

Be the band.

ghost<sup>®</sup>

modular pickup systems

Acoustic MIDI System

User Guide

## INTRODUCTION

Modular components

Saddle Pickups

Pagoda Shim

Hexpander

*Traction Switch*

Program Up/Down Switch \*optional\*

Tone Control

1/4" Jack and 9v Battery Connector

## INSTALLATION

Locating ghost<sup>®</sup> Components

Tools Required

***Do not file saddles!***

Saddle Pickups & Pagoda Shim

Putting plugs onto pickup wires

Installing Hexpander & 13-pin jack

Mounting the Tone Control

Variable Control Layouts

Control Knobs

Wiring Connections Diagram

## TECHNICAL DETAILS

Component Dimensions

Mounting hole diameters

Part Numbers

## **INTRODUCTION**

The ghost Acoustic/MIDI system lets you add MIDI capability to almost any acoustic guitar, as well as amplify the instrument's natural sound without the feedback problems of microphones or the string choice restrictions of magnetic pickups.

The ghost saddle pickups turn the vibrations of the strings into electrical signals that drive both of the ghost Acoustic/MIDI modules: the Hexpander MIDI interface, and the Tone Control adjustable acoustic preamp.

The ghost Acoustic/MIDI system was developed for Carvin's highly popular NS-1 chambered solid body acoustic guitar, and now is available for use in other applications. It is suitable for both nylon-string and steel-string acoustic guitars.



## Saddle Pickups

Acoustic/MIDI saddles sets are available with two notch sizes, for either steel-string or nylon-string guitars. The dimensions and installation procedures are the same.

Both types of saddles fit in an 1/8" (3.2mm) saddle slot, and are slightly oversized to permit sanding to a snug fit. The plastic connectors are not attached when you receive the pickups, so that you can pass the wire through a 7/64" hole in the bridge, and attach the connector afterwards.

dimensions: 0.130" (3.3mm) thick, 0.385" (9.8mm) wide, and 0.236" (6.0mm) high.

standard wire length: 9" (230mm)

## Pagoda Shim

The Pagoda Shim goes in the saddle slot and provides six “steps” at different heights for the saddles to sit on, resulting in an 18” radius. For guitars with flat fingerboards, the Pagoda Shim is not used.



*The stepped roofs  
of a pagoda*

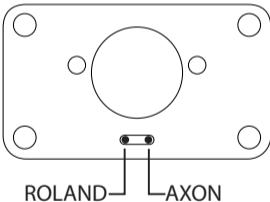
## Hexpander

The Hexpander is the MIDI interface board with integrated 13-pin connector. It interfaces with most pitch-to-MIDI converters, and is designed to be installed with the Tone Control

### *Traktion™ Switch*

The Traktion™ Switch selects between two output curves to optimize tracking for your converter and playing style.

The Traktion™ switch is located in the slot below the 13-pin jack, and slides left for Roland, and right



for Axon. For converters by other manufacturers, try both settings and use the one that tracks best.

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

The program selector QuickSwitch scrolls up or down through the MIDI patches. Modular plug connects to the Hexpander or Tone Control bus bar without soldering. The Up/Down Switch is optional, and omitting it doesn't require any jumpers in its place.

## **Tone Control**

The OEM Tone Control is an adjustable acoustic preamp that delivers true acoustic sound from piezo pickups. The middle pot is wire mounted so you can create custom control layouts. It is designed to be installed with the Hexpander.

## **1/4" Output Jack & 9v Connector**

The Acoustic/MIDI system includes a plug-in wiring harness with the 1/4" output jack and a 9v battery connector. A metal battery holder with self-adhesive backing is also provided.

## INSTALLATION

Installing the ghost Acoustic/MIDI system requires some permanent modification of the instrument, including holes through the sound board for the pickup wires and preamp controls, and a hole in the side for the 13-pin jack. If you're uncomfortable with any of the steps in this manual, please find a qualified guitar technician to do the work for you.

## Locating ghost Components

Adding the ghost® system to your instrument begins with careful planning. Begin by plugging the components into each other and lay them out on top of the guitar to decide the location of each component. Choose locations that are convenient for you, and look for space conflicts with structural parts on the inside of the 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.

## Tools Required

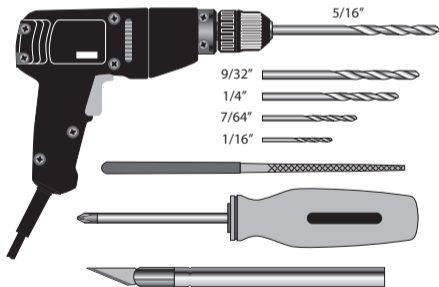
Electric drill and bits: 5/16" (12" long recommended), 9/32", 1/4", 7/64", 1/16"

Square file for 13-pin jack hole

Phillips screw driver for mounting 13-pin jack

X-Acto knife

masking tape



## **Do not file ghost saddles!**

Do not adjust the height of the strings by filing the string slots. This will alter the relationship between the string and the encapsulated pickup, and change the output unpredictably.



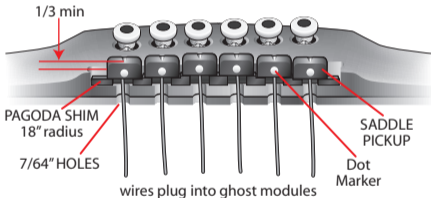
If you need to adjust the height of an individual string, either carefully file the Pagoda Shim, or file the bottom of the saddle, being careful not to damage the wire. The saddles can be sanded to adjust the thickness to fit a 1/8" (3.2mm) saddle slot, and the width can be filed or sanded to accommodate narrower string spacings.

## Saddle Pickups & Pagoda Shim

The saddles pickups fit in a  $1/8''$  (3.2mm) saddle slot. They are slightly oversized to permit sanding to a snug fit. Each saddle is marked with a dot to orient the pickup properly. This dot must face towards the fretboard so that the pickup senses the string optimally.

### CUT-AWAY VIEW OF BRIDGE

installation in saddle slot



For guitars with flat fingerboards, such as classical guitars, the Pagoda Shim is not used. The saddle pickups sit on the bottom of the saddle slot.

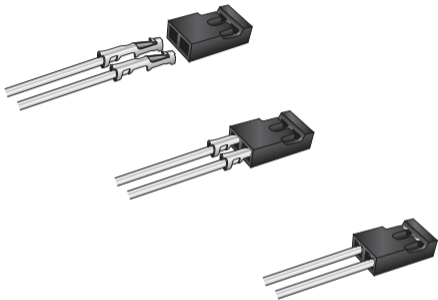
For steel-string guitars and other guitars with radiused fingerboards, the Pagoda Shim lies in the bottom of the saddle slot, and the pickup saddles sit on top of it. You may need to rout your saddle slot deeper to accommodate the pagoda shim. The pickup saddles should not protrude more than 1/3 of their height out of the saddle slot.

It is possible to sand the Pagoda Shim thinner, but it is very delicate, so if you choose to do this, proceed very carefully.

## **Putting plugs onto pickup wires**

Once the pickup wires have been threaded through the 7/64" holes in the bottom of the 1/8" saddle slot, the metal crimps on the ends of the pickup wires can be inserted into the plastic housing without tools. Align

the crimps so that the catches on the plastic housing will engage the crimps when they are fully inserted.



If you need to remove the housing, carefully lift both catches at the same time using an X-acto knife with a prying motion, and withdraw both crimps at the same time.

## **Installing Hexpander & 13-pin jack**

For instruments with solid-wood sides, reinforce the area where you are going to cut the hole for the 13-pin jack by gluing a small piece of 3/32" aircraft plywood inside the guitar. This reinforcement protects against cracking the wood, and makes the 13-pin jack stronger in case you step on your cable. Aircraft plywood is available at most hobby shops, and can be stuck on using regular wood glue (white) or carpenter's glue (yellow). Allow 24 hours to dry before cutting or drilling.

If your body depth is large enough, mount the 13-pin jack plate with the long dimension across the depth of the side. This will make for a stronger mount by placing the mounting holes closer to the kerfing. Also, the plate will require less curvature to fit.

For mounting the Hexpander output on the edge of the instrument, the integral 13-pin jack requires

a rectangular mounting hole in the body. Choose a location for this hole, checking that there is room for the Hexpander behind it, and that the ribbon cable will reach from here to the Tone Control Module.

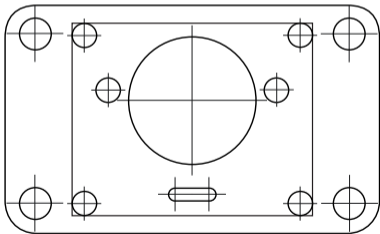
### **13-pin Jack Template**

The size and placement of this hole can be determined using the full-size template on the following page.

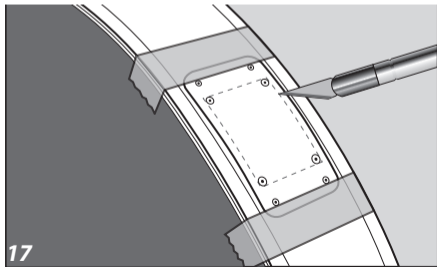
*This space intentionally left blank  
for reverse of template*

## 13-pin Jack Template

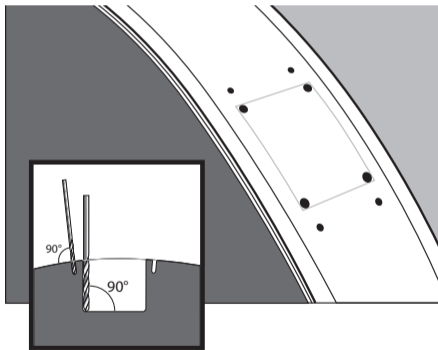
Cut out this full-sized template and use it to mark the location of the holes to drill for mounting the 13-pin jack on the edge of your guitar.



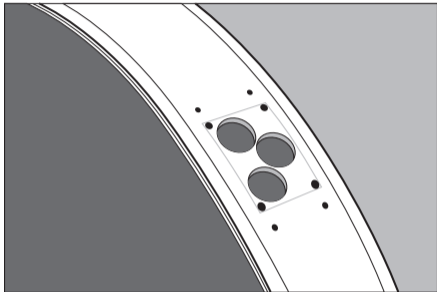
Tape the template to the edge of the instrument, and mark the center of the circles onto the guitar by tapping through the template into the lacquer using a center punch and a small hammer. Using an X-Acto knife, slice through the template along the edges of the inner rectangle, etching lines in the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



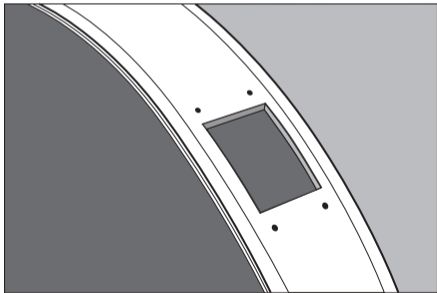
Using a 1/16" bit, drill the four holes for the mounting screws in the outer most marks to a depth of 1/4". Make these holes perpendicular to the surface. Using the 7/64" bit, drill the inner four marks, defining the four corners of the mounting hole.



Using a 5/16" bit, drill holes within the inner rectangle to remove most of the wood in the cavity.



Using a file or a Dremel rotary tool, remove the remaining wood to edges of the marked rectangle. 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.



## **Mounting the Tone Control**

Carefully consider the placement of the Tone Control module, not only in terms of locating the controls conveniently, but also making sure it will fit in the guitar as you expect. Check before you drill, for braces, kerfing, or other obstructions on the under side of the guitar top.

### **Variable Control Layouts**

The two outer pot shafts are fixed to the Tone Control Module, but the middle pot is on a wiring harness, so it can be positioned as you like, forming a triangular group of controls. To achieve an aesthetically pleasing control layout, remove the nuts and washers from the three pots, and lay the washers on the guitar top. Slide them around until they look just right, keeping the outer two 2-1/2" (63.5mm) apart to mount the Tone Control Module. The placement of the third hole is lim-

ited by the wiring harness on the middle pot, and placement of the Tone Control itself. Check inside the guitar to make sure there are no obstructions, and that the harnesses to the other components are long enough to reach. Mark the location of the holes on the top through the centers of the washers, then remove the washers and set them aside.

Drill three  $9/32''$  (7.1mm) diameter holes to mount the potentiometers. Two of these holes must be  $2-1/2''$  (63.5mm) apart, center-to-center, to accommodate the two pots that are mounted on the Tone Control's PC Board.

center-to-center between pots:  $2-1/2''$  (63.5mm)

mounting hole diameter:  $9/32''$  (7.1mm)

## **Control Knobs**

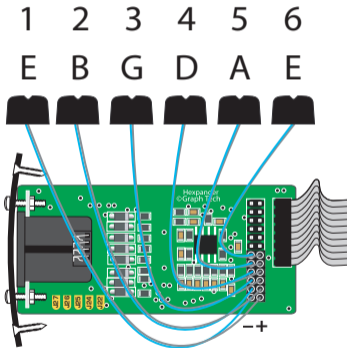
A set of three, stacked rosewood and brass knobs is available from Graph Tech as a separate item, with a 1/16" hex key included for installation. Or you can provide your own knobs. Secure the knobs onto the pot shafts by means of the set screws. Leave a little clearance between the inner and outer knobs so that they turn independently.

Pot Shaft Diameters:

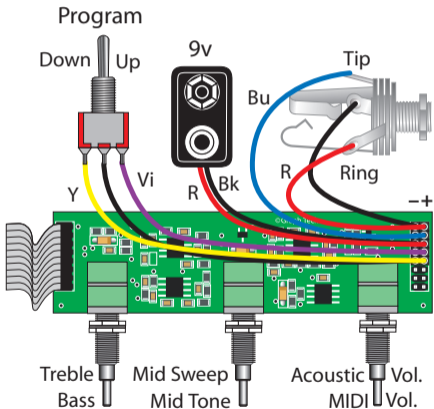
outer, 0.236" (6.0mm); inner, 0.139" (3.5mm)

# Wiring Connectons Diagram

## HEXPANDER



# TONE CONTROL



## TECHNICAL DETAILS

### ***Component Dimensions***

Hexpander: 1-3/16" x 2-1/2" (30.2 x 63.5mm)

Tone Control: 1" x 3-1/2" x 5/8" (25.4 x 89 x 15.9mm)

### ***Mounting Hole Diameters***

Volume/Tone/Mid-Sweep pots 9/32" (7.1mm)

Program Selector Switch 1/4" (6.4mm)

Output Jack 3/8" (11.9mm)

### ***Part Numbers***

BS-0077-00 Pagoda Shim

BN-9277-OE Acoustic Saddles

BD-0477-00 Hexpander

BD-0077-00 OEM Tone Control

BN-0180-00 Program Selector Switch

## **INSTALLATION NOTES**

## **NEW SOUND DISCOVERIES**

**FRIENDS WHO'VE GOT TO SEE THIS...**

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



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