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ghost

modular pickup systems

Hexpander MIDI Interface

Acousti-Phonic Pre-amp

User Guide

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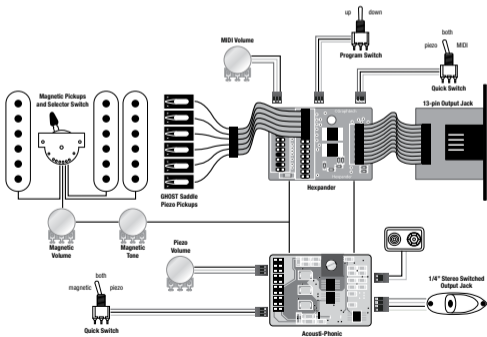
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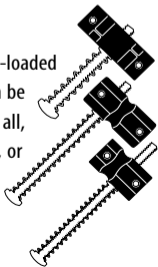
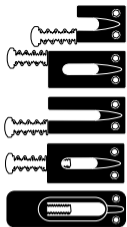
# OVERVIEW OF THE GHOST® SYSTEM

The ghost® system is a set of modular components that adds acoustic or MIDI capability to your guitar without altering your magnetic pickup tone. Ghost® pickups encapsulated in bridge saddles provide the input signal for the ghost® system, leaving your magnetic pickups unchanged. You can add either acoustic or MIDI capability or both, and choose one, a few, or all of the optional controls.



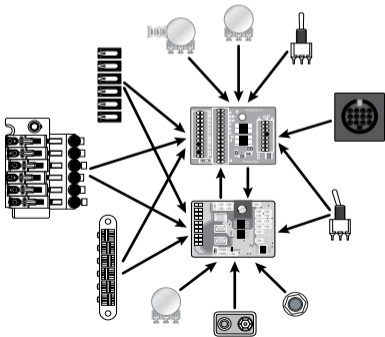
## Will it work with my guitar?

The ghost® system is designed to fit most guitars and basses. Installing it requires replacing the saddles on your bridge with compatible ghost® pickup saddles. Graph Tech makes these for Strat and Tele style guitars, guitars with Tune-O-matic style bridges like Gibson and Epiphone, Wilkinson, PRS, P-bass, Jazz bass, and any bass that can accept a Hipshot A-style bridge or ABM saddles. Floyd Rose Original and Licensed bridges can be replaced with our pickup-loaded ghost® LB63 bridge. Some installations can be done without altering the instrument at all, while others will require drilling, notching, or routing. This depends on the components you choose, and the design of your particular instrument.



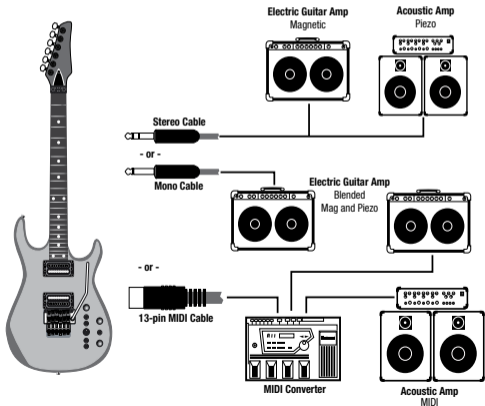
## Introducing modular components

Modular means that the ghost® system's components can be plugged into each other in different combinations to create different systems. Once you've selected pickup saddles to fit your guitar, these can be connected to the Acousti-Phonic™ for authentic acoustic sound from your electric guitar, or to the Hexpander™ to interface with MIDI and virtual instruments. Or both the Acousti-Phonic and Hexpander can be "piggybacked" together. You can add as many or as few of the optional controls as your instrument will accommodate.



## Output options

Replacing the 1/4" output jack with the Stereo Switched Jack supplied with the Acousti-Phonic permits the output of two signals, magnetic and acoustic, through one jack. The 13-pin jack installed with the Hexpander carries the hexaphonic signals for MIDI conversion, and can also carry the magnetic and acoustic signals so that a 1/4" patch cord is unnecessary.

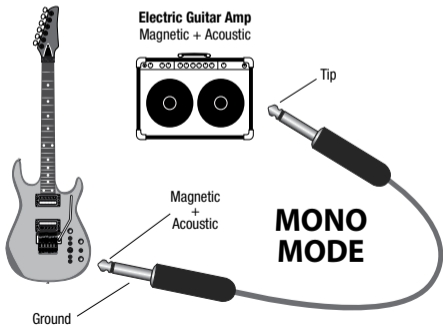




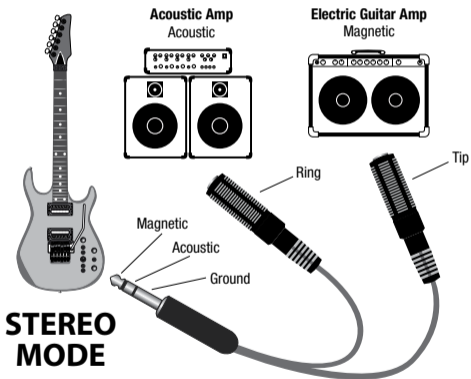
## Mono and Stereo Modes

The Acousti-Phonic detects whether you've inserted a stereo or mono plug into the 1/4" jack and automatically switches to Stereo (separate) or Mono (blended) mode.

In Mono mode, the acoustic and magnetic signals are blended together in the Acousti-Phonic and delivered together on the Tip contact. You can plug into one guitar amp and switch between sounds, or enhance your unaltered magnetic tone by dialing in a little of the acoustic sound.

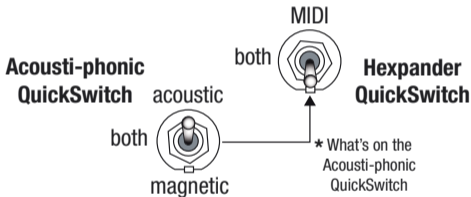


In Stereo mode, the acoustic signal is on the Ring contact, and the magnetic signal appears on the Tip contact so that you can process these signals separately using a stereo-to-two-mono Y-cable. For example, run your magnetic pickups through a crunchy guitar amp and your acoustic sound through a clean P.A. system.



## **QuickSwitch functions**

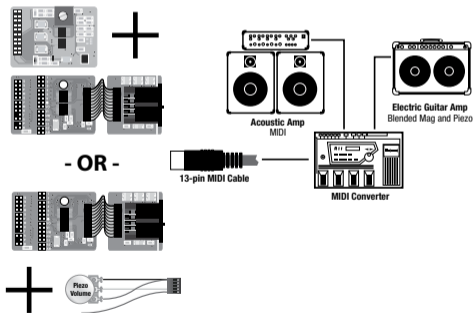
Two three-position switches provide fast, intuitive switching between all possible sound combinations: any one sound, any combination of two, or all three at the same time. Without the switches, you can mute any of the signals by turning the volume down, but with a QuickSwitch you can instantly turn a sound off, or on at the volume level you have chosen.



The QuickSwitches are SPDT on-off-on type switches. They cannot be replaced with on-on-on type switches or Les Paul pickup selector switches. QuickSwitches are available from Graph Tech only in silver color. Note that the Hexpander QuickSwitch does not control the signals on the Stereo Switched jack, but does control the three signals on the 13-pin jack.

## ***Hexpander only and mag-to-pin-7***

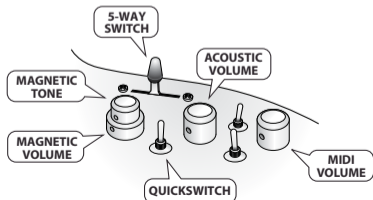
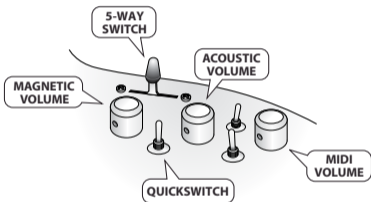
This option lets you run your acoustic and/or magnetic signals down pin number 7 of the 13-pin cable plugged into the Hexpander, so you don't need a 1/4" cable attached to your guitar. Most MIDI converters have two 1/4" outputs on the back -- one for MIDI and one for this pin-7 signal, so you can still run your mags to your electric guitar amp.

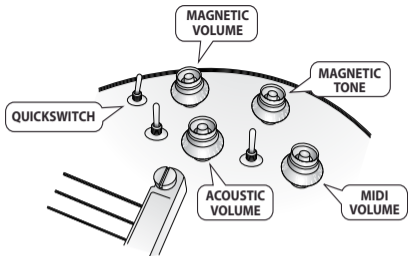


When the Hexpander is piggybacked on the Acousti-Phonic, the mag-to-pin-7 harness is not necessary because Acousti-Phonic passes the acoustic and/or magnetic signals to the Hexpander. But when you install the Hexpander only, adding the mag-to-pin-7 harness and an acoustic volume control (250K or 500K audio pot) provides this feature in the absence of the Acousti-Phonic. Note that the acoustic sound with the mag-to-pin-7 harness is the raw acoustic sound, and not the true acoustic sound that the Acousti-Phonic creates. **If you want pin-7 to carry just the mag or just the raw piezo signal, you can leave the unused wires disconnected and coiled up.**

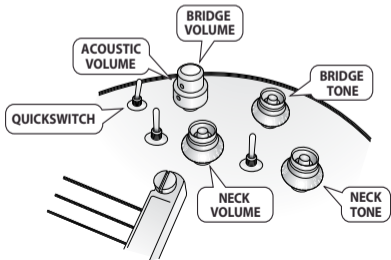
## Sample Control Layout(s)

Here are examples of possible control layouts on Strat-style and Les Paul-style guitars. The ghost® system is not just for Strats and Les Pauls, and other layouts are possible, as are custom controls and output options. Visit [www.graphtech.com](http://www.graphtech.com) for more possibilities.





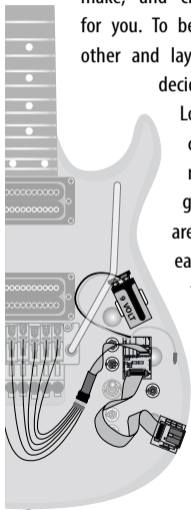
**\* requires rewiring 3-way switch for master volume and tone**



## PLANNING YOUR GHOST® INSTALLATION

Adding a ghost® system to your instrument begins with careful planning. Decide which optional controls suit the music you make, and choose locations that are convenient for you. To begin, plug the components into each other and lay them out on top of the guitar to decide the location of each component.

Look for space conflicts with adjacent components, especially the parts of the magnetic pickup system already in your guitar. Make sure that the harness wires are long enough to reach the location of each component. Remember that any of the optional controls can be added to the system later if you've left space for it, but drilling a hole in the wrong place can be hard to hide. Some routing may be required to fit the components in your particular instrument.

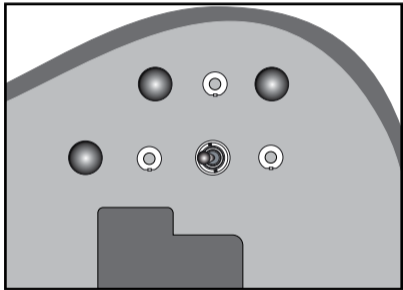




## Locating Ghost® Components

The ghost® boards are small -- about the size of a match box -- so they will fit inside the control cavity of most guitars without any routing. You must decide which arrangement is best for your particular instrument.

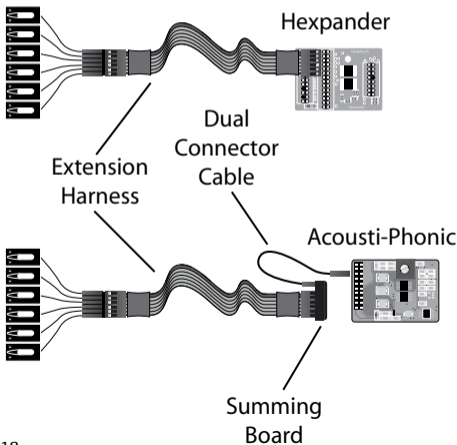
### *Pots and QuickSwitches*



To locate pots and switches, lay out their flat washers on the top of the guitar and arrange them until they look right, then trace the center of each washer to mark where to drill the hole. Before you drill, make sure there is room for the component inside the cavity behind the mark.

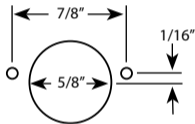
## ***Extension harness \*optional\****

Like an extension cord, it allows you to locate the pickups further away from the ghost® boards. For some installations this may be necessary, while for others it may make the installation neater or more convenient. It can be used with both the Hexpander and the Acousti-Phonic.

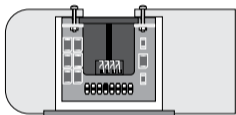


## Hexpander and 13-pin Jack

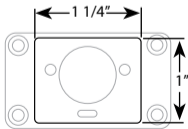
The 13-pin jack that comes with the Hexpander can be mounted on the edge, on the front, or on the back of the instrument. Edge-mounting requires a rectangular hole and the included 13-pin jack plate, while front and rear mounting can either use the jack plate or a round hole. The Hexpander board can be located in the control cavity, but it must not touch any electrical components or shielding.



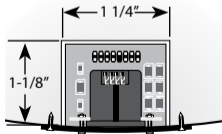
Output Jack Hole Size



Rear Mount



Output Jack Cavity Size



Edge or Front Mount with jack plate

## ***Acousti-Phonic & 9v battery***

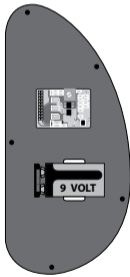
The 9v battery that powers the Acousti-Phonic may require some routing to fit inside your guitar. Consider these possible locations for the battery: the side wall of the cavity, the back wall behind the pots, or stuck to the control cavity cover plate. The Hexpander does not require a 9v battery because it will get power from the MIDI converter through the 13-pin jack.



Front Wall



Side Wall



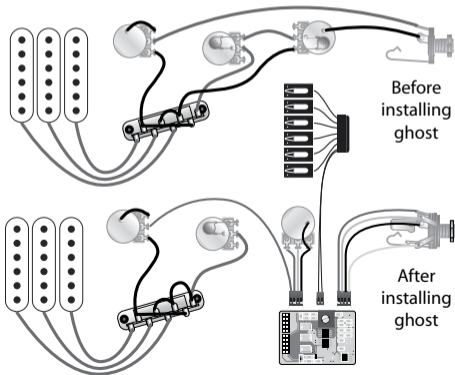
Cover Plate

## Acoustic volume: convert, stack, or drill?

The Acusti-Phonic requires a pot to control the level of the acoustic sound, but none is included. Choose one of these three methods to add an acoustic volume to your guitar for the ghost® system:

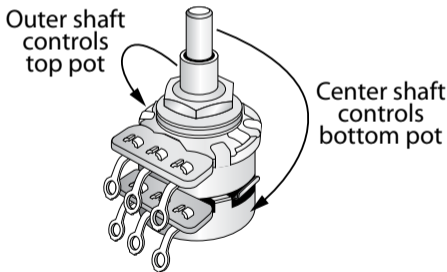
### ***Convert Mag Tone Pot to Acoustic Volume***

For the basic installation, convert one of your tone pots into the acoustic volume using the supplied wiring harness. This avoids drilling a hole in your guitar to add an acoustic volume pot.



## ***Replace a Pot with a Stacked Pot***

If you prefer to keep your tone control, you can also avoid drilling a hole for the acoustic volume pot by replacing one of your pots with a “stacked” or “concentric” pot\*. You may choose to group the magnetic and acoustic volume pots together on the concentric pot, or group your magnetic volume and tone on the concentric and convert one of the single pots into the acoustic volume using the supplied wiring harness.

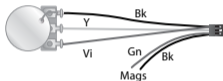


\* not sold by Graph Tech -- available from most guitar parts suppliers

## Drill a Hole and Add a Pot

If you have room to add another pot to your guitar, you can drill a hole and add a pot for the acoustic volume. You can purchase a 250K or 500K audio-taper potentiometer\*, or you can get the ghost® Acoustic Volume with Mid/Dark Switch from Graph Tech either as a push-on/push-off pot or as a toggle switch.

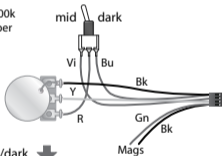
You supply  
the pot



Harness supplied  
with Acousti-phonics

250k or 500k  
audio taper

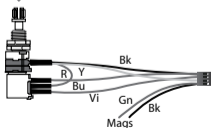
You supply  
the pot



Order harness with  
mid/dark toggle  
switch

mid/dark

Order acoustic  
volume pot  
with mid/dark  
switch...



...complete  
with harness

## **Strats and Teles**

Strats have the electronics on a front-mounted plastic pick guard which is easily removed, drilled, notched, and reinstalled. The control cavity is also fairly large and can often fit the ghost® components without routing. The Strat has two tone controls, and either one is well suited for conversion to a ghost® volume. Tele controls are also front mounted, but the cover plate is metal, and the cavity is quite small; consider adding a 9v battery box\* or locating the ghost® boards in a cavity routed beneath the pick guard or metal bridge plate.

## **Les Pauls and Hollow Bodies**

Les Paul-style guitars have rear-mounted controls with a cover-plate, and roomy control cavities. Routing is seldom required for the Acousti-Phonic. Note that the Les Paul toggle switch cannot be used as a substitute for the ghost® QuickSwitch because they make connections differently inside.

Hollow bodies have plenty of room to add the ghost® system, but it can be difficult to work inside them (you may feel like you're making a ship in a bottle!) Few of them have convenient access hatches.



If installing the Acousti-Phonic, the board and 9v battery can be located beneath the magnetic bridge pickup. On some hollow bodies you may need to rout this cavity deeper to make room. If installing the Hexpander, the board can be inserted through the hole you make in the edge of the guitar for the 13-pin jack.

## **ROUTING, DRILLING, AND NOTCHING**

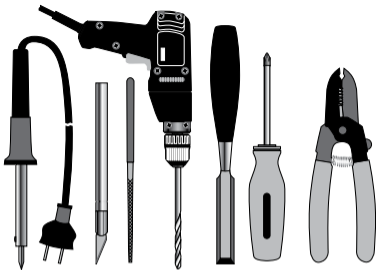
Some modification of the guitar body may be required to install the ghost<sup>®</sup> system in your instrument. The modification required depends on the design of your instrument, and the ghost<sup>®</sup> components you've chosen to install.

## **Required Tools**

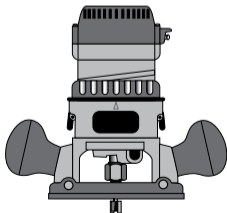
- Electric drill and 5/16" bit (12" long recommended) for drilling hole between cavities and starting 13-pin jack hole; 9/32" bit for adding optional pots; 5/64" bit for 13-pin jack mounting plate holes; and 1/4" bit for installing optional QuickSwitches
- Small round needle file for pick guard notches
- Screw driver for changing saddles and setting intonation
- Phillips screw driver for removing pick guard or cavity cover
- Soldering iron (25W) for Acousti-Phonic 1/4" jack and acoustic volume pot harnesses
- Wire stripper / cutter
- 3/8" chisel for shaping 13-pin jack hole
- Olfa or X-Acto knife
- Masking tape

## ***Optional Tools***

- Dremel and 1/8" cutting bit for pick guard notches
- Router and 3/8" bit for shaping 13-pin jack hole



## Required Tools



## Optional Tools

## Reversible installation

If you have a vintage instrument and its value may be affected by modifications, or if you want to try the ghost® system before committing to the modifications required, you can do a reversible installation. A ghost® system installed this way may not be as neat or as convenient, but you can return the instrument to its original condition if you choose to remove the ghost® system.

**Strats and Teles:** Install the pickups without notching the pick guard. The pick guard will remain slightly raised over the wires, and the wires will not be evenly spaced. Or, you can order a replacement pick guard\*, set your original pick guard aside, and drill and notch the replacement. Converting your tone control by soldering the supplied wiring harness is reversible.

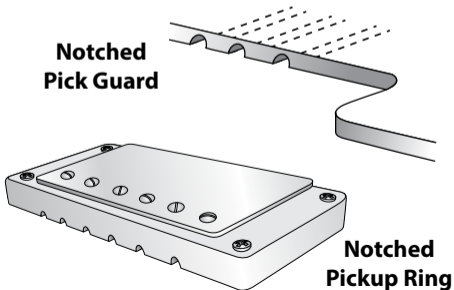
**13-pin jack:** mount it in a replacement pick guard or rear cover plate.

**Acoustic Volume:** You can omit the volume pot and connect the yellow and purple wires together and operate the Acousti-Phonic at full volume.

## Saddles

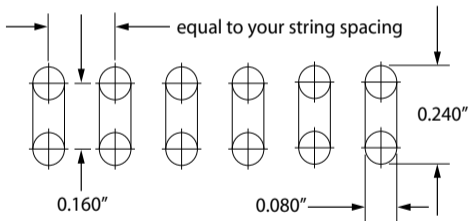
### *Notching the pick guard or pickup ring*

The wires on the ghost® saddles must go into the control cavity to plug into the Hexpander or into the Acousti-Phonic via the Summing Board and Dual Connector Cable. Cutting six, small notches beneath the bridge-side of the pick guard or pickup ring lets the wires enter an existing cavity neatly and without modifying the body. Notches can be cut with a Dremel-type rotary tool or by hand with a needle file. Remove the pick guard or pickup ring from the instrument body for this operation. We recommend removing the pickup from the pickup ring to prevent damaging the pickup.



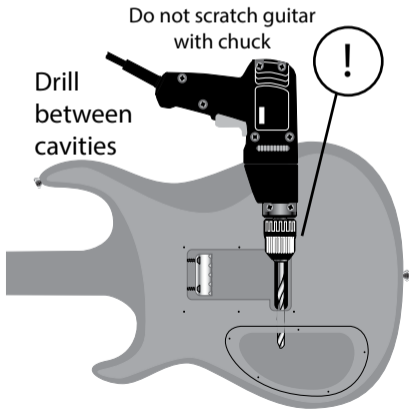
## ***Slotting the base plate \*optional\****

Slotting the base plate of the bridge is an alternative to notching the pick guard or pickup ring. It will make the Ghost® wires practically invisible by running them into the guitar body through slots cut in the bridge. The bridge will have to be removed from the guitar and taken to a machine shop that can cut the slots precisely in the steel. The diagram below shows the slot dimensions.



## ***Drilling between control cavities***

In some installations, you may have to drill a hole to route the wires between cavities in the instrument to pass the pickup wires through. This hole will have to be large enough that the connectors on the pickups can be passed through easily. We recommend 5/16" diameter. Be careful that the drill chuck does not scrape the finish of the guitar while you are drilling this hole.



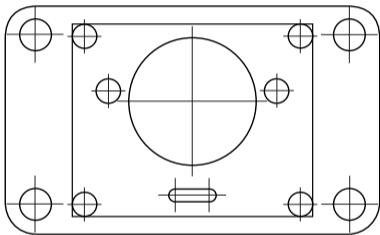
## **Hexpander**

### ***13-pin jack***

For mounting the Hexpander output on the edge of the instrument, the small PC board with the 13-pin jack requires a rectangular mounting hole in the body. Choose a location for this hole, checking that there is room for a 1-1/8" (30mm) deep cavity, and that the ribbon cable will reach from here to the main Hexpander board. The size and placement of this hole can be determined using the template in this guide.

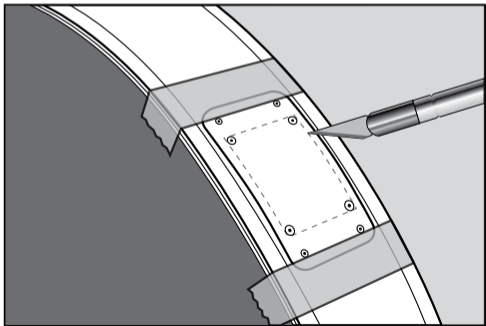
Cut out this template and tape it to your guitar where you want the jack. Follow the 13-pin jack installation instructions to scribe marks through the template to locate the hole.



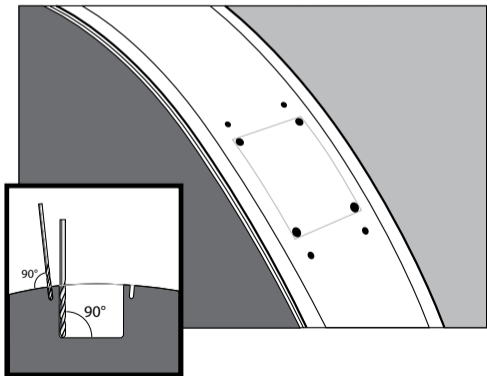


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blank for reverse of template***

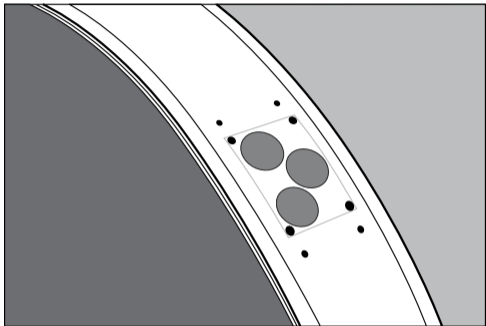
Tape the template to the edge of the instrument, and mark the center of the circles onto the guitar by tapping through the template into the paint using a center punch and a small hammer. Using an Olfa or X-Acto knife, slice through the template along the edges of the inner rectangle, etching lines in the paint to mark the edges of the mounting hole. Remove the template and make sure these lines connect in the corners (this prevents your paint from chipping beyond the scratched lines when you begin drilling).



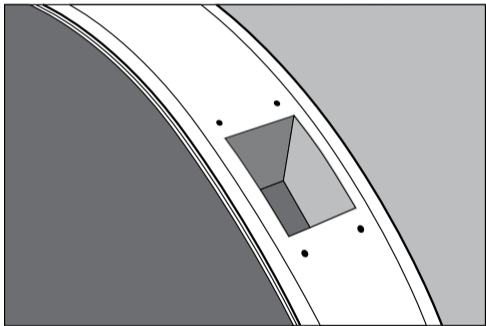
Using a 1/16" bit, drill the four holes for the mounting screws in the outer most marks to a depth of 1/4". Make these holes perpendicular to the surface. Using a 1/8" bit, drill the inner four marks to a depth of 1-1/8", defining the four corners of the mounting hole. Drill these holes parallel to each other; in other words don't drill them perpendicular to the surface, as this will make the cavity narrower towards the bottom, preventing the 13-pin board from fitting properly.



Using a 3/8" bit, drill holes within the inner rectangle to remove most of the wood in the cavity.



Using a router, a Dremel rotary tool, or a chisel, remove the remaining wood to edges of the marked rectangle, to a depth of 1-1/8". Be careful not to enlarge the mounting hole beyond the lines, as the jack plate fits quite precisely to these dimensions. Remember, this cavity does not have to be neat and smooth, as it will be hidden completely by the jack plate.



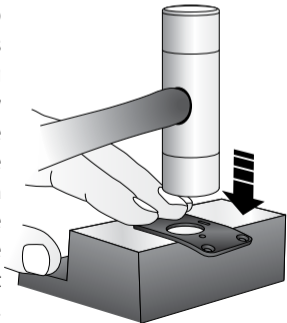
Drill through the back of this cavity to join it to the main control cavity where the Hexpander will be located. Two 5/16" holes side by side makes a slot wide enough for the ribbon cable to fit through.

## ***Enlarging the control cavity***

In most cases, no enlargement of the cavity is required to install the main Hexpander board. Guitars with small cavities like Telecasters, or guitars with a lot of electronics already installed may require some routing to make room for the Hexpander.

## ***Curving the Jack Plate***

The jack plate can easily be curved to conform to the surface of the edge of the instrument where the 13-pin jack is to be mounted. An even curve can be achieved by placing the jack plate face up on hard surface with a sharp edge (anvil or machinist's vice is ideal) and moving the jack plate progressively over the edge while tapping the jack plate against the edge with a soft-face mallet. The edge will make lines on the back of the jack plate, but the face will be smooth.



## **Acousti-Phonic**

### ***Stereo switched Jack (no routing required)***

Usually, no routing is required to replace the 1/4" jack in your instrument with the 1/4" Stereo Switched Jack that comes with the Acousti-Phonic. In some instances, the jack is recessed in a hole that is too small. In this case enlarge the recessed hole to 7/8" diameter. The mounting hole for the Stereo Switched Jack is 3/8" diameter.

### ***9v battery***

Usually, you can find room for the 9v battery in the existing control cavity. If your instrument's cavity is too small or too full of other electronics, you can either enlarge the cavity or create a cavity the size and shape of the battery underneath the pick guard.



# INSTALLING GHOST® MODULAR COMPONENTS

## Saddles

Ghost® saddles are made of our patented String Saver composite material which is rugged and durable. The pickup wires, however, are delicate and must be handled gently during installation.

### *Pickup Wires*

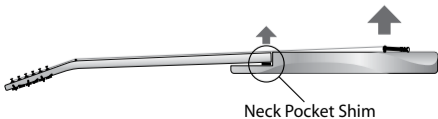
Route the wires so that they are not flexed sharply or excessively, and are not abraded by the edges of holes they must pass through. When setting the saddle height, avoid lowering it so much that it crushes the wire or bends it sharply. On some guitars a neck pocket shim must be added to maintain sufficient saddle height.



Correct

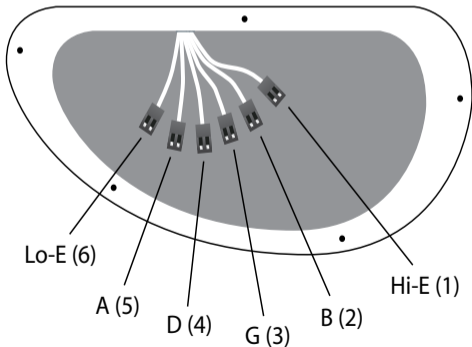


Wrong



## ***Color code***

The ghost saddle pickups are all identical and can be installed in any string position. If you are installing the Hexpander and you must feed the wires through a hole from one cavity to another, you may need to mark the wire ends to be able to tell which is which. When plugging into the Summing Board for Acoustiphonic only installations, the pickups can go in any order.



## ***Signal/ground color code***

The silver wire is signal; the blue wire is ground. If you can't tell which is which, try holding the wire at a different angle, or in a different light.

## ***Summing Board***

Connects all the saddle pickup signal wires together, and all the ground wires together, then the Dual Connector Cable (a small wire with a plug on each end) connects the Summing Board to the Acousti-Phonic. Note the Summing Board and Dual Connector Cable are not used when installing the Hexpander, or when the Hexpander is piggybacked on the Acousti-phonic.

## ***Extension harness \*optional\****

Use the colored wire on the Extension Harness to make sure it is oriented properly, extending the pickup wires without reversing them. The blue wires of the pickups must be connected to the ground side on the ghost® boards.

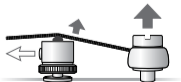
## ***Seating and setup***

Ghost® saddles are designed to be set up just like the regular saddles they replaced. For optimum performance, make sure that both height adjustment screws are set so that the saddle pickup is level (Strat, Tele, and PRS), and that the string is not obstructed in any way as it passes over or through the saddle. Mechanical interference near the saddle can cause string balance problems or false MIDI triggering. On ResoMax® bridge installations, adjust the height of the tail piece so that the strings do not contact the bridge behind the saddles. The ghost® ResoMax® bridge must be installed with the intonation screws facing away from the tail piece or string anchor points. Reversing the bridge will reduce the string vibration sensed by the saddle pickups.

### **Strats, Teles, PRS**



Correct



Wrong



### **Les Pauls, Epiphones**

## Hexpander

Locate the Hexpander where it can accept plug-in connections from the 13-pin jack, the saddle pickups, and the battery and options if applicable. When piggybacking with the Acousti-Phonic, mount the pair of boards on the cavity wall or rear cover plate using the self-adhesive foam supplied with the Acousti-Phonic. For Hexpander-only installations, the Hexpander can be left suspended inside the control cavity, as the rigidity of the ribbon cable and other wires will stabilize it sufficiently. If there is any possibility of the Hexpander coming into contact with cavity shielding or other electrical components, wrap the Hexpander in electrical tape to insulate it, or add two layers of adhesive foam to the back of the Hexpander board and mount it to the cavity wall or rear cover plate.

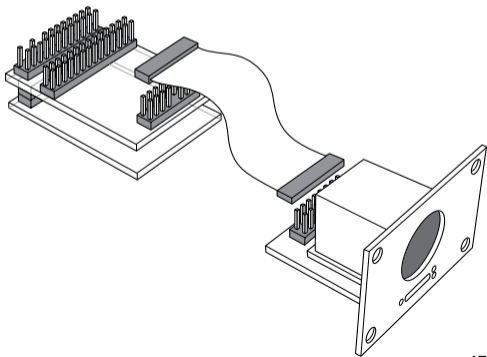
## ***13-pin jack***

After the mounting hole has been routed and the 13-pin jack plate has been curved to conform to the edge of the guitar (see instructions in the Routing, Drilling, and Notching section of this manual) bolt the 13-pin jack plate to the 13-pin jack using the supplied nuts, bolts, and lock washers. Be careful to align the Traktion switch with the slot in the 13-pin jack plate; tightening the bolts with this slot misaligned will damage the Traktion switch and may make the Hexpander unusable. When tightening the bolts, make an effort to center the 13-pin jack in the round hole in the 13-pin jack plate. Perfect centering is not necessary, but severe misalignment will prevent the 13-pin plug from seating properly and making a good connection.

Align the 13-pin jack plate with the four screw holes drilled in the guitar body. Make sure that the 13-pin jack is oriented the same way as planned when making the mounting hole, as it is not symmetrical and cannot be reversed 180 degrees. Attach the 13-pin jack plate to the guitar body using the four small wood screws supplied.

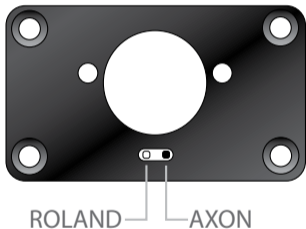
## ***Connecting Hexpander to 13-pin jack***

Plug the Interface Wiring Harness (ribbon cable) into the header pins on 13-pin jack; this connection is 'keyed' (one pin missing, one hole blocked) so that it can only be plugged in correctly. Feed the harness through the mounting hole and into the control cavity where the Hexpander will be located.



## ***Traktion Switch***

The Traktion Switch optimizes the output of the Hexpander for use with either Roland or Axon MIDI converters. Reach into the slot on the 13-pin jack plate with a toothpick to slide this tiny switch to match the converter you're using. If your converter is a Yamaha or another brand, try both positions and use the one that works best.





## ***Connecting Pickups to the Hexpander***

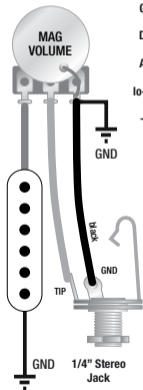
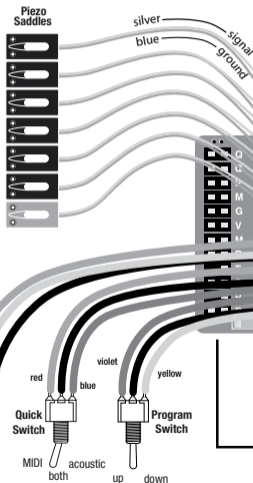
Plug the six blue and silver wires from the pickups into the Hexpander on the pin pairs labeled 1, 2, 3, 4, 5, 6, with the silver wires nearest the labels and the blue wires on the ground row, according to the order for your instrument:

6 string guitar	EBGDAE = 123456
4 string bass	GDAE = 2345
5 string bass	GDAEB = 23456
6 string bass	CGDAEB = 123456

# HEXPANDER CONNECTION DIAGRAM

## String Assignments for Guitar and Bass

Number of Strings:	4	5	6
	-	-	hi-E
	G	G	B
	D	D	G
	A	A	D
	lo-E	lo-E	A
	-	lo-B	lo-E
			lo-B (not Hex)

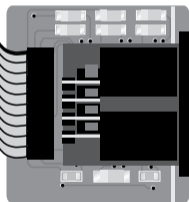
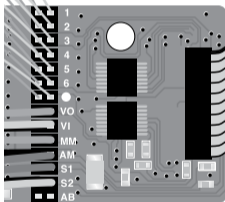




Summing Board and Dual Connector are not used for Hexpander-only and "Piggyback" installations

ghost Hexpander MIDI interface board  
(dimensions: 1-1/8" x 1-5/8" x 1/2")

13-pin Hexaphonic Output Jack  
(fits hole: 1" x 1-1/4" x 1-1/4" deep)



HEADER PINS

SIGNAL ROW (all colored wires)

GROUND ROW (all black wires)

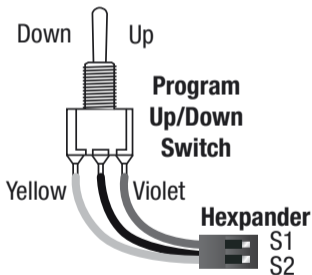
Interface Wiring Harness  
(ribbon connector)

Piggyback connections  
to Acousti-phonics

Traktion  
Switch

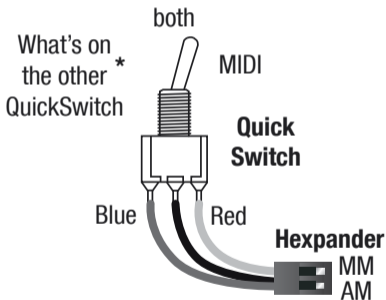
## ***Program Up/Down Switch \*optional\****

Drill a 1/4" hole in the pick guard or guitar top and mount the switch using the nuts and washers supplied. Orient the switch as desired: pushing the toggle towards the violet wire scrolls up, and towards the yellow wire scrolls down. Plug the connector into the Hexpander on the rows marked S1 and S2 with only the black wire on the ground row.



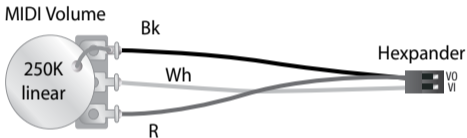
## **QuickSwitch for MIDI/both/guitar \*optional\***

Drill a 1/4" hole in the pick guard or guitar top and mount the QuickSwitch using the nuts and washers supplied. Orient the switch according to your preference, using the colors of the wires soldered onto the switch to indicate which direction is which. Plug the QuickSwitch into the second row of the Hexpander on the pins marked MM and AM to select MIDI/both/guitar.



## ***MIDI volume pot \*optional\****

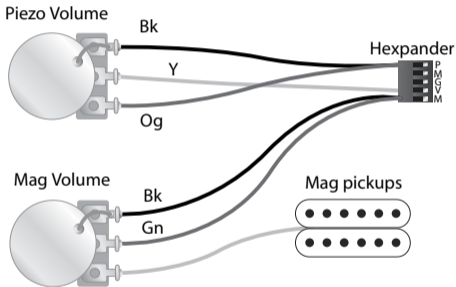
Use an existing hole, or drill a new 9/32" hole in the pick guard or guitar top and mount the pot using the nuts and washers supplied. Plug the MIDI volume pot connector (red, white, and black wires) into the Hexpander on the rows marked VO and VI.



Note: a 250k linear-taper pot is preferred, but it will work with a 250K audio-taper pot too. (regular guitar pots are audio-taper) You will still be able to control MIDI volume if you use an audio-taper pot, but mid-volume will not be at mid-scale.

## ***Mag-to-pin-7 Harness \*optional\****

Plug the Mag-to-pin-7 harness into the first row of the Hexpander, nearest the edge of the board. It will span the pins labeled PMGVM, with the colored wires nearest the labels and the black wires on the ground row.



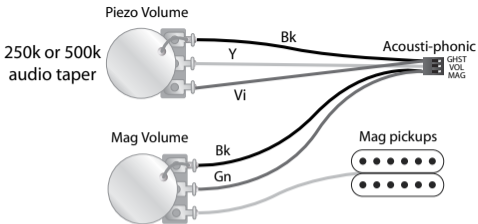
## **Acousti-Phonic**

Locate the Acousti-Phonic where it can accept plug-in connections from the 1/4" jack, the saddle pickups, the battery, and options if applicable. Attach it, using the self adhesive foam tape on the back, to the side or back of the control cavity or to the inside of the cover plate.

### ***Acoustic volume and magnetic input***

The Basic Acousti-Phonic does not include a volume pot, but instead a wiring harness is provided to convert one of your tone controls into the Acoustic Volume Pot. (The Advanced Kit includes the Acoustic Volume with Mid/Dark Switch complete with harness, or you can order it as a separate item) The pot you convert should be either 250k or 500k to work properly with the Acousti-Phonic. (If you would like to operate the Acousti-Phonic without a volume pot, you can install the wiring harness only and get acoustic output always at full volume. Solder the purple and yellow wires together, and coil up the black wire and leave it unused.)



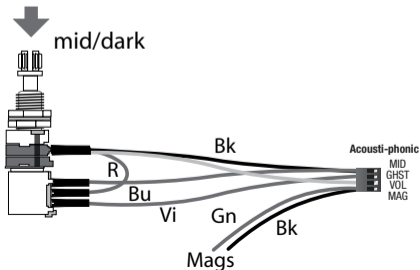


To convert your tone control to an acoustic volume control, begin by unsoldering and removing any wires or components attached to the tone pot. Solder the purple, yellow, and black wires to the pot according to the diagram. Plug the acoustic volume harness into the Acousti-Phonic so that it spans the pin rows labeled GST VOL MAG (G V M when the Hexpander is piggybacked on the Acousti-Phonic) with the purple, yellow, and green wires nearest the labels and the ground wire furthest from the labels. The green wire is the input from your magnetic pickups; solder it to the middle lug of your magnetic volume pot. Remove the wire that runs from your 1/4" jack to the magnetic pickup system.

## Acoustic volume with Mid/Dark switch

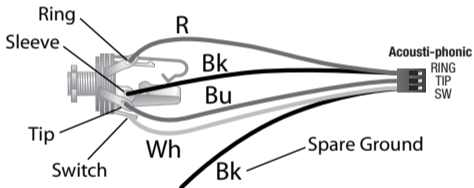
**\*optional\***

This switch selects either the EQ'd ghost® acoustic sound, or a second EQ curve with a boost in the mid range. It can be installed either as a mini-toggle switch, or as a switch incorporated in a pot. A push-on/push-off pot is available as part of the ghost® system, which controls acoustic volume and the Mid/Dark switching, or we can provide the harness with a mini-toggle switch for you to convert one of your tone pots. The green wire is the input from your magnetic pickups; solder it to the middle lug of your magnetic volume pot. Unsolder the wire that runs from your 1/4" jack to the magnetic pickup system.



## ***Stereo Switched Output Jack***

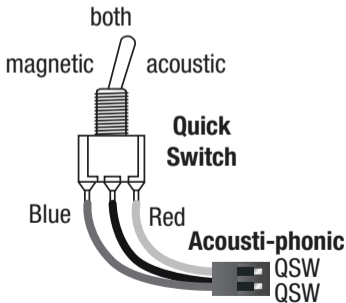
Solder the Output Jack Harness (red, white, blue, two blacks) to the supplied Stereo Switched Output Jack, cutting the wires to a reasonable length for your installation. The second black wire can go to the same lug as the first, or be used as a bridge ground if necessary. Remove the guitar's 1/4" jack and replace it with the Stereo Switched Jack, using the nuts and washers supplied.



Black goes to the sleeve contact, Red to the Ring, Blue to the Tip, and White to the Switch contact, which shorts to the Tip contact when the plug is withdrawn from the 1/4" jack. When the plug is inserted in the jack, these contacts separate, and power is supplied to the Acousti-Phonic and any other device powered by the red Auxiliary Power lead.

## **QuickSwitch for mag/both/acoustic** **\*optional\***

Drill a 1/4" hole in the pick guard or guitar top and mount the QuickSwitch using the nuts and washers supplied. Orient the switch according to your preference, using the colors of the wires soldered onto the switch to indicate which direction is which. Plug the QuickSwitch into the Acousti-Phonic (or on the pass-through pins marked Q Q in the piggyback configuration) to select mag/both/acoustic.

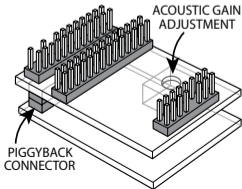


## ***Connecting Pickups to Acousti-Phonic***

Plug the six blue and silver wires from the pickups into the Summing Board with all the blue wires on the same side and all the silver wires on the other. Plug the dual connector into the Acousti-Phonic on the pins marked PIN (pickup in) with the dark blue wire on the ground, away from the label. Plug the other end of the Dual Connector Cable into the Summing Board with the dark blue wire on the same side as the blue pickup wires, and the grey wire on the same side as the silver wires.

## ***Gain Adjustment***

The Acousti-Phonic has a blue and white trim pot that can be adjusted with a small screw driver to match the level of the acoustic output to the level of the magnetic pickups. Clockwise increases the gain. Turning it all the way counter-clockwise does not turn the acoustic signal to zero.



## ***Battery Power***

A battery is required to power the Acousti-Phonic. The magnetic signal has to go through the Acousti-Phonic for blending purposes, so if the battery is removed or dead, there will be no output from the 1/4" jack, not even magnetic pickups. In normal use this battery lasts 500 hours, which means changing it twice a year will ensure that it never goes dead. Always unplug the cable from the 1/4" jack to conserve battery life when not using the guitar.

Connect the Battery Clip Harness (red, black, a short red) to the battery and insert the battery into the metal holder. Locate the battery along the side or back wall of the control cavity, or on the cavity cover plate. Make sure the wiring harness will reach the Acousti-Phonic, then peel and stick the Battery Holder to the chosen location.

The Acousti-Phonic is designed to operate on 9v or 18v, and the same batteries that power it can also power active pickups or another on-board device by using the short, red Auxiliary Power Lead. Ground the active magnetic pickups using any of

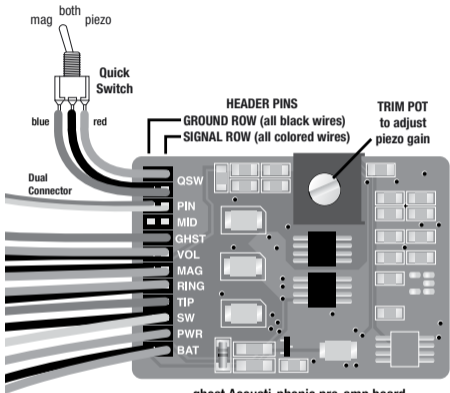
the black ground wires on the harnesses. These ground wires will all be lifted from the battery negative when the 1/4" plug is removed from the Stereo Switched Jack, powering off both the Acousti-Phonic and the active pickups or other accessory.

### ***Connecting battery to Acousti-Phonic***

Plug in the battery harness last, and make absolutely certain that the black wire is alone on the ground row of pins, and the two red wires are on the row with the other colored wires. Plugging this in incorrectly may damage the ghost® boards. The battery harness connector spans the two pin rows labeled PWR (power) and BAT (battery).







ghost Acusti-phonics pre-amp board  
(dimensions: 1-1/8" x 1-5/8" x 1/2")

**black\***

The harness for the Stereo Switched Jack has a second black ground wire that can be used as a bridge ground. If unused, solder it to the same place as the first one, on the Stereo Switched Jack.

## **Piggyback -- Hexpander + Acousti-Phonic**

When installing both boards, connect them together with the Hexpander on top and Acousti-Phonic on the bottom. Plug the row of pins on the Acousti-Phonic into the matching receptacle on the bottom of the Hexpander. The boards will align, and the blue and white screwdriver adjustment on the Acousti-Phonic will be accessible through the hole in the Hexpander board.

## **Other Possible Installations**

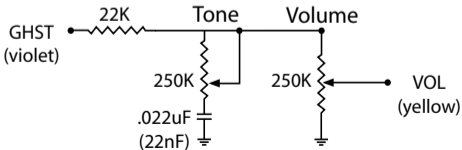
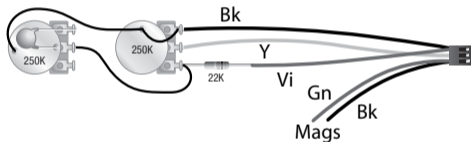
The ghost® system is quite versatile, and the installation described in this manual is by no means the only possibility. Included below are a few of the most popular alternatives to the standard installation.

### ***Dual output jacks***

You can have two 1/4" output jacks on your guitar with magnetic on one, and acoustic on the other. The Acousti-Phonic's mono (blended) mode does not function in this configuration, as the magnetic pickups do not go through the Acousti-Phonic. Visit [www.graphtech.com](http://www.graphtech.com) for wiring diagrams.

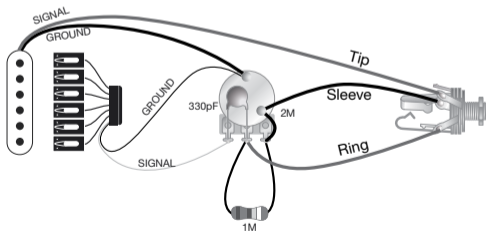
## Tone control on acoustic

You can add a tone control to the Acousti-Phonic volume circuit to attenuate the high frequencies, the same as you would on your magnetic circuit. Be forewarned that a lot of players think they will need this, but discover they never use it because they prefer the EQ'd acoustic sound the way it is. Try your ghost® system first without the added tone pot, and install it if you really need it.



## ***Passive volume kit***

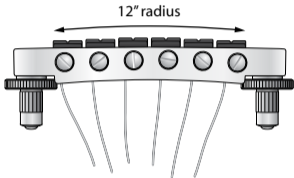
This kit is for connecting the ghost® pickups to an output jack without the Acousti-Phonic. It provides an on-board acoustic volume control, and prevents loss of high frequencies at lower volumes. The 2M volume pot included in the kit helps match the resistance of the ghost pickups to a standard amp input. Without the Acousti-Phonic, the output of the pickups is rather harsh, and does not sound like an acoustic guitar, so we recommend that you process the passive signal external to the guitar using a preamp or active EQ.



## Technical Considerations

### ***Bridge radius - Do not file saddles!***

The bridge radius should match the fingerboard radius in order to prevent "fretting out" -- fret buzz or wrong notes sounding when you play high up the neck. The ResoMax<sup>®</sup> bridge assembly is manufactured with a fixed radius of 12". Do not file ghost<sup>®</sup> pickup saddles to adjust the radius, as this will change the output levels unpredictably. The LB63 has a radius of 20", and this can be adjusted by inserting shims\* under saddles that are too low.



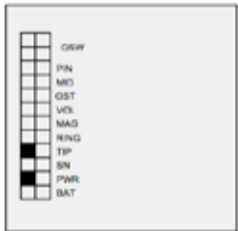
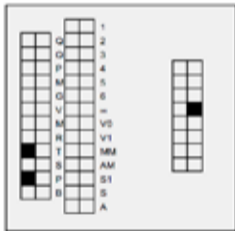
**DO NOT FILE  
GHOST<sup>®</sup>  
SADDLES!**



\* not sold by Graph Tech -- available from most guitar parts suppliers

## Missing Pins (keyed connections)

To prevent critical connections from being plugged in the wrong way, some pins have been clipped on the Hexpander, the 13-pin Jack board, and the Acousti-Phonic. Corresponding holes are blocked on the plug-in connectors so that they can only go together correctly. In this diagram, the black squares indicate pins that are missing.



Note: Black squares indicate sockets without pins

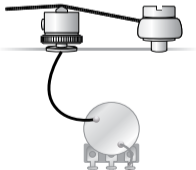
Hexpander

Acousti-Phonic

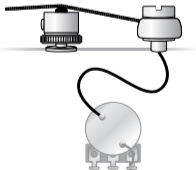
## ***String ground to prevent hum***

Because ghost® saddles are non-conductive, on some guitars this can isolate the strings from the grounded bridge and cause them to pick up hum. This often needs to be addressed on Les Pauls and other guitars with Tune-O-Matic style bridges, including ResoMax® bridges. To ground the strings, run a ground wire to the post of the tail piece, or other string anchor point. On guitars where the strings are anchored in metal ferrules pressed into the wood, each ferrule must be grounded individually. This may take some creativity and skill to do invisibly.

**Tune-O-Matic ground**

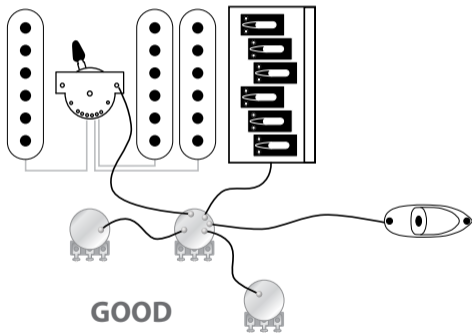


**ResoMax® ground**



## Ground Loops

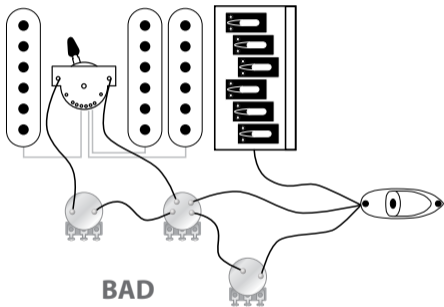
Ground loops cause your guitar to pick up annoying hum or buzz (sometimes even radio stations!) and can be difficult to troubleshoot. The best strategy is to choose a central ground point (usually the back of one of the pots) and make all other ground wires join here in a star pattern. Avoid creating



loops; in other words, don't run a ground wire from the first component, to the second, to the third, and back to the first.



Sometimes a loop can be formed accidentally, through cavity shielding or another conductive component. If you're experiencing problems, "think like an electron" and see if there's more than one way to get back to 'true ground'. If you find several paths, eliminate them until there is only one wire to take you home.



### ***Pot & switch mounting hole diameters***

Pots 9/32"

QuickSwitches 1/4"

Stereo Switched Jack 3/8" (recess in 7/8" hole if necessary)

## Shielded cavity caveat

To improve noise immunity, the walls of the control cavity are sometimes shielded, either with metal foil or conductive paint (usually grey or black). This conductive shielding can sometimes cause problems for the ghost® system. The ghost® boards are not coated or insulated, so they must not touch the cavity shielding. Mounting the boards on the shielding is okay, as long as the foam tape on the back of the Acousti-phonics board keeps the board separated from the shielding. If you find it difficult to install the ghost® boards with space around them to prevent touching the shielding, after you've plugged in the pickups and all other connections, wrap the board(s) in electrician's tape to insulate the board from the cavity shielding.

In some instances, the cavity shielding can ironically cause the ghost® system to pick up "buzz" or "hum" (sometimes even radio stations)! Because it is a modular system, each ghost® component comes with a ground wire. This abundance of ground wires, combined with the pots and switches being grounded through the shielding where they are mounted, increases the likelihood of creating a ground loop.

# INSTALLATION NOTES

[www.graphtech.com](http://www.graphtech.com)



[sales@graphtech.com](mailto:sales@graphtech.com)