

TONEBONE™

Radial Headbone VT & SS

Part # VT R800 7040 00
SS R800 7084 00



Owner's Manual



Radial Engineering
1638 Kebet Way, Port Coquitlam BC V3C 5W9
tel: 604-942-1001 • fax: 604-942-1010
email: info@radialeng.com • web: www.radialeng.com

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>>> IMPORTANT SAFETY AND LIABILITY NOTICE <<<

Radial Engineering (JP Cabletek Electronics Ltd.) manufactures products that are safe for use when connected as per the instructions in our owner's manuals. Manuals are freely available for download on our web sites. As it is impossible for Radial to ensure the user is following these instructions, the user must take full responsibility in the suitability of purchasing a Radial product for his or her use.

For safe operation, the Headbone MUST be properly grounded, not only to provide shielding from hum and noise, but also to prevent any SHOCK HAZARD. The Headbone is connected to the earth ground (AC-3rd ground pin) via its connection to Amp-1. You must make sure that both amplifiers being connected to the Headbone are properly grounded and equipped with a 3rd safety pin on the AC plug. It may be unsafe to use the Headbone with vintage amplifiers equipped with a 2-prong plug or amplifiers whose 3rd pin has been removed or lifted. For safety, always consult a qualified technician on making proper connections to the equipment that you wish to connect.

It is important to note that all Radial products that function using AC or DC electrical current, are sold with a government agency approved power supply for use around the world (i.e. UL, CSA etc.). We insist that Radial products be used with equipment that carries the same or similar safety government approvals. If you plan to use equipment that has not been approved by a government-approved electrical safety body, you are doing so at your own risk.

By purchasing this product, you clearly understand that you are taking full responsibility for the use of this product. If, after purchasing this product from your dealer, you are not comfortable in accepting this responsibility, we ask that you return the product within 7 days to the dealer for refund, credit or exchange. Consult your dealer on their policy regarding this matter.

Radial Engineering accepts no responsibility (consequential or inconsequential) for damage or injury caused by improper connections, user error, using improperly grounded amplifiers, or injury caused by failure of the Headbone or any component inside. The use of the Headbone implies that the user/owner agrees to all of the terms stated within this document, and has made the decision to keep the Headbone under these terms, and waives his/her rights to a liability claim against Radial Engineering (or associated companies or directors) for any damage or injury caused while using the Headbone. Please read the Headbone warranty for further details.

RADIAL HEADBONE™ OWNER'S MANUAL

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Congratulations on your purchase of a Radial Headbone!

As part of the growing family of Tonebone products, the Headbone is designed to open doors to creative new sounds and provides the discerning guitarist with greater options on stage and in the studio with a simple, yet extremely versatile interface.

The Headbone is designed to connect two amplifier heads to one speaker cabinet and switch between amplifiers with a footswitch. The Headbone uses pure Class-A electronics under digital control for the hi-impedance guitar signals and hi-power speaker signals. Add Slingshot™ remote control and you get a true marvel whose time has come! Best of all, the Headbone is engineered to ensure the safe operation of either tube (VT) or transistor (SS) amps.

To take advantage of all of the wonderful features that have been incorporated into the Headbone, please take the time to read through this manual before you use it. This will give you a broader sense of the Headbone's capabilities and ensure its safe and proper operation. If you have questions that are not covered here, please visit the FAQ section on our web site. This is where we post answers from questions that come from users. If you have a question that is not covered there, please feel free to send us an email at info@tonebone.com and we will do our very best to respond as quickly as possible.

Start your engines!

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Radial Engineering

Headbone Owner's Manual

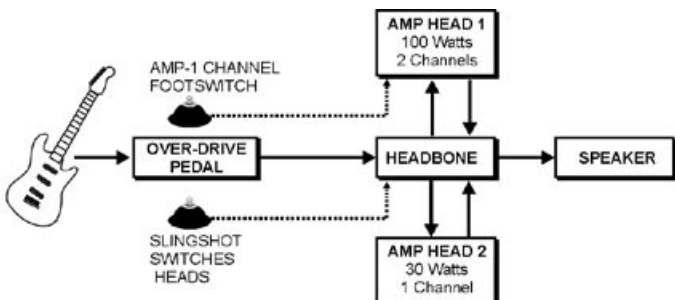
INTRODUCTION



Whether you have a Headbone VT or a Headbone SS, the setups and connections are identical. For simplicity, this manual will discuss the Headbone VT. It is important to note that because of the very different nature of solid-state amps and valve-tube amps, each Headbone's internal circuit is different. The Headbone VT is exclusively designed for valve-tube amps; the Headbone SS is exclusively designed for solid-state amps. As such the SS and VT are not interchangeable. Attempting to use a solid-state amp with the Headbone VT (or vice versa) could damage your amp and/or the Headbone. This would void your warranty. Please consult your dealer and make sure you fully understand the ownership disclaimer before using the Headbone.

When developing the Headbone, we asked guitarists: "What would be the ultimate guitar setup?" Ask 10 guitarists this question and you will likely get 10 different answers. The reason for this is simple: There are no right answers as the possibilities are endless. So where do you start? You need a concept. The following is a setup concept that will help get those creative juices flowing. It combines simplicity with awesome stage performance.

The guitar connects to the effects on the pedalboard. The pedalboard is connected to the Headbone input. The Headbone connects to the inputs of the two amplifier heads. The amplifier outputs are brought back to the Headbone which, in turn, connects to the speaker cabinet. In the example below, amp head-1 is a 100-Watt 2-channel amp with one channel set to clean and the other set to saturated overdrive distortion. Amp head-2 is a low power 30-Watt amp that would be driven 'hard' for natural output tube overdrive. Add a good distortion pedal and all of a sudden your setup becomes a tone monster.



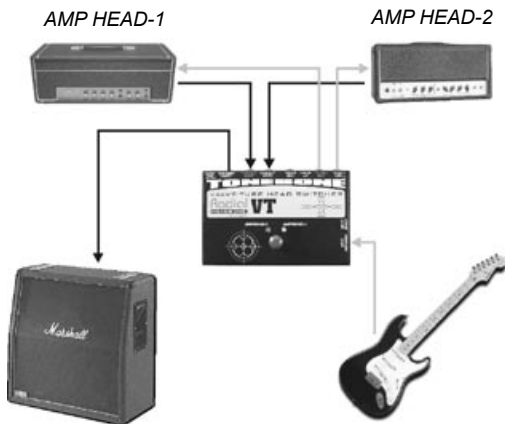
Typical Headbone setup with a channel switching head and a single channel head.

Why is this setup so cool? Because it truly covers all of the bases: the powerful clean sound from a 100-Watt amp is radically different than an all-tube 30-Watt amp cranked to 10. Not just as far as loudness goes, but also as far as tone. Being able to use that reserve power for blistering solos can make a huge difference. Best of all, you only have to carry around a single speaker cabinet - a luxury that is best appreciated at two in the morning after the gig!

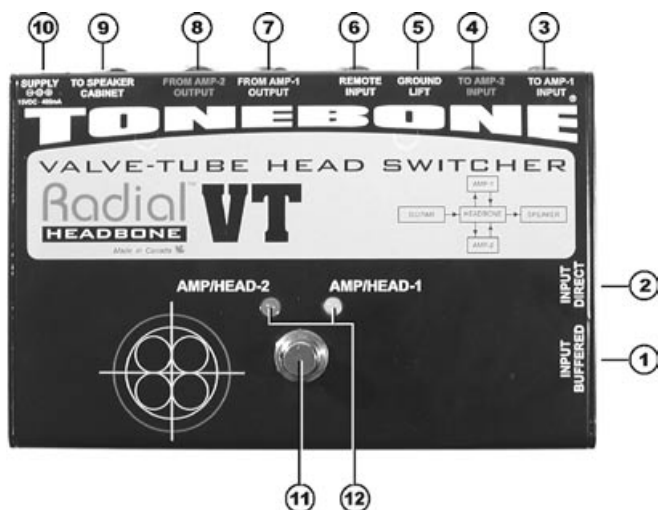
	TYPE OF SOUND	OVER-DRIVE PED-AL	HEAD-1 CLEAN CH. 1	HEAD-1 CRUNCH CH. 2	HEAD-2 OVER-DRIVE
Tone-1	Clean Rhythm		X		
Tone-2	Solo Distortion		X		
Tone-3	Crunch Rhythm (change amp ch.)	X		X	
Tone-4	Saturated Solo			X	
Tone-5	Overdrive Rhythm (change heads)	X			X
Tone-6	Saturated Rhythm				X

Tone chart: two amp heads, one distortion pedal, one speaker cabinet, six distinct amp tones.

This is the point: with the Headbone in your rig, you are now able to specify which amplifier you will use for a particular song or passage. You do not have to compromise. And you do not have to carry around two amp-stacks to get there. Yes, finally a device that adds tonal flexibility while reducing the amount of equipment you bring to the gig!



FEATURE SET



1. **Input Buffered** – This is the primary input for your guitar and pedal effects that do not buffer (pre-amplify) the signal.
2. **Input Direct** – Used when driving the Headbone from a device, like the Radial Loopbone, that buffers (pre-amplifies) the signal.
3. **To Amp-1 Input** – This is a ¼" hi-impedance guitar signal output that connects from the Headbone to the input of the first guitar amplifier.
4. **To Amp-2 Input** – This is a ¼" hi-impedance guitar signal output that connects from the Headbone to the input of the second guitar amplifier.
5. **Ground Lift** – This recessed switch connects the ground to Amp-2. This switch is factory set in a 'lifted' position to eliminate ground loops.
6. **Slingshot Remote Input** – This ¼" input is used to remotely control the Headbone from your pedalboard using a standard contact closure foot-switch or another Tonebone device that features a Slingshot output.
7. **From Amp-1 Output** – Connects from the first amplifier's speaker



output jack back to the Headbone. This is a speaker level signal, so use a good quality speaker cable for best power transfer.

- 8. **From Amp-2 Output** – Connects from the second amplifier's speaker output jack back to the Headbone.
- 9. **To Speaker Cabinet** – Connects the Headbone to your speaker cabinet.
- 10. **Power Supply Connection** – The Headbone comes with its own 15VDC power supply in a choice of 100V, 110V, 220V and 240V models.
- 11. **Footswitch** – Used to toggle the Headbone between Amp-1 and Amp-2
- 12. **LED Indicators** – Indicates which amplifier head is active.

QUICK START

Before making any connections, ensure that your amplifiers are turned off, the Headbone power supply is disconnected, and volume controls are set to zero.

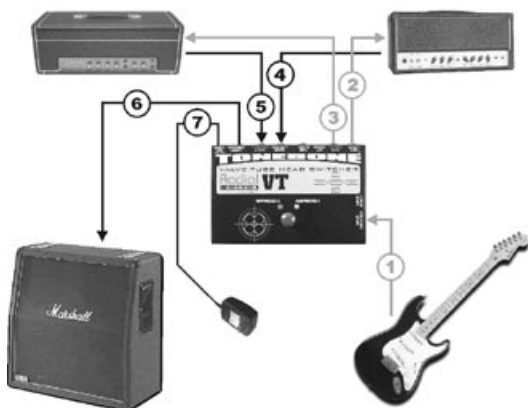
1. Begin by connecting your guitar to the Headbone's ¼" **Buffered Input**. This will allow you to test the system more effectively during the initial setup. For unbuffered (**Direct**) input use, please go to the section that discusses this on page 7.
2. From the Headbone, connect the **To Amp-1 Input** jack to your first amp's guitar input. This circuit connects the guitar to your first amplifier. Always use good quality shielded cable to ensure low noise and best performance.
3. From the Headbone, connect the **To Amp-2 Input** jack to your second amp's guitar input. This circuit connects the guitar to your second amplifier when the footswitch is toggled.

You are now ready to connect the speaker jacks. At this time, you should check to make sure both amplifiers have their impedance set to match the speaker cabinet impedance. If you are unsure about this, consult a qualified technician. Always use good quality speaker cables to ensure the best possible power transfer.

4. From your first amp's speaker output, connect to the Headbone's **From Amp-1 Output** jack. This brings the signal from amp-1 back to the Headbone.
5. From your second amp's speaker output, connect to the Headbone's **From Amp-2 Output** jack. This brings the signal from amp-2 back to the Headbone.
6. From the Headbone's **To Speaker Cabinet** jack, connect to your speaker cabinet. You are now ready to start system tests.
7. Connect the Headbone's power supply. The Headbone will turn on and you will see one of the LEDs illuminate.
8. You can now turn on your guitar amplifiers. It is a good practice to test equipment setups at a low volume to reduce any possibility for system damage should there be an improper connection. Turn up the volume slowly while listening for excessive noise. Depress the footswitch to make sure both amps are working. If all is well, you are ready to crank it up!

QUICK START CONNECTIONS

- ① Signal from guitar or pedalboard.
- ② Guitar signal to amp head-1.
- ③ Guitar signal to amp head-2.
- ④ Speaker signal from amp head-1.
- ⑤ Speaker signal from amp head-2.
- ⑥ Speaker signal to speaker cabinet.
- ⑦ Power supply



Throughout this manual, references are made to “guitar level signals” and “speaker level signals”. The Headbone passes both types and it is important to use the proper cables.

A guitar level signal requires a good quality shielded cable to work well. You will find that using high quality guitar cables with proper shielding will help reduce system noise and radio interference.

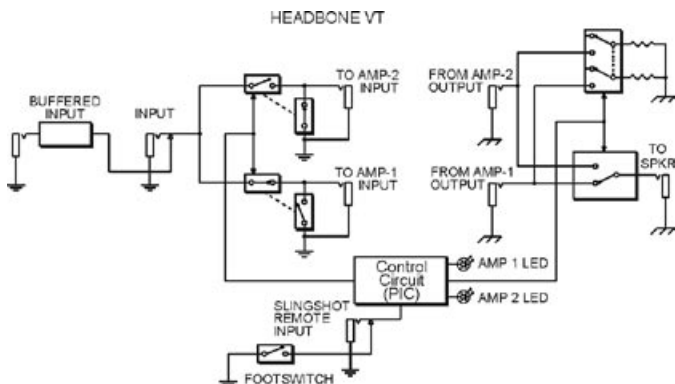
Speaker level signals require good quality unshielded speaker cables. We recommend using a minimum of 14 AWG cables for speaker cable runs under 8 feet. Larger gauge cables should be used for longer runs. Never use shielded guitar cables for speaker connections. A Headbone cable kit is available from Radial Engineering. Ask your dealer.

GETTING TO KNOW YOUR HEADBONE

To best explain the workings of the Headbone, take a minute to study the block diagram. Reading from left to right, you can see the inputs, the high-impedance guitar switching, the control circuitry and the speaker level switching.

The Input Signal Path

The Radial Headbone's input signal path is 100% discreet Class-A.



This means that it employs a whole bunch of parts such as resistors and capacitors instead of a transistor to buffer (amplify) the guitar signal to a manageable level. Class-A circuits are preferred over integrated circuits (IC chips) as they are more natural sounding.

Buffered and Direct Inputs

The Headbone gives you the choice of two inputs: one buffered and one direct or unbuffered. The reason we do this is that when you are driving a pre-buffered signal, there is no advantage to buffering the signal again. In some cases, two buffers in series could add distortion or noise.

If you are connecting the guitar directly to the Headbone, use the **Buffered Input**. If you use a buffering device (pre-amp), such as the Radial Loopbone or Switchbone, you would plug the output of the device into the unbuffered **Direct Input**. Some effect pedals use a buffering stage in their design, some do not. If you are connecting an effect pedal before the Headbone, the best way to decide which input to use is to let your ears choose the one that sounds best to you.

Switching Guitar Signals

To make the Headbone work, it cannot simply switch the amplifier's speaker outputs. The inputs to the amp must be switched as well. It is important that the input going to the unused head be turned off so that while on standby, it is not trying to amplify a signal with nowhere to go. The Headbone simultaneously switches the amp's inputs and outputs. Actual head switching is performed by a series of opto-couplers, which are made to ramp-up and ramp-down the guitar signal in such a way as

to avoid any clicks or pops. The PIC digital controller controls this action (see block diagram on page 7).

Switching Speaker Signals

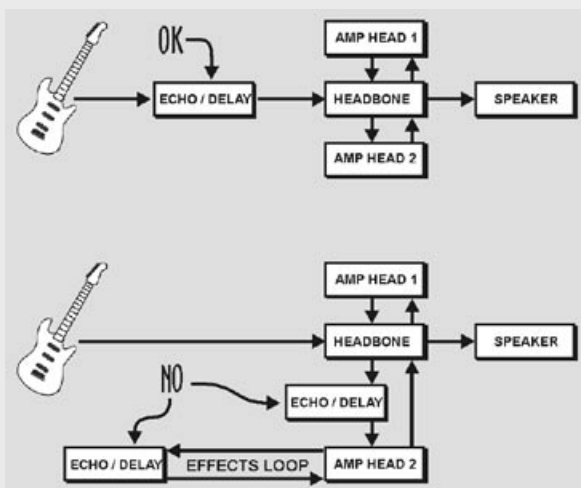
To accomplish this task, the PIC sends a status change command to a series of internal relays that connect the speaker to the active amp, and connect the load resistor to the standby amp. Always use good quality, large conductor speaker cable between the Headbone, your amps and your speaker cabinet, as this will reduce signal loss and improve the transient response. Your Headbone has been designed to work with amps whose maximum output is 100-watts RMS. The power is limited by the relay that is used to switch the speaker signals. To be safe, never exceed this power limit.



*Effects such as echo or loop-playing devices, **MUST BE CONNECTED BEFORE** the Headbone so that their residual or sustaining sound can be disconnected from the input of the amplifiers. This means that you cannot use any type of echo device that prolongs a signal on the amplifier's effects loop or after the Headbone in your signal chain. Failure to do so could cause the echo to continue to play through the standby amp which, in turn, would continue to amplify the signal without a load. This could cause the amp or the Headbone to malfunction. The Headbone's internal resistor load is only designed to support the standby amplifiers residual output. The Headbone is NOT a load box.*

Matching the Speaker Load

The Headbone itself has no effect on amplifier load or speaker imped-



ance. You must manage the speaker connections for the best impedance match. It is important to note that most amplifiers are designed to work best at their rated impedance. If your amp features selectable impedance loads, use the one that matches your speaker cabinet. Always consult the amplifier's specifications to ensure the speaker connections are within the amplifier's accepted working range.

While matched loads between the amplifier and speaker are the ideal, unmatched loads can be used. The guidelines below will explain the ramifications of using unmatched loads.

Using Unmatched Speaker Loads With Tube Amps

Driving a speaker load that is lower than the amps output impedance (8-Ohm amp with 4-Ohm speaker) tends to drive the tubes harder, which means they will not last as long. On the other hand, a higher speaker impedance load (4-Ohm amp with 8-Ohm speaker) will generally sound less full and less punchy, but tube life is extended.

Using Unmatched Speaker Loads With Solid State Amps

Transistor or solid-state amps work differently than tube amplifiers. With solid-state amps, lowering the speaker impedance load generally makes the amp sound louder with little change in tone. Most solid-state amps are designed to see an 8-Ohm or 4-Ohm load. **Never go below the rated minimum impedance for transistor amplifiers.**

Grounding for Safety!

The Headbone is powered by an external power supply with a floating

Amp type	Rated impedance	Higher speaker impedance	Lower speaker impedance
Tube amp	8-Ohm	Connecting a 16-Ohm cabinet will make amps sound less punchy & warm. You get longer tube life.	Connecting a 4-Ohm cabinet will make amps sound more punchy and warm. You get shorter tube life.
Solid-state amp	8-Ohm	Connecting a 16-Ohm cabinet will reduce the power and lower the volume.	Connecting a 4-Ohm cabinet will increase the volume. Check amp specification for minimum load.

ground. This means that the guitar derives it's ground thru the amplifier connected to the Headbone's **To Amp-1 Input** jack.

The **To Amp-2 Input** jack is transformer-isolated from ground to eliminate hum or buzz caused by so-called ground loops passing between amp-1 and amp-2. A recessed ground-lift switch is provided to bypass the transformer and reconnect the ground through amp-2. The switch is factory set in the lifted position. Should the amplifier connected to the **To Amp-1 Input** jack not be properly grounded, this switch may be depressed to connect the ground path through amp-2.

For safety, always use properly grounded guitar amps with 3-prong electrical AC plugs. The third prong is a safety ground that is there to protect you

from electrical shock. Most amplifiers have been subjected to safety tests from authorities like UL or CSA. Amplifiers that have passed these tests are safe to use with your Headbone. If you intend to use the Headbone with amps that only have 2-prong AC plugs, such as old vintage amps, you are doing so at your own risk. Please consult a qualified technician if you are not sure how to establish a safety ground connection.

Safe Mode™ Operation

One of the really smart features in the Headbone is a function called Safe-Mode. Should the Headbone's DC power supply be disconnected, the system will 'default' to Safe Mode, whereby AMP-1's input and output will automatically connect to the speaker cabinet. This simple, yet extremely important safety feature, will ensure that the active guitar amp always "sees" a load and that the standby amp is muted.

Slingshot Remote

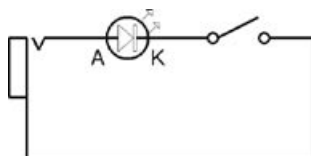
The Slingshot feature allows you to position the Headbone adjacent to the guitar amplifier setup and remotely control it from a distant footswitch. With Slingshot you can avoid a mess of spaghetti by keeping the cables between the Headbone, amps, and speaker short. This also improves amplifier efficiency and reduces system noise.

The Headbone's Slingshot Remote is a simple contact closure that allows a standard 'latching' footswitch to remotely toggle the Headbone's status from amp-1 to amp-2. Most standard 1/4" mono-style footswitches will work. The Headbone may also be used with Slingshot equipped pedals such as the Radial Loopbone. Other pedal-switching devices or MIDI controllers that are equipped with a contact closure output will also be able to toggle the Headbone.

Remote Footswitch Schematic

Use this drawing for making your own remote footswitch.

Use a SPST push-on/push-off type footswitch. If you wish, an optional LED can be included in the circuit. Any standard size (T-1 or T-1 3/4) red LED with forward voltage between 1.6 & 2.2 volts (current = 20ma)



will work. The LED will light when AMP-2 is active. Connect the switch to the Slingshot Remote input on the Headbone with a two conductor cable. Connecting a remote footswitch to the Headbone will disable the onboard footswitch. If you are unsure of these requirements, please refer to a qualified electronic technician.

FAQ

Q: I heard that tube amps must always see a speaker load or else they will blow up. Is this true?

A: This is true. To deal with this, the Headbone is equipped to manage two loads: the speaker for the active amp and a load resistor for the standby amp. The Headbone transitions between these two loads when the footswitch is toggled.

Q: Is the Headbone a load-box?

A: No. A load-box is designed to absorb an amplifier's full output and pass a reduced amount of power to the speaker. The Headbone uses a much smaller load resistor to provide an idle load for the standby amplifier.

Q: Why does the Headbone use opto-couplers and relays to switch the guitar and amp signals?

A: To switch active signals a circuit designer must choose between voltage controlled amplifiers (VCA's), opto-couplers, relays, or converting the signal to digital and then back to the analogue domain. The type of guitarist that uses a Radial product is generally a purist and is very concerned about retaining the natural tone of his instrument. VCA and digital circuits are not acceptable as they change the tone of the instrument. Tonebone products use opto-couplers on the hi-impedance circuits to eliminate all switching noise and relays on the speaker level signals where high voltage is present.

Q: I have heard that using an echo with a head switcher can cause a problem with the amps. Is this true?

A: It depends on where the delay is positioned in the signal chain. If the delay is placed before the Headbone, there is no problem. If the delay device is placed after the Headbone, or in an amplifier's effects loop, you can have a problem because the echo may continue to generate a signal and send it through the "stand-by" amp with no speaker load connected. It is generally not good to run an amp this way as the output transformer can heat up and ultimately short out. Thus, always put delay and looping devices before the Headbone in the signal chain.

Q: Can I use the Headbone like an A/B box?

A: It certainly could be done, but you may encounter ground loop problems as the Headbone is not set up for this function. The Radial Switchbone would definitely be a better choice.

Q: Can I use the Headbone with a MIDI switcher?

A: Yes. Most MIDI switchers are equipped with a contact closure output jack. This would be connected to the Headbone's Slingshot input to remotely control amp switching.

Q: If I do not want to use the Slingshot remote, how far from the

amps and speaker can I be?

A: As a general rule, we do not recommend running cables any more than 20 feet as you are subjecting the signal to increased resistance. If you are intent on doing so, use good quality cables. For speaker connections use large gauge (12AWG) speaker cables. For guitar signals use low capacitance shielded cables.

Q: How do I know if my footswitch will be Slingshot compatible?

A: If your external footswitch employs a basic latching type switch with a ¼" or ¼" TRS connector it will, in all likelihood, be compatible. If it employs some type of multi-pin connector or telephone style jack, it may not. Consult your dealer or manufacturer for advice on how you can make an adaptor that will allow you to enjoy the benefits of the Headbone's Slingshot.

Q: Can I use another power supply other than the 15VDC that comes with the Headbone?

A: No. Never use another power supply unit other than the one included with your Headbone. Because of the Headbone's Class-A circuit, a more powerful 15VDC supply is required. If you need a replacement power supply, contact your Tonebone dealer.

Q: If I have a 300-Watt amp, can I modify the Headbone?

A: Yes. In fact we have included a provision in the design to allow a 350-Watt relay to be factory installed in the Headbone. Simply contact your Tonebone dealer for details on how you can order this special high power version.

Q: I have two amp heads; one tube head and one solid state. Do I use the VT or the SS?

A: Unfortunately the world of tubes cannot collide with the world of transistors due to the way that the amps are designed. We are, however, working on the Headbone TS (tube & solid state) that will allow you to do this. Until then, you would have to use a product like the Tonebone Switchbone and carry two speaker cabinets.

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Radial Engineering
1638 Kebet Way, Port Coquitlam, BC V3C 5W9
tel: 604-942-1001 • fax: 604-942-1010
email: info@tonebone.com
web: www.tonebone.com

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