



**EASY SETUP GUIDE**



**CruzTOOLS®**

# QUICK SETUP REFERENCE

## Truss Rod – Relief

Measure At	Condition	Specification	Notes
8th Fret	Hold down first and last frets	Guitar: 0.010" Bass: 0.015"	Guitar: Check on 6th string Bass: Check on 4th string

## Bridge – Action (String Height)

Measure At	Condition	Specification	Notes
17th fret	Clearance between string and fret	Guitar: 5/64" (2mm) Bass: 3/32"	Unfretted

## Nut

Measure At	Condition	Specification	Notes
First fret	Clearance between string and fret	0.020" – 0.022"	Unfretted

## Pickup Height

Measure At	Condition	Specification	Notes
Pickup	Depress last fret	Guitar: 1/16" – 1/8" Bass: 3/32" – 1/8"	Adjust for equal volume on all strings

## Bridge – Intonation

Condition	Result	Notes
Fret and harmonic at 12th string	Fretted note sharp	Lengthen string
	Fretted note flat	Shorten string

Use the blanks to write in your brand-specific setup parameters, if applicable.

Thank you for your purchase of the GrooveTech™ Tool Kit! We put a lot of care into selecting the right combination of tools and other contents to allow easy setup and other work on your instrument. The kit includes:

**Screwdriver:** 6-in-1 reversible with #1 and #2 Phillips tips, 1/4" and 3mm slotted tips, 1/4" and 5/16" nut drivers (for Gibson and other makes requiring a conventional socket)

**Measurement:** 15 Blade Thickness Gauge, 6" Precision Steel rule

**Misc.:** GrooveTech Diagonal Cutting Pliers, Capo, 3 LED 2AA Flashlight, String Winder (Guitar kit only)

**Hex Keys (Guitar Kit):** 1.5mm, 2.5mm, 3mm, 4mm (Ball-End), 5mm (Ball-End), 0.050", 1/16", 5/64", 3/32", 1/8" (Ball-End), 3/16" (Ball-End); **(Bass Kit):** 1.5mm, 4mm (Ball-End), 5mm (Ball-End), 0.050", 1/16", 5/64", 7/64", 3/16" (Ball-End)

The pouch is designed for easy access to all items, and will fit into most gig bags. In addition, a large pocket is included to carry a spare set of strings, your owner's manual, and of course, this guide. There's also a pocket to store your picks.

Some tools may contain an oily film which helps to protect against corrosion during transportation and storage. Now's a good time to thoroughly wipe tools down – especially the thickness gauge – using a soft tissue.

Note that fractional hex keys have a black finish and metric keys a gold finish for quick identification.

In addition to setup, the GrooveTech kit should address virtually all the tool needs of your guitar or bass, including knobs, tremelo systems, pick guard, tuning machines, battery replacement, and so on.

**NOTE: the work described in this guide is intended for individuals with basic mechanical skills. If you don't understand the described procedures or are uncomfortable using tools, please leave work to a qualified stringed instrument technician.**

## INTRODUCTION

With so much expressiveness, it may be easy to overlook the technical aspects of your guitar or bass. Each string must vibrate at a certain frequency, frets allow precise control of pitch, neck curvature provides for smooth playability, the bridge sets string length and height, and electrical components convert acoustic energy into electrical signals with further processing of those signals.

Many of these geometries are fixed at design by the manufacturer, but considerable adjustability remains. Adjustments may appear daunting at first, but with a little knowledge and experimentation you'll be well on your way as a basic technician. You will be surprised how much improvement in performance is possible from a properly setup instrument, and how easy it is to keep in top playing shape from changes in temperature, humidity, string gauge, and handling.

Before jumping into the setup process, a few general notes are in order:

- While all guitar and bass makes are fundamentally similar, any given brand or model will have its own nuances. Therefore, this guide should be considered a supplement to your owner's manual. In order to keep it simple, we provide general setup specifications. If your make has significantly different setup parameters, use those instead. We refer to inch-based measurements in this guide, but many manufacturers specify metric units. No problem – both the ruler and thickness gauge provide fractional and metric scales. In

case you were wondering, simply multiply any inch measurement by 25.4 to obtain the metric equivalent (for example, 0.015" times 25.4 equals 0.381mm).

- Your guitar or bass may have come with special tools – for example, a socket-style truss rod wrench. If so, simply store them in the GrooveTech pouch. However, redundant items (such as hex keys) should be set aside in favor of the higher grade tools we provide.
- Always make adjustments at room temperature, and keep the instrument in correct tune throughout the entire setup process.
- Setup starts with the truss rod, followed by the bridge and pickups, and concludes with intonation. Find a surface with suitable space and good lighting – your kitchen table will do fine. Lay down a soft bath towel, and position a few books underneath the neck. Allow about an hour for your first setup; subsequent checks and adjustments will go much faster.
- For best results, take measurements with the instrument in its upright playing position to avoid the unwanted influence of gravity.
- Setup specifications are really just a starting point. For example, some players prefer the tone of a flatter neck, and will try to set it as flat as possible without buzzing. Alternatively, others want extremely low action on a certain part of the neck, and might use a setup combination to achieve that goal. Once you become comfortable with the process, feel free to experiment, taking small steps at a time. After finding a setup that works for you, be sure to measure and record settings - you'll always be able to return to it!
- Tremelo setup and adjustment is outside the scope of this guide – refer to specific instructions from the manufacturer. Regardless, the GrooveTech kit should already include the necessary tools for tremelo systems.
- Most of the bass references in this guide relate to four-string versions. The same principles apply directly to five and six stringers as well – we simply recommend that you refer to your owner's manual for specific setup parameters.

## CHANGING STRINGS

The ideal time for a complete setup is following installation of fresh set of strings. A few notes on mounting strings:

1. Change only one string at a time, keeping other strings at regular tuning. This will help to maintain somewhat normal tension on the neck.
2. If using the cutters to remove strings, detune the string a little first to reduce tension and the risk of injury or damage from "snapping" of the string.
3. Cut each new string four to five inches beyond the tuning post. You may see recommendations elsewhere for as little as two inches, but the extra winds will help hold tuning.
4. Insert the tips of the string into the post, and wind from the top down. While turning the key, use your other hand to coil the string on the post – keep it nice and neat.
5. Bring the string to desired tuning pitch, then move to the next one.

Note that most tuning machines are much better at tuning "up," rather than tuning "down." Therefore, when you need to tune down it's a good practice to go below the desired frequency and tune back up from there. A gentle tug on the string can also help.

## TRUSS ROD

One adjustment that probably causes the greatest anxiety is the truss rod. Clearly, random truss rod changes can cause problems, but the right tools and process will empower you to master this otherwise mysterious component.

String tension pulls on the neck, creating a slight upward bow. This is called "relief," and desirable within a certain range. To control relief, manufacturers place a metal bar (or sometimes more exotic material) called a truss rod inside the neck with a nut on one end. Tightening the nut (clockwise) will flatten the neck, reducing relief. Conversely, loosening the truss rod (counterclockwise) will increase relief. Since the neck is made of wood, it won't necessarily respond immediately to changes in truss rod tension. Therefore, it is generally recommended to wait at least several minutes between adjustments to let the neck "settle," then measure again. Only a small amount of adjustment is typically required; otherwise you may need to consult a professional.

Before making the first measurement, you can "sight" for curvature by looking down the neck. With the instrument in an upright position, set the body on a table or other surface and look down from the headstock. You can quickly get a feel of your starting point. After making adjustments, sight the neck again. After a while, you'll be able to spot problems without tools.

To measure for proper truss rod tightness, an automotive-style thickness gauge and straightedge are needed. As it turns out, a string under tension happens to make a very good straightedge. The process therefore involves holding the string down at the two extreme frets and measuring clearance between the string and fret at the midway point. Since you only have two hands, a capo is provided for the first fret. Fasten the capo on top, rather than behind, the first fret.

You can measure relief by fretting at the first and last fret on the 6th string (4th string on basses), and checking clearance at the eighth fret. That is, with the first and last fret depressed, measure the distance between the bottom of the string and the top of the eighth fret on the E string. Gently insert the thickness gauge while laying it completely flat on top of the fret. Clearance for guitars should be about 0.010," and 0.015" for basses. You may find it helpful to check with the next highest and lowest gauges until you get a good feel for clearance.

If the gap exceeds the appropriate thickness, there's too much relief and the truss rod should be tightened. If less, loosen the truss rod for more relief. You might end up overshooting the spec – that's OK; just go back in the other direction slightly. The important thing is to make small adjustments at a time.

As previously mentioned, necks can be somewhat slow to respond to truss rod adjustments. It's therefore useful to recheck the neck later, perhaps after a gig or two, and make residual adjustments as needed.



Use common sense and don't force truss rod adjustments! If you feel abnormal resistance to movement, or if the neck is significantly out of spec, it would be prudent to leave further work to a qualified technician.

## **ACTION**

Action refers to string height, which is adjusted by raising or lowering the bridge saddles. If set too low, buzzing occurs; too high and playability is impacted

Measure clearance between the bottom of the string and top of the 17th fret, and adjust to about 5/64" for guitars (2mm may be easier to read on the ruler) and 3/32" for basses. Rest the steel ruler on top of the fret, placed behind the string, and measure. Bridge saddles require either a slotted screwdriver or hex key for adjustment. Make sure each saddle screw pair is set to approximately the same height. Since thinner strings move less from vibration, you can usually set action lower on these without buzzing.

In addition to bowing in the direction of the truss rod, each neck also has a fixed curve in the direction of the frets. If you were to complete an imaginary circle from the frets, you would be able to associate a radius with it. Most guitars and basses have a radius ranging from seven to twenty inches.

Setting string height as described above will roughly match neck radius. For more precision, you can purchase a commercially available steel gauge, make one using a protractor, or find printable gauges on the web.



Action can be set to a wide range of preferences. Those who want lightning fast action might try for the lowest possible setting, perhaps even to a level that tolerates slight buzzing. Others may be more comfortable with a higher setting. The key is to experiment and find what best suits your style.



## NUT CHECK

With the truss rod and action set, you're ready to check the nut. Measure for a clearance of 0.020" to 0.022" at the first fret, without fretting the string. This is an excellent "acid" test of your nut, which can cause problems on an otherwise properly set up instrument. For example, you might set up a bass completely to spec, and be driven crazy by a buzzy E string. The nut clearance check may reveal insufficient clearance as the culprit. Alternatively, too much clearance will prevent action from being set sufficiently low.

Any nut work should be left to an experienced professional. However, if your string sits too low in the string slot with resultant buzzing, you can temporarily solve the problem by placing a shim under the string. Small pieces of business card paper stock work fine.

## PICKUP HEIGHT

Virtually all pickups can be adjusted, and it's not unusual for the treble side pickup to sit slightly closer to the string. Pickup adjustments are interactive, requiring listening through an amp over a range of playing conditions, and fine tuning for uniform volume levels across all strings.

Typical clearance ranges from 1/16" to 1/8" for guitars, and 3/32" to 1/8" for basses. Using the ruler, the measurement is made at the pickup with the last fret depressed. Bass players with split "Precision" style pickups don't need to worry about having both pickup surfaces on the same plane – start with a setting using the ruler, and fine tune for uniform volume output.

## INTONATION

The other bridge adjustment sets length of the string by moving the saddle forward or backward. Calibration of intonation assures optimal tuning increments over the entire fretboard, and is easily adjusted with the aid of an electronic tuner.

The process involves comparing tune between a fretted note and harmonic at the twelfth fret. A properly intonated string will have the exact same frequency under both conditions.

With the tuner ready, depress the string at the twelfth fret and observe the output frequency. Then, play a harmonic (with your finger only slightly touching the string) at the twelfth fret and note that frequency. If the fretted note is sharp, increase string length; if flat, decrease length. Most bridges are adjusted using either a #1 or #2 Phillips screwdriver – make relatively small adjustments, retune, and check intonation again. If you're shortening the string, you'll need to tap the top of the screwdriver handle to make sure the saddle moves forward; otherwise the adjusting screw head may not be seated against the bridge chassis.

## BECOME YOUR OWN BASIC TECHNICIAN

After you've completed a few setups, you should feel empowered! Not only should there be a sense of satisfaction from doing your own setup, but you'll start to become aware when further adjustments are needed. You'll also probably notice the most significant truss rod adjustment will be necessary during Spring and Fall as temperatures change, and quickly take care of it.

We sincerely hope this guide has been helpful, and welcome your feedback. Thanks for reading...

## LIMITED WARRANTY AND DISCLAIMERS

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