

Ultra Tonic™ Pickup Version 3

Installation Instructions for Steel String Guitars

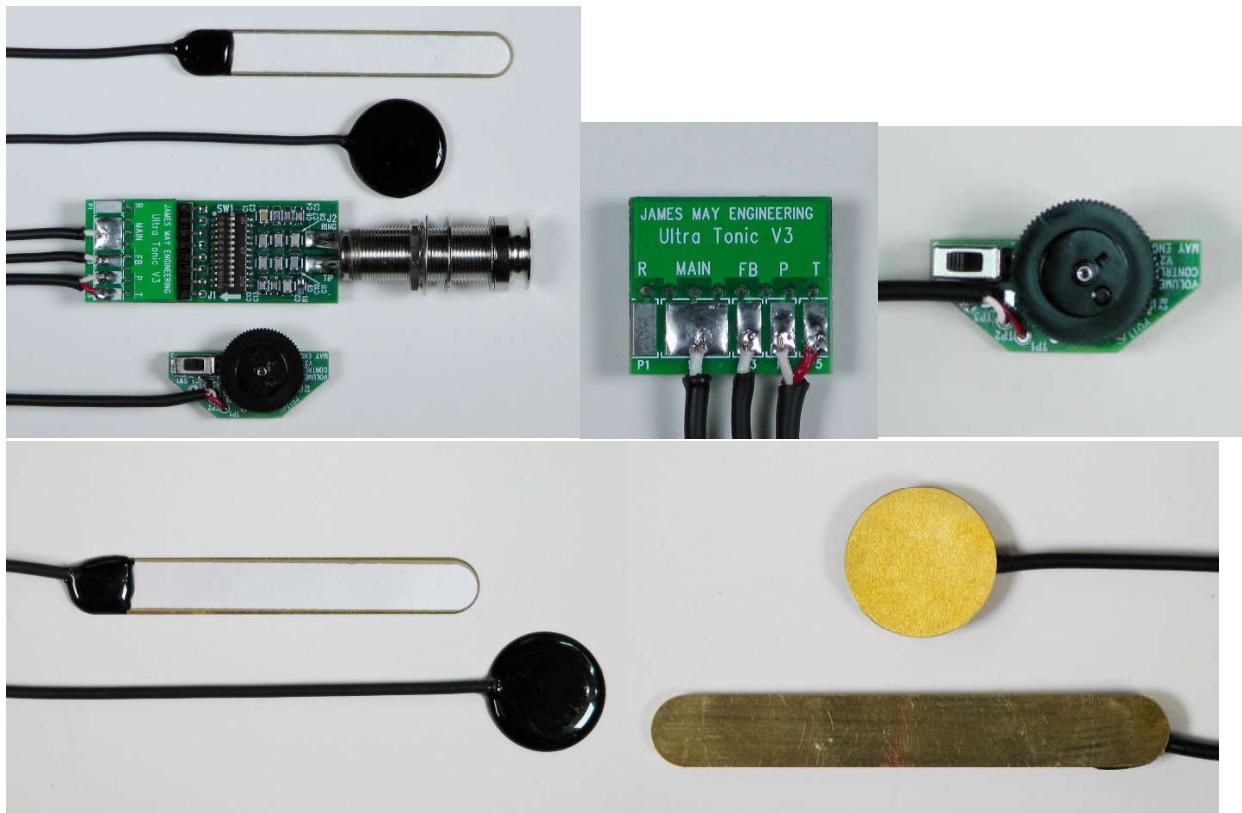
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Version 1.0 ©James May Engineering

Scope

These instructions apply to Version 3 of the Ultra Tonic Pickup, shown here. This version has two sensors and volume control wired to a disconnecting header so that they can be easily removed from the endpin circuit board for installation convenience.

The main sensor is a 10mm x 72mm custom piezo bar. The feedback suppression sensor is a 21mm custom piezo disc that has opposite polarity to the main sensor. They are passively mixed together in the endpin circuit board by adjusting the 12-position switch for optimum sound quality. The exact switch position used will vary from guitar to guitar, even of the same model. Instructions for this procedure are given in sections 4 and 5.

Version 3 of the Ultra Tonic comes standard with a sound-hole mounted volume control. If not required, it can be removed. See instructions for removing it in section 3.

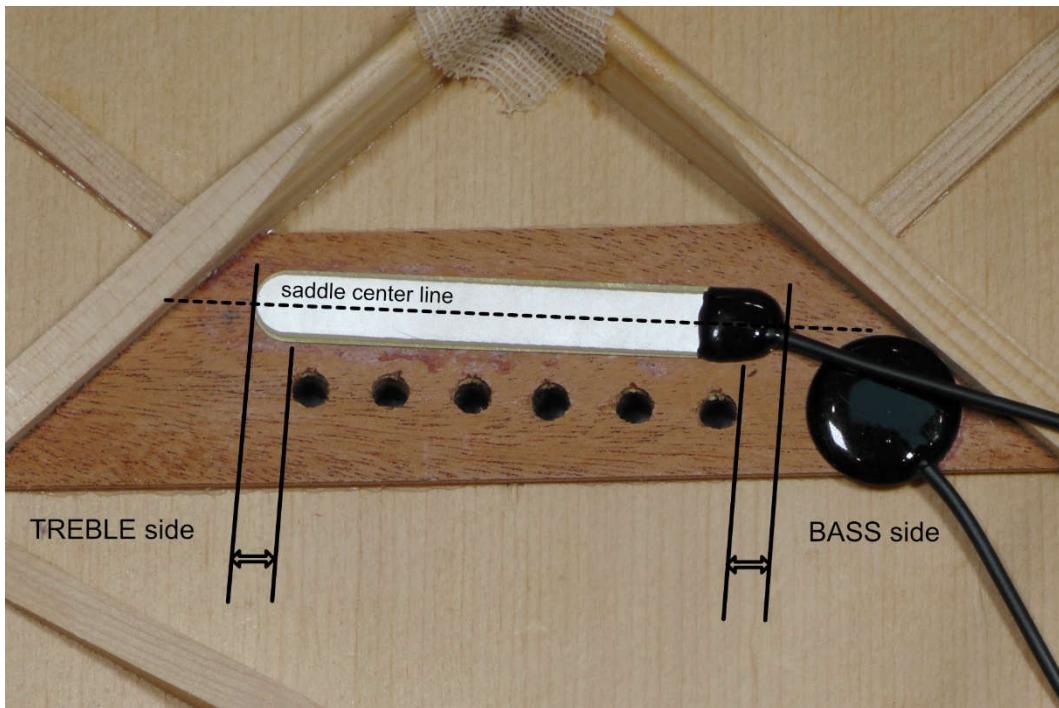


1. Install the main bar sensor

The 10mm x 72mm bar sensor has its crystal sensing area slightly offset to the treble side. This serves to strengthen the high E which would otherwise be weak.

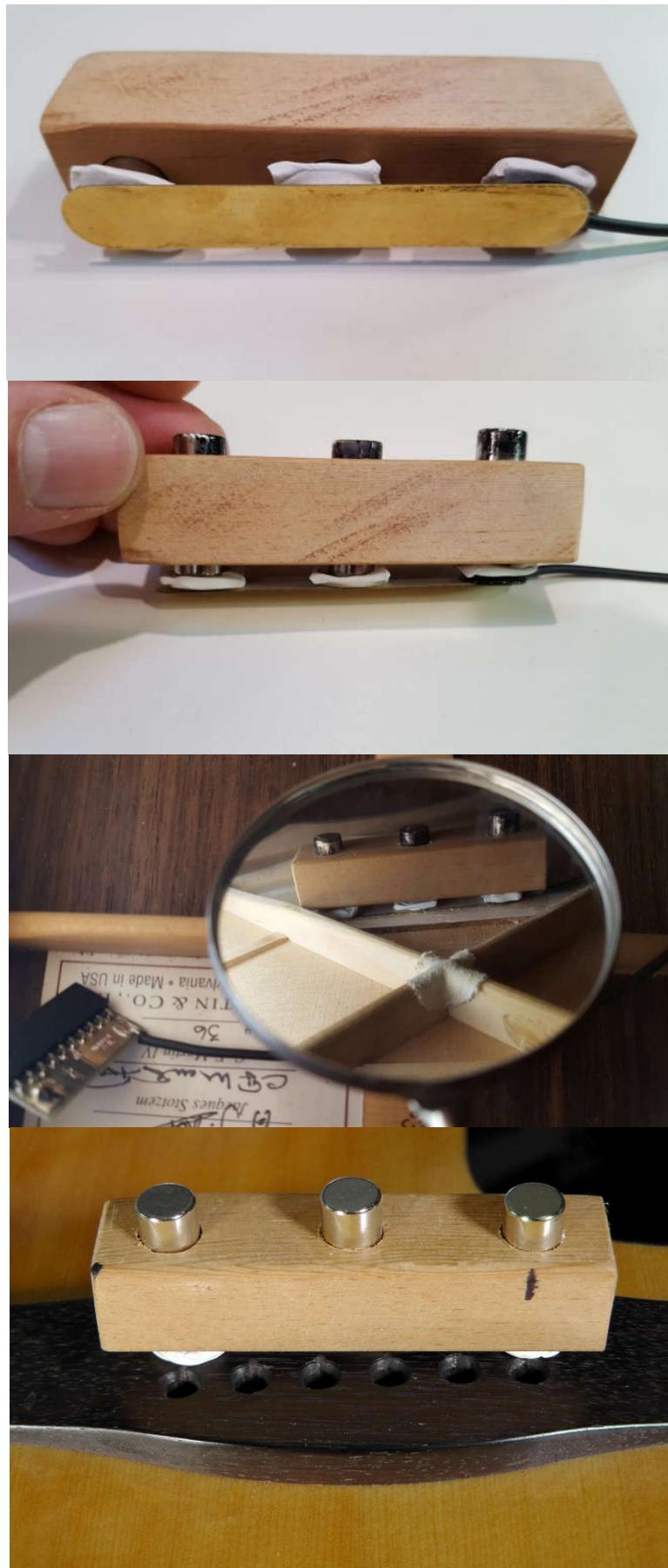
There are three important steps for correct positioning:

- The center line of the sensor should be aligned with the center line of the saddle. This is the place that picks up the strongest vibrations.
- The sensor should positioned as shown, with the potting and wire on the bass side.
- It should be centered left to right over the span of the saddle or bridge pin holes. The two dimensions indicated by the arrows should be about equal within about 1mm. In order to give sufficient strength to the high E string, the silver crystal itself is offset and does not extend as far toward the bass side as it does the treble side. (The offset is hidden by the potting compound.)



Accurate alignment is important! If you have the luxury, glue the sensors to the open top plate before the guitar is assembled. If you are retrofitting a finished guitar, there are several practical ways to accurately position the discs:

- Use a jig of some sort, such as with a cardboard holding platform aligned with golf tees.
- Use 3/8" x 1" neodymium magnets. These are strong enough to penetrate all the way through the bridge and top and still provide plenty of clamping force. Use adhesive putty (like "UHU tac" or similar) to temporarily attach the sensor to the magnets or to position the top locating magnets to the bridge. The putty will come off cleanly.
- A three-hole wooden jig to hold magnets comes in handy to keep the magnets from attracting to each other, and to serve as a convenient way to hold for positioning. The one shown here is ~0.75 x ~0.75 x 3.25 with a 1.115 center to center magnet spacing. A slightly shorter and narrower wooden jig would be even better to allow fitting into tighter interior spaces.

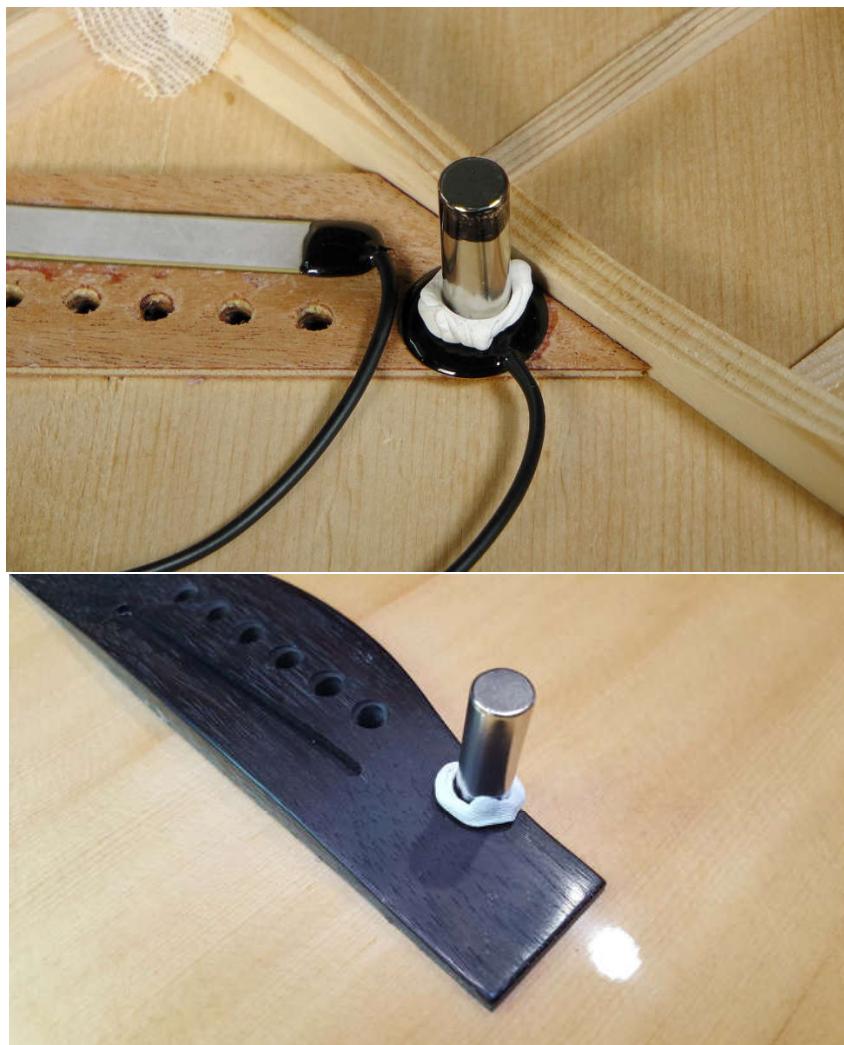


It is highly recommended to use gel superglue or StewMac 30 thick superglue, generously applied so that the whole surface is covered. Press firmly and hold or clamp until the glue sets up which will typically be in about 1 minute. A little squeeze-out is normal and indicates that enough glue was used. Leave undisturbed for 15 minutes.

2. Install the feedback suppression sensor

The feedback suppression sensor should be located at the far end of the bass corner of the bridge plate, as far back (toward the rear) as the plate will allow. With a little practice, you can do this by feel. A jig probably won't be necessary. Or use the magnet technique. You can experiment with a top guide magnet while checking the bottom location with a mirror.

The sensor can overhang the end of the plate by as much as 2mm and still be fine. If it does overhang, make sure the overhang is on the side with the wire, as the crystal is offset underneath the potting.



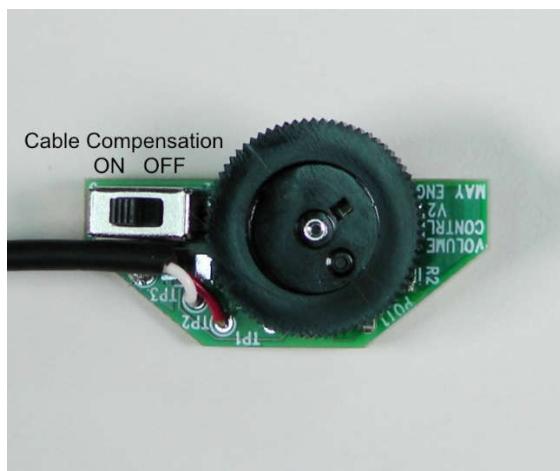
3. Install the Volume Control

Peel off the protective tape and firmly press the volume control board to the underside of the top so that the thumbwheel is accessible through the sound hole. Position it as high up on the sound hole as the bracing pattern will allow. This will give the easiest access for adjustment during performance. If you need to reposition, it will come off cleanly without damage to the wood.

Cable Compensation Feature

For use with normal 12-15Ft guitar cables, leave the cable compensation switch set to on. This will prevent loss of highs when dialing down the volume, caused by the capacitance of the guitar cable. (Using a longer cable or one with more capacitance will result in only a slight change in high frequencies when adjusting the volume.)

If using a very short cable, such as with a wireless system, turn the cable compensation to OFF. The switch can be accessed with the finger even after mounting.



Option – Remove the Volume Control

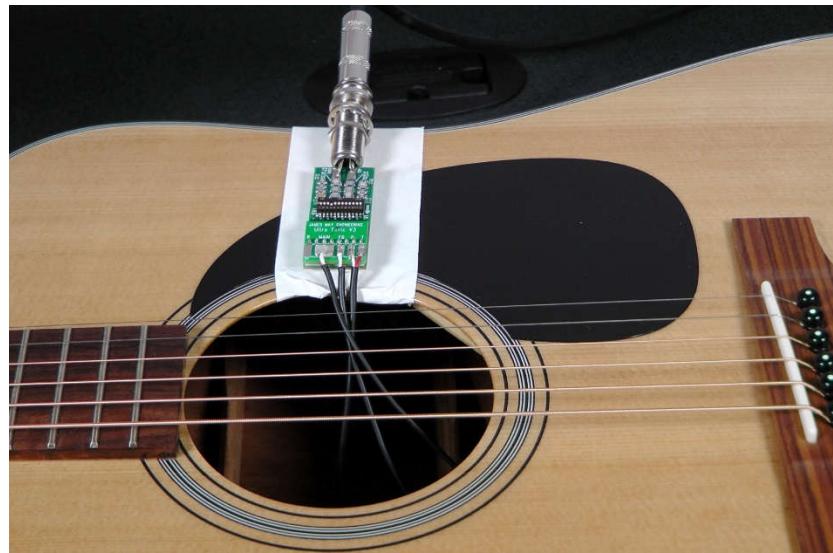
If the volume control is not required, unsolder the white and red wires from pads P4 and P5, and the shield connection from rear ground plane. To complete the circuit, solder a short piece of wire between pads P4 and P5 as shown here.



4. Set the Switch

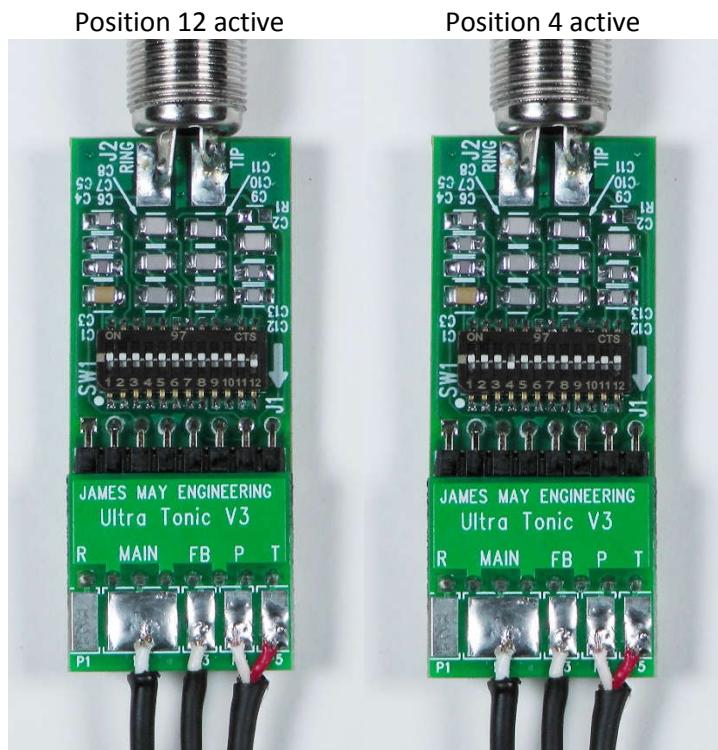
Use some artist tape to protect the top of the guitar.

Plug the circuit board onto the pickup connector and let it hang out of the sound hole. If the guitar is unstrung, restring it and bring it up to pitch.



Plug it into a PA or full range instrument amplifier so you can judge the sound accurately. (Do not use an electric guitar amplifier, as the tonal balance can be misleading.)

- Set switch 12 to the active position (down) as indicated by the large white arrow on the PCB to the right of the switch. The active position is opposite the ON marking on the switch. All the other positions should be up or ON as shown. For reference, see the pictures below.



- Play the guitar and make a mental note of the bass response, tap the top to get an idea of the tap sensitivity. Crank it up to see where it starts to feedback.
- Then in turn, one at a time, set the current switch back to the inactive UP position, and activate the next switch to the DOWN position. Play and listen and tap, then set it back to the inactive UP position. For each successively lower switch number, you should be hearing less bass and less feedback sensitivity.
- At some point as you go lower in number, you may start hearing more bass. **The switch position with the least bass is the setting for maximum feedback suppression.** (This position will typically be in the middle range between position 3 and 9, but could be at the lower or higher extremes.) It is quite possible that two positions will be about the same. In that case, the higher of the two should be considered the setting for maximum feedback suppression.
- **The optimum setting will be the next higher switch position, or possibly the one after that.** It is up to you to decide as you fine tune the sound to your liking in the next section.

5. Fine tune to taste

While playing the guitar plugged into a full range amplifier, listen to the difference in sound between the following two scenarios:

1. Feedback suppression at minimum – switch position 12 is active (DOWN)

With this setting, the pickup will have the most bass. Depending on your specific guitar where the best feedback suppression position is, it will likely be somewhat muddy in the low end, and a bit dull in the highs. Try tapping on the top and turn up the amp to get a sense of how easily the guitar feeds back.

2. Feedback suppression, but with more bass – switch is set to the optimum setting

With this setting, the pickup will have a lively but controlled bass response, and not be boomy or muddy at all. You should still get plenty of top plate sensitivity to tapping.

Additional useful info:

With this switch set to the max feedback suppression position the sound may be a little too dry and tight, and the bass a bit too thin.

Higher switch numbers will give progressively more bass and more top responsiveness, with progressively less feedback immunity. Those positions won't take anything away from the direct string sound.

Lower switch numbers than the max suppression position will usually have progressively more feedback, and less direct string sound. These positions usually don't sound as good and are not recommended.

6. Wrap it up

Mount the circuit board with endpin jack in the end block of the guitar, in the usual way. It's important to keep the wires from contacting the top or back of the guitar during normal playing and moving. You can twist the assembly to shorten the span so that the wires hover inside without touching anything. If necessary, you can use a tie-wrap or some self-fusing silicone rubber tape to hold the wires together midway. Alternately, you might use an aluminum tie down clamp stuck to the guitar side to hold the wires, especially for the volume control wire.

[Wiring a secondary pickup](#)

Should you need to wire a passive second pickup to the RING connection, it can be soldered to the P1 pad (marked R above) and the ground plane on the back.

Note: Active (battery powered) secondary pickups are not supported by the Ultra Tonic, since they almost always require a connection to RING to complete the battery connection for power on. You would need to mount a second dedicated end-pin jack to accommodate this.

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