

# Ultra Tonic Pickup Installation Instructions

James May Engineering  
12/23/17  
Version 0.6

## 1. Install the pickup elements

Note that there are 5 discs provided with the unit – four small ones and one large one. The four small discs, pre-soldered to edge connector pins 1-4, are interchangeable. Together they function as the main pickup. The larger fifth disc, pre-soldered to connector pin 5, is special. It has opposite polarity from the four small discs, and functions as a feedback suppression pickup.

For steel string guitars, refer to Fig. 1 below. For nylon string guitars, see the text at the end of this section. Three small discs (shown in solid black) are to be attached to the bridge plate in the exact same location as you would install the K&K pure mini pickup. They are the same size as the K&K discs, and should be glued as shown right under the saddle location above.

The fourth small disc (shown in gray) goes on the high E side and is intended to strengthen the high E string which is often weak with an installation of only three discs. Position it as shown, right next to the disc that straddles the E and B strings. Use a jig and procedure like what K&K recommends, or any other that you are comfortable with. Getting the locations right is important.

The large disc should be located at the far end of the bass side of the bridge plate, as far back as the plate will allow. With a little practice, you can do this by feel. A jig probably won't be necessary. It could overhang the end of the plate by as much as 1/8" and not be problematic.

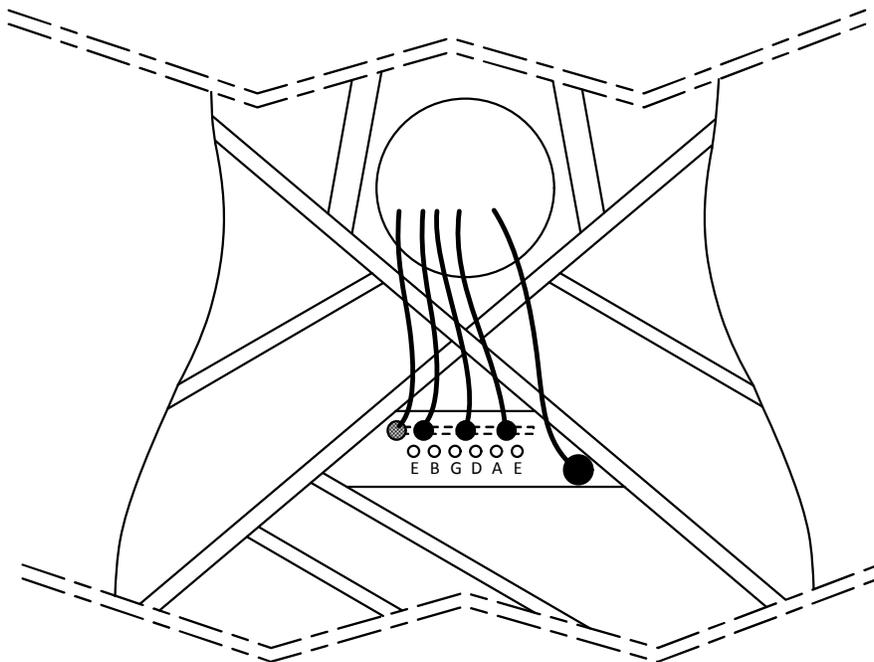


Figure 1  
Location of pickups

It is recommended to use gel superglue, generously applied so that the whole surface is covered. Press firmly and hold until the glue sets up. Alternately, 3M 254 double sided tape or equivalent may be used. Be sure the surface is clean and dry before pressing firmly into position. Using double sided tape for the four main elements will result in slightly reduced output levels and a somewhat altered tonal balance. Using high quality double sided tape for the feedback suppression element should work as well as glue.

For nylon string guitars with a bridge plate, mount the 4 main pickup elements and the feedback cancelling element in the same positions relative to the saddle and strings above. It will require a little more care to find these locations since there will typically not be string pins to use as location finders. Mount the feedback suppression element to the far bass end of the bridge plate.

For nylon string guitars without a bridge plate, mount the 4 main pickup elements directly to the bottom of the top plate, in the same positions relative to the saddle and strings. Mount the feedback suppression element to the bottom of the top plate, directly underneath the far bass side of the bridge.

## 2. Check string to string balance

Refer to Fig. 2 for a picture of the circuit board and jumper locations.

Protect the top of the guitar with some artist tape or similar so that the circuit board assembly can hang out of the sound hole. Restring the guitar and bring it up to pitch.

Remove the shorting jumper.

Plug the guitar into an amplifier and check the string to string balance, listening carefully to the loudness of each string while picking each in turn with consistent strokes. If by chance the high E is too strong, the fourth element can be disconnected. After carefully identifying which pickup wire is connect to the 4<sup>th</sup> sensor, unsolder that wire from the circuit board. Then either remove the sensor from the bridge plate entirely by prying it off, or just clip the wire close to the sensor and leave the unused sensor in place.

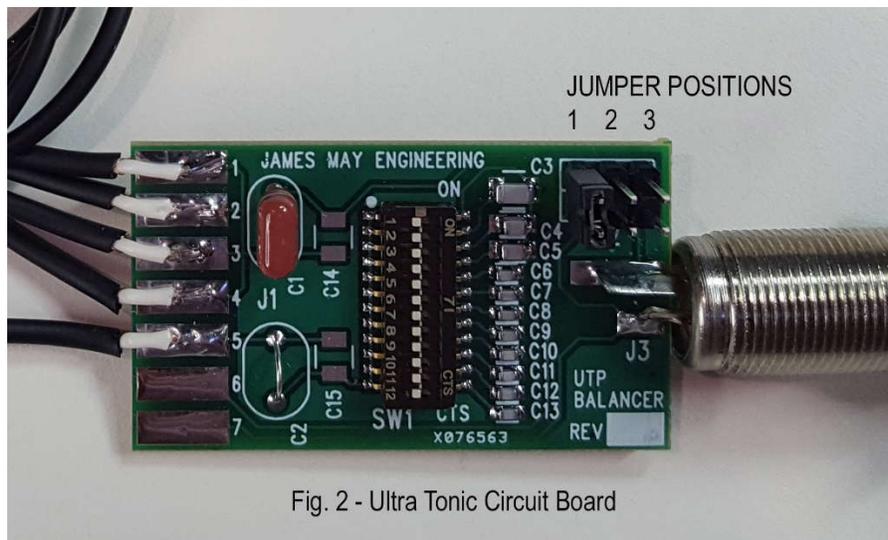


Fig. 2 - Ultra Tonic Circuit Board

### 3. Adjust the pickup balancing circuit for best feedback suppression

Refer to figures 3 and 4. In order to adjust the pickup balancing circuit for optimum feedback suppression, you will need a few things:

- An AC voltmeter capable of reading single digit millivolts. A 200mV full scale works well, and most modern meters can do this.
- A signal generator capable of outputting a sine wave in the 80Hz to 250Hz range. Alternately, there are many free smart phone apps that can do this.
- An amplifier capable of driving an 8ohm speaker. You could use a stereo or hi fi amp, a guitar amp, a PA amplifier, or a headphone amplifier.
- The calibration exciter, which is a kind of speaker without a speaker cone. Its role is to vibrate the top of the guitar. This is available from James May Engineering.

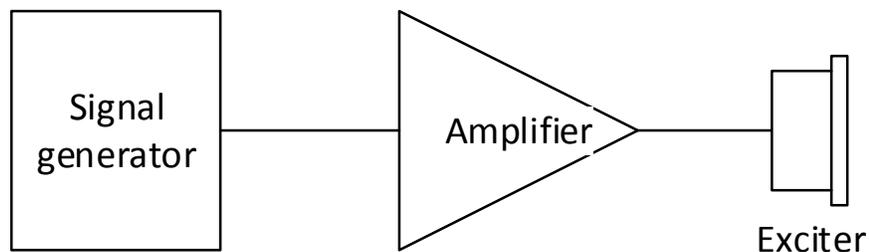


Figure 3  
Balancing Adjustment Setup

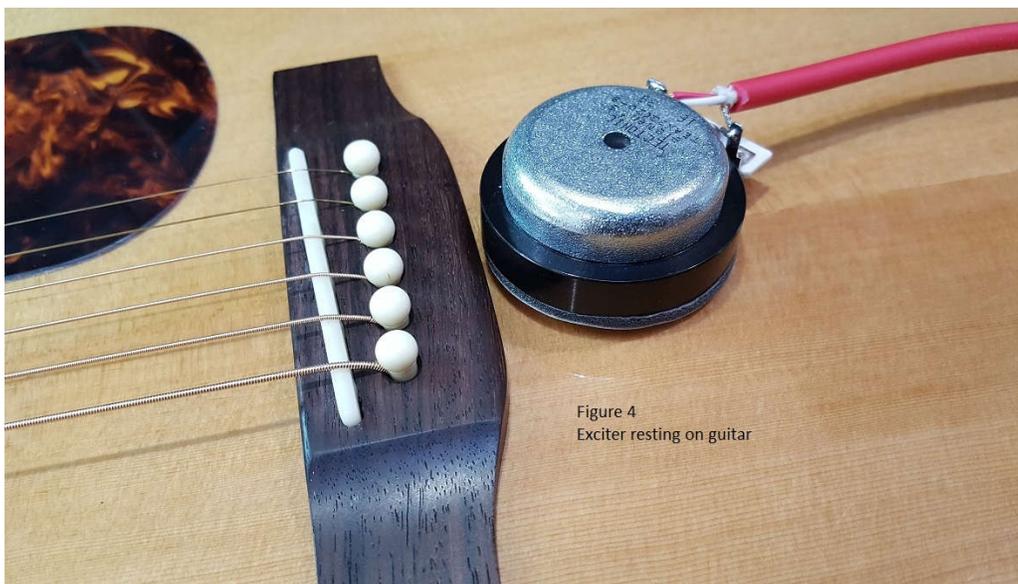


Figure 4  
Exciter resting on guitar

As shown in Figure 3, connect the signal generator to your amp, and then plug the exciter into the amplifier's speaker output.

Install the jumper in position 2. Make sure all 12 switches are in the off position.

Set the exciter on top of the guitar behind the bridge, approximately in the center per Figure 4. The position is not overly critical. The exciter has enough weight to properly couple to the guitar top, and has a protective gasket to keep it from sliding and also keep it from marring the finish.

Find an adapter cable or use clip leads to connect a ¼" plug to your AC voltmeter. Polarity doesn't matter. Plug the AC voltmeter into the output jack of the Ultra Tonic circuit board.

Set the signal generator to about 85Hz, and adjust the level so the guitar top can be clearly heard. If the exciter starts to dance and wander around, it is too loud.

While observing the AC voltmeter and using your ears, slowly sweep the generator frequency up from 85Hz to about 250Hz and note where the two loudest hot spots are. These will correspond to the main chamber resonance (typically 90-110Hz) and the main top plate resonance (typically 175-240Hz). After noting which of these two hot spots is stronger, fine tune the signal generator back and forth to hone in on it. When the meter reads highest, and it sounds loudest, then you've found it. If by chance both hot spots are about the same level, then choose the higher frequency one. A typical meter reading will be in the 30mV to 50mV range but could be higher or lower. The exact voltage reading is not critical. Leave the oscillator set at that frequency.

With a small tool such as a pencil, pen or toothpick, flip the first of the 12 dip switches (switch 1, on the far left) to the ON position and make note of the voltage meter reading for that switch. Make certain to return the dip switch you just tested to the OFF position before progressing to the next switch. Set dip switch 2 to the ON position, note its meter reading, and return it to the OFF position.

Repeat this procedure for each of the 12 dip switches. Whichever dip switch, when set to the ON position, provides the **lowest meter reading** should now be flipped ON, and all the others set to OFF. This will be the correct setting for the highest feedback suppression. Note the switch position number. Let's call that position N. This will be the tentative final setting, subject fine tuning in the next section.

#### 4. Compare the sound with and without feedback suppression, and fine tune to taste.

While playing the guitar plugged into an amplifier, listen to the difference in sound between using the feedback suppression and not using it:

- Feedback suppression on (switch position N is on)
- Feedback suppression off (all switch positions are off)

With feedback suppression off, the pickup will sound very much, if not exactly, like a K&K pure mini pickup. It will have a lot of bass and probably be somewhat muddy in the low end, and a bit dull on the high end. Try tapping on the top, and turn up the amp to get a sense of how easily the guitar feeds back.

With the feedback suppression on, the pickup should sound much clearer. The low end mud should all be gone, and the top end should sound a little brighter. Check the feedback sensitivity. Typically, it will now have at least 10dB more gain before feedback at the main chamber resonance of 90-110Hz. The top will be much less responsive, but should still be usable for tapping effects.

Next, compare the sound with switch position N engaged to the sound with nearby positions N-1, N+1, or N+2 engaged. N-1 will have somewhat less bass. N+1 or N+2 will have somewhat more bass, but a

little less feedback immunity. You may prefer the sound of one of these positions if it has enough feedback immunity for your needs.

## 5. Wrap it up

The pickup installation can be completed three ways, depending on preference. These correspond to the three shorting jumper positions:

- Jumper position 1. An optional switch may be connected to terminal pads 6 and 7 to allow using the pickup with and without feedback suppression. If you want to use this option, James May Engineering can supply a suitable switch and shielded connection wire for a modest charge. Or, you can rig up your own. Mount the switch next to the sound hole, with enough overhang to enable access. A dab of hot melt glue works quite well for this purpose. The pickup signal appears on TIP with respect to SLEEVE ground.
- **Jumper position 2 is the most typical installation.** The pickup always operates in feedback suppression mode, and appears on TIP with respect to SLEEVE ground.
- Jumper position 3. The feedback suppression pickup signal is brought out of the guitar on the RING pin. The main pickup is wired to TIP. This way, they can be combined with an external switch or even a mixer.

Install the balancing circuit with endpin jack in the end block of the guitar, in the usual way.

Enjoy your new pickup!