

Solid-body ST-style Guitar Kit Assembly Manual



This guide provides step-by-step instructions to build a solid-body ST-style DIY guitar using a kit. Even if you have never built a DIY guitar before, you can learn how to get started by reading this tutorial.



There's nothing more satisfying than playing a guitar you have put together yourself!

Project Toolbox

Before we get started check the list below and ensure you have the necessary tools and consumables required to complete the project.

Tools

- 2 X Timber clamps (*set neck guitar only)
- Electric jigsaw or coping saw (*If shaping the headstock)
- Steel ruler (at least 40cm)
- Hard sanding block
- Center punch (or similar tool for marking hole locations)
- Electric drill and assorted drill bits
- Large and small screwdrivers (phillips head and flat head)
- Pliers (needle nose preferably)
- Soldering iron

Consumables

- Disposable gloves
- Titebond, PVA, or similar wood glue (*set neck guitar)
- Small paintbrush
- Wood grain filler (If open grain timber such as Mahogany or Oak)
- Sandpaper. Various grades, from 120 up to 1500 (*depends on finish)
- Finishing supplies. (This depends on your choice of finish)
- Painters masking tape
- Assortment of clean rags and paper towel
- Denatured alcohol (or cleaning product with degreasing ability)
- 0000 fine grade steel wool
- Solder (and sponge for cleaning tip of iron)
- Container for storing finishing supplies.

Next, check that all parts have been included.

Parts List

Below are the parts you will find included in your packaging to complete an ST guitar kit.

- ST body and neck
- Neck plate, neck plate cushion and screws
- 2 x Strap buttons
- 6 x inline tuners
- Floating tremolo bridge and tremolo bar
- Tremolo claw and springs
- Pre-mounted pickguard (3 x single coil pickups, 1 x volume and 2 x tone controls, 1 x 5 way pickup selector)
- Input jack
- 2 x string trees
- Cable and hex wrench (for adjusting truss rod)
- Tone and volume knobs
- Assorted screws and washers

Safety Precautions

To complete your guitar kit safely, also ensure you have the following on hand, and a well ventilated work space to work in.

Protective eyewear

Use protective safety glasses or a genuine face shield, not regular prescription, reading, or sunglasses.

Disposable gloves

Use disposable gloves if applying stains or oil finishes directly to the guitar.

Masks

Use an N95 rated dust mask for sanding and an R95 rated particle mask for finishing. If using water based finishing products an N95 dust mask may suffice for both sanding and finishing, but be sure to check the finishing suppliers recommendations first. Paint fumes are dangerous.

A well ventilated work area

Ensure your work space is well ventilated, especially when finishing to prevent a build up of potentially toxic fumes.

Making your Guitar Kit play and sound great

There are four stages to building a great kit guitar, these are:

1. Preparation and finishing

The finished surface appearance of your guitar e.g. staining, painting, or applying a hand rubbed oil finish.

2. Hardware Installation

Fitting the tuners, strap buttons, bridge, and pickups.

3. Connecting the electronics

Connecting the pickups to the input jack, and incorporating a pickup selector and volume and tone potentiometers.

4. Final Setup

Adjusting the neck relief, action, intonation and pickup height. We'll cover each of these below, starting with preparation and finishing.

1. Preparation and finishing

Inspecting and prepping the body

Once unboxed, remove the pickguard by removing the two screws holding it in place on either side of the bridge cutout. Next, carefully inspect the guitar body and neck under good light.



Identify problem areas, as these should be addressed early on before commencing the project.

This includes large dents that require filling, deep scratches that require sanding and glue residue on the surface of the guitar that will prevent your finish from being absorbed evenly. Glue stains are only a potential issue for guitars with binding, and/or a veneer top.



Once you have identified problem areas you can begin prep sanding the guitar. Start by sanding the entire body using 180 grit sandpaper. Follow that up with 240 grit paper. If you are applying a stain directly to the

raw wood sand up to 400 grit, but sanding any smoother than this may begin to affect how well the stain is absorbed.

Once you have completed sanding up to 240 grit, wipe a small amount of moisture on the surface of the guitar. Using denatured alcohol is a good option here as it evaporates before it is absorbed into the timber, but water will also raise the grain of the timber which can then be sanded flat. Generally grain will only raise once, so you can be confident by taking care of it now, you won't have any problems during the finishing process.

Dry Fitting the Neck

You should also check the neck fit. While the ST is a bolt-on neck guitar, it's still important to dry fit the neck and check how well it fits the neck pocket, along with neck alignment, neck angle and scale length.

Insert the Neck

First push the heel gently into the back of the neck pocket, then push the neck down flat.



This reduces the risk of chipping the thin edges of the neck pocket before the neck has been installed.

Check the scale length

You can check the location of your bridge with regard to scale length by loosely installing the bridge and measuring the distance from the edge of the nut closest to the fretboard and the middle of the 12th fret and then doubling that number. An ST guitar kit should have a scale length of 25.5" or 650mm.

If your scale length appears out by a few mm, keep in mind the individual saddles can be adjusted forward or back via the intonation adjustment screws.

Check the neck fit

The neck, once inserted into the neck pocket, should have very little sideways movement. If there is a gap on either side of the neck, you may need to shim the neck by cutting small sections of scrap wood with a craft knife and gluing these to the sides of the neck pocket. Otherwise smaller gaps can be filled prior to finishing using a filler.

Check the neck angle

Run a steel ruler along the fretboard and over the bridge. The steel ruler should sit just above the saddles on the bridge when the bridge is sitting flat against the body.

Cutting the Headstock

If shaping your headstock, start out by sketching out some rough concepts before transferring the chosen design to paper at the correct size.

When designing your headstock be sure to leave a margin of at least 15mm from the last tuning hole and the edge of the headstock (the equivalent distance between the tuning peg holes).

1. Once you have a completed design at the correct size cut the shape out and glue it to a thin scrap piece of timber to be used as a template. (You can also use cardboard which in many cases will be easier to work with).
2. Using a coping saw, jigsaw, or ideally a bandsaw cut out the headstock shape and sand the edges of your template smooth.
3. Taking a small clamp, clamp the template to the headstock and carefully trace the outline.

From there you can either cut the new headstock shape using the template as a guide, or remove the clamps and cut following the outlines you just made.

When cutting out your headstock shape protect the neck of the guitar when cutting, cut well outside the lines to allow room for sanding and keep your saw as vertical as possible to ensure straight lines on your headstock.

If unsure keep the design simple. A well executed simple design is better than a poorly executed complex one. Once complete, sand the edges until as smooth as the rest of the body and neck.

Masking

Before we start grain filling and finishing we should mask the neck pocket, and body cavities of the guitar.



Mask the tuning peg holes on the headstock to keep the holes clean, along with the holes for the bridge and tailpiece and pay special attention to the truss rod. You should also mask the fretboard when spraying the back of the neck.

If your guitar has binding you can either attempt to mask off the binding, which in most cases will mean some finish still permeates the masking tape and will need to be removed, or not masking, and scraping the binding clean with a razor blade before spraying your clear coats.

I'd normally scrape the binding as this is a more effective use of time, rather than attempting to mask. But it's best to mask the binding if you notice any cracks as the finish you apply will permeate the binding staining it permanently.

Grain Filling

Grain filling is optional, and mostly depends on the wood your guitar is made from and whether you are aiming for a flat finish.

If your guitar is made from an open grain timber such as Oak or Mahogany, the open pores of the timber will prevent a flat finish unless filled.

Basswood for the most part is optional. In most cases it's advisable to grain fill but if painting a solid color (which we are in this case) you can get by using a primer which will level and seal the surface.

If you are staining, depending on the product you are using, you can grain fill either before or after. In most cases I've found grain filling first results in a more even application, and a better result.

There are a number of different grain fillers available, including solvent, water and oil based options, along with pre-tinted options. Oil based grain fillers penetrate deeper into the wood, but water is obviously easier to work with with regard to drying times and clean up.

Using a tinted grain filler is a great option if you want to accentuate the grain pattern of the guitar, as the excess will be removed when sanding but the filler used to pack the pores of the wood will remain in place, emphasizing the grain pattern of the wood under a transparent finish.

Below are the steps required for applying grain filler:

1. Mix up enough product to grain fill the entire guitar. Follow the recommendations for the product you are using in terms of application, cleanup and safety, then mix your grain fill into a workable paste in a spare container.
2. Apply to the guitar using a clean rag, working in line with the grains pattern of the wood. Next, work across the grain really pushing the grain fill into the wood, making several passes.
3. Once finished applying, leave the guitar for ten minutes and then wipe away any excess using a clean damp rag.
4. Once dry, sand back to the surface level of the guitar, working through the grades of sandpaper from 120 grit to 240. Sand sufficiently to remove the excess grain fill but not enough to dig into the wood and create more open pores.
5. Inspect the surface of the guitar and repeat the process if required.

Finishing

It's beyond the scope of this guide to cover every available way to finish an electric guitar but below are a few rules that apply to almost all finishing options:



- Carefully consider your finishing options with regard to how protective they are and how they might affect tone along with aesthetics.
- Choose your type of finish based on the wood itself. For example, it would be a shame to cover up a beautiful grain pattern with a solid color finish. Alternatively, staining a less figured piece of basswood for example may not provide a great aesthetic either.
- Wear gloves and a mask and work in a well ventilated area as required. Fumes from some finishing products can be toxic.
- Clean the body of the guitar using a product that includes a degreasing agent
- Wear disposable gloves when handling the guitar after cleaning.
- Make sure you are working in a relatively dust free environment and make sure to clean the cavities of the guitar body thoroughly after sanding. Dust accumulates in the cavities of the guitar, and when turning the guitar over that dust will become airborne.
- If staining, make sure to wipe away any excess that hasn't been absorbed after approximately ten minutes.
- Be aware of the compatibility of the products you use. If painting using spray cans I'd recommend using the same brand and type of paint for your seal coat, color coat and clear coats.
- If you have to spray outside avoid spraying on windy days.

- Spray the sides of the body first. That way when spraying the front and back you will be spraying over any overspray from the sides of the guitar.
- Don't spray heavy coats. In many cases, several lighter coats are a better option than 1-2 heavy coats due to the potential for runs.
- Check your binding for cracks. If cracks are present, mask the binding prior to applying a colored finish or the finish will penetrate the binding and become impossible to restore to its original state.
- Don't apply too many coats within recommended drying times. If you spray more than 3 coats in a day for example, your first coat may have trouble curing.
- If you are using steel wool on the body of the guitar prior to finishing ensure you remove all fibers from the steel wool.
- Always hang your guitar in a cool dry environment. Do not leave your guitar outside to dry, it will attract dust.
- In most cases, you can respray within an hour. If you leave it longer than this, you may need to leave the guitar for 24 hours and then lightly scuff up the paint with 600 - 800 grit sandpaper to ensure the ensuing coats will adhere to the previous coats. (This depends on the product you are using, so check the label). If you're looking for a resource that covers guitar finishing in great detail, check out *Guitar Finishing Step-by-Step* by Dan Erlewine and Don MacRostie.

Installing the neck

Now that the finishing stage is complete we can safely install our neck.



Within your packaging there will be a neck plate, neck plate cushion and four long screws.

Place the neck into the neck pocket and ensure it is pushed right up into the back of the cavity.

Place the black neck plate cushion followed by the chrome neck plate and then loosely place the 4 screws, but don't begin tightening these yet.

Next, double check your alignment and begin installing the screws. Install the top left screw first, followed by the bottom right screw, working diagonally. Once all screws are in place, tighten and double check the neck alignment.

2. Hardware Installation

Next we'll install our hardware, the pre-mounted pickguard, tuners, strap buttons, string trees and floating tremolo bridge.. There are some best practices to follow including drilling pilot holes and aligning your hardware correctly which we'll cover in more detail below.

Pilot Holes

Drill pilot holes for all screws used on the body and neck of the guitar.



The small screws used for securing your tuners for example are small, fragile and easily stripped.

Whenever installing hardware:

1. Use masking tape on the guitar to mark the location of the hole using a pen (pencils usually don't result in sharp lines on masking tape).
2. Mark the location of the hole making an indentation in the wood through the masking tape using a hole punch or similar tool.
3. Decide on the correct size drill bit ($\frac{2}{3}$ thickness of the screw) and mark the drill bit depth using a small piece of masking tape at approximately $\frac{2}{3}$ the depth of the screw to be installed.
4. Always aim to drill your holes straight. If you have a drill press this is preferred.
5. Use a countersink drill bit (or similar) to chamfer the edges of any holes in the body of the guitar, especially if painted using a solid color finish, to prevent chipping. You may want to drill less than $\frac{1}{3}$ depth on less dense timbers such as Mahogany and Basswood.

Installing the pickguard

We'll start by installing the pre-mounted pickguard. The pickguard already has the pickups and controls pre-mounted so the first thing we need to do is identify the wires for the input jack and ground wire for the tremolo claw.

The wire connected to the middle lug (output) of the volume pot will go to our input jack, and either of the remaining two wires can be the ground for the input jack. I'm using the black wire for the ground of the input jack, and the white wire for the ground for the bridge in this instance.



Once you have threaded the wires, including the ground wire for the bridge, install the pickguard. Check the alignment and then mark indentations in the timber for each screw hole using a hole punch or similar object and the pickguard as a template.



Once you have marked the location of your pilot holes select a drill bit approx. $\frac{2}{3}$ the size of the screws being used for the pickguard and mark the drill bit at $\frac{2}{3}$ the depth of the screw using a small piece of masking tape to indicate the depth of your holes. Drill the pilot holes, keeping the drill straight. Then position the pickguard and secure with the smaller screws found in your packaging.

Installing the Tuners

ST guitar kits utilize inline tuners, so you won't need to separate your tuners into left and right.



1. Start by inserting the tuner in the back of the headstock with the mounting hole facing back toward the body.
2. Place the washers over the tuning posts, then place the bushings and install the tuners by hand tightening.
3. Align the tuners using a steel ruler (see image below).
4. Mark the location of the mounting screws, drill your pilot holes and install the small screws.
5. Remove the protective covering by firmly pressing masking tape onto the back of each tuner and removing both the covering and masking tape in one action.



You can also install the first and last tuner, and using a steel ruler mark a straight line between them on masking tape to ensure a straight line to mark out the location of the pilot holes.

Installing strap buttons

Strap buttons not only support your guitar when playing standing up, the placement of the strap buttons also affects the balance of the guitar.



On an ST guitar, the rear strap button is located in the center of the lower bout. The front strap button is inserted into the top horn on a downward facing angle.



Follow the method described above for all hardware installation including using painters marking tape for marking the location of pilot holes, and drilling to the correct size and chamfering the edges of the holes.

Installing and floating tremolo bridge

Start by inserting the bridge into the bridge cavity and positioning within the cutout in the pickguard. The holes for the screws that secure the bridge at the front are pre-drilled, so taking 6 of the smaller screws secure the bridge in place.

Installing the input jack

Place the input jack in the cavity and align until satisfied with the placement. Mark your pilot hole location, remove the jack and drill pilot holes. Next, warm up your soldering iron as we'll quickly connect the ground and hot wire to the jack.

3. Connecting the electronics

Soldering

If you haven't soldered before you're going to need a soldering iron, solder, and a damp sponge to clean the tip of your iron. I'd also recommend practicing before committing solder to your electrical components.

Most entry level soldering irons will do the job, and your kit will come with more than enough solder. Be careful when soldering. Solder won't melt until it reaches 185°C (365°F) and soldering irons get very hot, up to 392°-896° F in some cases.

When soldering there are two key areas to keep in mind.

1. Tinning

Tin your soldering iron and the components you are connecting to. Tinning refers to maintaining a light coating of solder over the tip of your soldering iron and prevents the iron tip from oxidizing.

2. Preheating

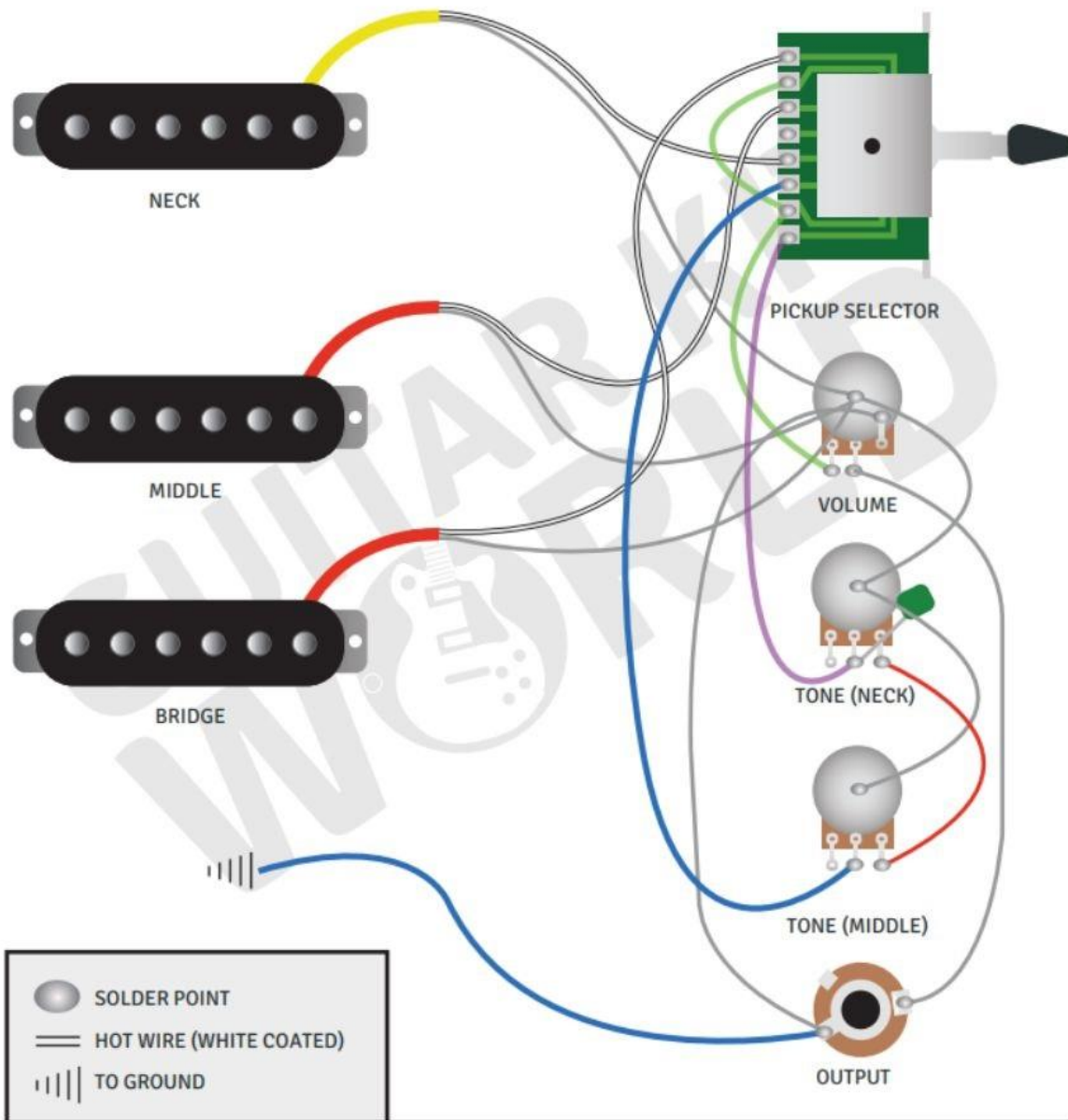
Soldering is really about transferring heat. The lug or component you are connecting to should be preheated so the solder is drawn to it rather than staying on the already hot iron.

Wiring

Next we'll connect the electronics. There's only three connections to make when wiring an ST guitar kit, all other wiring is taken care of courtesy of the pre-mounted pickguard.

WIRING DIAGRAM:

SSS, 1 x Volume / 2 X Tone, 5 Way Selector



* Wire colors may vary depending on manufacturer

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Tin both lugs on the input jack by applying a small amount of solder to each and let cool.

Take the hot wire, in the example this is the red wire, and thread it through the eyelet of the lug attached to the outer sleeve of the input jack. Next, take the ground wire (black) and thread it through the eyelet of the lug attached to the inner sleeve of the input jack.

Making sure your soldering iron is tinned, begin heating up the lug attached to the outset sleeve of the jack for a few seconds and then slowly introduce the end of your solder to the lug and wire. Once the solder begins to melt, take the iron away and allow it to cool. Once cool, check the connection by lightly pulling on the wire.

Connect the ground wire in the same way and then secure the input jack in place with the supplied screws.

Inserting the tremolo claw and springs

Take the tremolo claw and place it against the end of the tremolo cavity with the flat part of the claw diving down.



Mark the location of the two screws in the rear of the cavity and remove the claw. Choose a drill bit 2/3 the size of the screws for the tremolo claw and drill on a slightly downward angle to 1/2 depth of the screw.



Screw the claw into place but only loosely fit the screws in place for now, as we'll need to install the springs next. Taking the 3 strings in your packaging, thread the round ends of the springs over the tremolo claw end and the square end of the tremolo block. I attach to the middle three positions on the tremolo claw but this is really up to you.

Once the springs are in place (you may need to loosen the screws further or use a tool if unsuccessful) tighten the screws back to approx. half depth.

Connecting the ground wire to the trem claw



We'll connect the white wire we threaded through the side of the control cavity earlier to the tremolo claw to ground the guitar.



Locate the wire and tin the end. Next melt a small puddle of solder around the hole to the side of the trem claw. If you don't have a pre-drilled hole, simply melt a small puddle of solder directly onto the trem claw.

Take the ground wire, thread it through the hole or hold against the puddle of solder made earlier and begin to apply heat. Add a little more solder and complete the connection.

If you notice the back of your trem claw has a wax-like substance coating, take some rough sandpaper and remove a section to help the solder adhere.

Once complete install your back cover by aligning the cover to the body, holding in place with masking tape and following the same process for drilling pilot holes as done previously.

Your electronics should now be connected, so now's a good time to check everything is working correctly. Plug a cable into the input jack, connected to an amplifier and check the pickups are working by tapping on them. If you hear a lot of interference check the ground wires, as there is likely to be a wire or connection broken.

Installing the String Trees

String trees serve to increase the break angle from the nut to the tuners, for the high E, B, G, and D strings, providing greater stability for the nut and preventing strings moving around in their slots.



This is fairly typical of Fender® style guitars, as the majority of necks have much less of a backward tilt compared to Gibson® style guitars which typically do not utilize string trees.



You should have two string trees in your packaging. One will feature a longer barrel which is to be used for the string tree between the D and G strings, with the shorter one reserved for the B and high E strings.

To install your string trees, you will first need to install your strings to allow for perfect alignment. Once the strings are in place lay the top face of the string trees across the E,B and D and G strings. Align the D and G string tree between the first and second tuning post and the D and E string tree in line with the second tuning post.

Once in place mark the holes as we have done for all hardware up to this point and drill your pilot holes before placing the string tree barrels in place and screwing the string trees in place.

4. Final Setup

The last stage of our project is setting up the guitar. This is an important step that makes all the difference with regard to playability and tone. Our final setup will consist of four key areas:

- Floating the trem
- Neck relief
- String action
- Intonation
- Pickup Height

I'll provide a basic overview of each below. Also, keep in mind the guitar should be tuned to concert pitch and checked regularly during the process to ensure the correct amount of tension is on the neck as adjustments are made.

You may also want to revisit aspects of your setup once you have had time to play the guitar and have identified problems e.g. fret buzz or intonation issues.

Floating the Trem

Now that the strings are on, we'll adjust, or aka float the trem. What we're aiming for is enough action on the tremolo unit to allow for a semitone (half step) shift in pitch when laying the bridge plate flat against the guitar body.



The amount of action provided by the tremolo depends on the interplay between the springs and the strings.



1. Make sure the guitar is tuned to concert pitch.
2. Loosen the mounting screws for the bridge on the face of the guitar by approx. A $\frac{1}{4}$ turn. Then, tighten the two outside screws down.

3. Flip the guitar over and tighten the tremolo springs. While retuning the guitar as needed and checking how much tilt the tremolo has.

Check the amount of pitch shift when laying the trem flat against the body and continue to adjust until satisfied.

Adjusting neck relief

The ideal guitar neck is one that has a small amount of inward bow or relief to provide clearance for the strings when vibrating. A neck that is too straight will very likely run into problems with fret buzz.



You can measure the straightness of the neck using a steel ruler. I prefer to hold down the first and last fret and then tap the 12th fret lightly of the low E string. If the string is already sitting hard against the fret more relief is required. If sitting well above the fret, the amount of relief can be reduced.

To adjust the amount of relief, adjust the truss rod using the hex key included in your packaging. Turn counter clockwise to loosen the truss rod which will introduce more relief. Turn clockwise to flatten the neck further.

Remember to only make incremental changes of $\frac{1}{8}$ th to a $\frac{1}{4}$ turn each time and make sure the guitar is tuned to concert pitch so the correct amount of tension from the strings is placed on the neck. Be sure to continue to check your tuning through the entire setup process.

Adjusting the action

Action refers to the height of the strings from the fretboard of the guitar. This is usually measured from the top of the 12th fret to the underside of the low E string.



A good starting point if unsure is 2.4mm on the low E side and 1.6mm on the high E side, taking into account the different string gauges. Make sure the guitar is in tune before checking and making adjustments.

Action is adjusted at the bridge. Taking the small alum key in your packaging, turn the individual saddle posts counter clockwise to lower the individual saddle posts or clockwise to raise the action. You'll need to match the height for both to keep the saddle balanced on the bridge.

Intonating the guitar

Intonation, in essence means, is the guitar in tune with itself. You can check this by tuning to standard tuning and then checking the strings at the 12th fret (an octave up from the open string). If the pitch is sharp you will need to lengthen the string length. If flat you will need to shorten it.



As mentioned earlier. Your scale length is not a precise measurement as there is some compensation required for the additional mass of the heavier bass strings. This is also why most bridges on electric guitar are angled away from the body of the guitar toward the bass strings.

To lengthen the string, turn the intonation adjustment screws at the back of the saddle counter clockwise. To shorten turn them clockwise. Make sure the guitar is in tune before checking and adjusting.

Adjusting pickup height



Lastly, we'll check and adjust the pickup height. Much like string action, the height of your pickups is mostly subjective and will depend on what you are hearing.



But, if unsure a good starting point is 2.4mm from the top of the magnetic pole piece to the underside of the string. However, this should be measured when pressing down the last fret of the guitar.

To adjust the height of the pickups, adjust the mounting screws on the outside of the pickup surround.

Summary

And that marks the end of our project.

Once you have completed the steps outlined above. You should have a complete guitar ready to play. Keep in mind, as you become more accustomed to the guitar you may want to revisit some aspects, especially the final setup of the guitar.

You should also test the guitar, by going through each pickup position and testing the volume and tone pot. Also test for interference by taking your hands off the guitar and listening for hum. If you hear any signs of electrical interference you may need to open the electronics cavity and check your ground circuit.

Lastly I'd recommend playing each fret up and down each string and listening for fret buzz or any sign of dead notes. If you notice a problem, chances are it can be resolved by either adjusting your action or adjusting your neck relief.

Thanks for following along!