach the precise saddle location.



- Repeat for every string

You'll now want to re-tune the guitar to pitch and check your adjustments against the tuner. If the pitch at the 12th fret doesn't match the open string, you'll want to repeat the process above. This will need to be done for everything string. While this process can be insanely tedious, the results make it all worth it! Your guitar will play exactly how you want it, and you can fall in love with your guitar's sound once again.

END of guitar setup

Guitar Detailing and Hardware Tuning

4. Lubricate the Nut And Saddles
5. Fretboard care
    a. Remove Strings
    b. Tape off Pickups
    c. Polish Frets
    d. Oil Fretboard
6. Wiring and Hardware Evaluation and Adjustment
7. Pickup Height Evaluation and Adjustment

END of guitar detailing and hardware tuning