



# Application Note

## Bourns® Model 95 Premium and Model 82 Vintage Guitar Potentiometer Proper Grounding Method



Model 95 Premium



Model 82 Vintage

Improper grounding of electric guitars can produce an unwanted “hum” or “buzz” (noise) in the output of the amplified guitar signal. This application note addresses the proper grounding procedure to use when installing Bourns® Model 95 Premium and Model 82 Vintage Guitar Potentiometers in electric guitars or bass guitars.

### GROUND AFFECTS NOISE

Even though “ground” is referred to as “earth” in some countries, the terms are synonymous and they refer to the same definition. Simply defined, a ground is similar to a “drain” where all electrical noise is deposited. If the “drain” is not properly connected to the ground lug on the output jack, electrical noise will occur in the circuit. The level of audible hum or buzz will intensify if more than one component in the guitar is improperly grounded. Such components include potentiometers, pickups, and/or bridges.

### POTENTIOMETER DESIGN

Most standard guitar potentiometers have a rear metal cover that is used as the ground. The rear cover is actually grounded to the metal bushing and the metal shaft. The potentiometer must be designed with a good internal ground to eliminate noise. Some potentiometers lack good internal ground resulting in a “scratchy” sound when the shaft is rotated. This phenomenon can be mistaken for a “dirty” potentiometer even if the part is perfectly clean.

Bourns® Model 95 Premium and Model 82 Vintage Guitar Potentiometers are internally grounded to eliminate unwanted noise. In addition to the internal ground, these potentiometers are designed with high-grade ceramic elements with a conductive polymer resistance ink. The specific audio taper incorporated into these potentiometers provides a desirable gradual increase in output without “dead spots,” or areas of sudden level increase that may be encountered with standard potentiometers. Together, the element and a multi-finger wiper system produce true sound while minimizing the effects of unwanted noise, providing the guitarist with many years of service. The Model 82 Vintage Guitar Potentiometer has a proven track record with several well-known artists who installed this potentiometer in the late 1970s when it was originally released. These potentiometers continue to provide uninterrupted service today, 30+ years later.

Bourns® Model 95 Premium and Model 82 Vintage Guitar Potentiometers are available in 250k ohm and 500k ohm standard resistances with audio taper. They are also available with knurled split-shaft and solid shaft configurations to fit all standard guitars.

## PROPER GROUND PROCEDURE

A typical wiring diagram for a single pickup guitar is illustrated in figure 1. As illustrated, the ground wires (shown in black) are daisy-chained to the ground tab on the output jack. Another method of grounding is to bring all the ground wires to a common point. From the common point, a ground wire is routed and soldered to the ground tab on the output jack.



Model 95 Premium



Model 82 Vintage

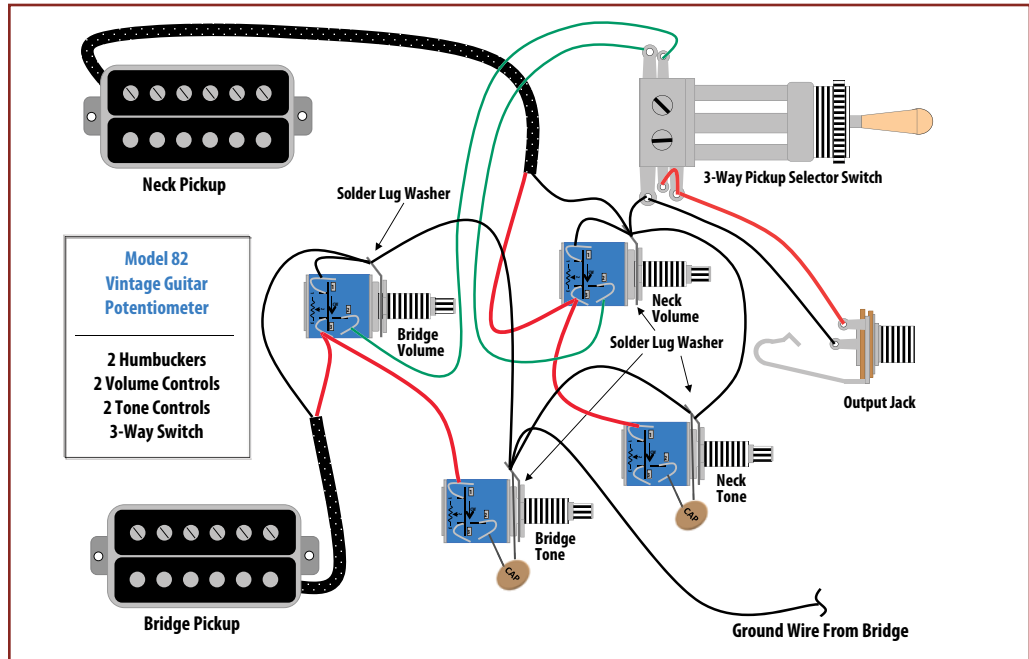


Figure 1: Wiring diagram for dual humbucking pickup guitar with 2 volume controls and 2 tone controls

Model 95 Premium Potentiometers and Model 82 Vintage Guitar Potentiometers include a separate solder lug lock washer (Bourns P/N H-127 as shown in figure 2); the solder lug lock washers facilitate grounding. If the shield is not grounded, the solder lug lock washer must be placed on the bushing of the potentiometer prior to installation on a blank pick guard, or into an unshielded cavity of an electric guitar.



Figure 2: H-127 solder lug lock washer



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### PROPER GROUND PROCEDURE *(Continued)*

Figure 3 illustrates proper mounting of a Model 95 Premium Guitar Potentiometer on a pick guard that has copper foil shielding. By grounding the bushing with the solder lug lock washer, the potentiometer will be properly grounded. A ground wire can then be soldered to the ground lug and brought to a common point for routing to the ground tab on the output jack. Alternatively, the ground wires can be daisy-chained to the ground tab on the output jack. For a potentiometer that is used for volume control in a passive circuit, typically terminal 1 will be grounded (terminal 3 for left handed guitars). A potentiometer that is used for tone control in a passive circuit will use terminal 2 for grounding through a capacitor to roll-off high frequencies to ground.



Figure 3: Correct mounting of solder lug lock washer

Some guitars contain active electronics on a Printed Circuit Board (“PCB”) that include potentiometers mounted on a PCB. In most cases, the PCBs have been designed with compensation to allow grounding of the potentiometer. If the potentiometer is being mounted on a PCB that already has a ground plane or ground pad where the nut will fasten the potentiometer to the PCB, then there is no need to install the solder lug lock washer. Figure 4 illustrates a circuit board for active electronics that contains a ground pad for the potentiometer.

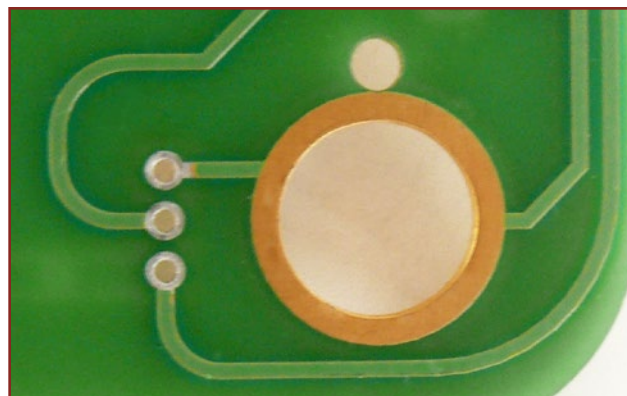


Figure 4: PCB with round pad for potentiometers

## Bourns® Model 95 Premium and Model 82 Vintage Guitar Potentiometer Proper Grounding Method



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### GROUND LOOPS

Proper ground connections 1) flow in one direction, or 2) flow to a central point. The connections exit through the ground lug on the output jack. If two independent paths can be taken from any single component to the output jack, then a ground loop has been created. The result will be noise similar to a poorly grounded circuit. A good practice to avoid ground loops when retrofitting an electric or bass guitar is to sketch out the wiring diagram prior to replacing the potentiometers or other components. This will ensure that all devices have been properly connected and grounded. The likelihood for creating an unwanted ground loop increases as additional electronic components are added to an electric or bass guitar during upgrades.

Other Bourns® products available for replacement of standard potentiometers are Models PDB241-GTR Series guitar potentiometers, PDB181-GTR Series mini-guitar potentiometers, PDB182-GTRB Series Blend-Balance bass guitar potentiometers, and PDB183-GTR Series guitar potentiometers which contain a push-pull switch.

Guitarists who spend hours in recording studios and who have an affinity for the perfect sound will benefit by upgrading their standard potentiometers to Bourns® Model 95 Premium and Model 82 Vintage Guitar Potentiometers, the right solution for reliable sound.

For further technical support and for complete pro audio solutions, please visit

[www.bourns.com/proaudio](http://www.bourns.com/proaudio)

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