

### **RADIAL ENGINEERING 3 YEAR TRANSFERABLE WARRANTY**

Radial Engineering Ltd. warrants this product to be free from defects in material and workmanship and will remedy any such defects free of charge according to the terms of this warranty. Radial Engineering will repair or replace at its option any defective component(s) of this product, excluding the finish, the tube, the footswitch (tubes and footswitches are warranted for 90 days) and wear and tear from normal use, for a period of three (3) years from the original date of purchase. In the event that a particular product is no longer available, Radial Engineering reserves the right to replace the product with a similar product of equal or greater value. In the unlikely event that a defect is uncovered, please call 1-800-942-1001 or email [service@radialeng.com](mailto:service@radialeng.com) to obtain an RA number (Return Authorization number) before the 3 year warranty period expires. Once you have obtained an RA number you must return the product, freight prepaid, within fifteen (15) days after the date the RA number is issued. To make a request or claim under this limited warranty, the product must be returned prepaid in the original shipping container (or equivalent) to Radial Engineering or to an authorized repair centre and you must assume the risk of loss or damage. A copy of the original invoice showing date of purchase and the dealer name must accompany any request for work to be performed under this limited warranty. This limited warranty shall not apply if the product has been damaged due to abuse, misuse, misapplication, accident or as a result of service or modification by any other than an authorized repair centre.

THERE ARE NO EXPRESSED WARRANTIES OTHER THAN THOSE ON THE FACE HEREOF AND DESCRIBED ABOVE. NO WARRANTIES WHETHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE SHALL EXTEND BEYOND THE RESPECTIVE WARRANTY PERIOD DESCRIBED ABOVE OF THREE YEARS. RADIAL ENGINEERING SHALL NOT BE RESPONSIBLE OR LIABLE FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSS ARISING FROM THE USE OF THIS PRODUCT. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS, WHICH MAY VARY DEPENDING ON WHERE YOU LIVE AND WHERE THE PRODUCT WAS PURCHASED.



True to the Music

1588 Kebet Way, Port Coquitlam, BC V3C 5M5  
tel: 604-942-1001 fax: 604-942-1010  
email: [info@radialeng.com](mailto:info@radialeng.com)

JX-2 Users Guide v2.0 - Feb. 2010 Part #: R870 1030 00  
Specifications and appearance subject to change without notice. Copyright  
© 2010 Radial Engineering Ltd.

**[www.tonebone.com](http://www.tonebone.com)  
[www.radialeng.com](http://www.radialeng.com)**

# **TONEBONE™**

## **JX-2 Switchbone™ Users Guide**



**CAUTION:** You must read this manual before connecting this device. There is a strict procedure to follow especially when connecting older vintage amplifiers that are not equipped with safety grounds.



Radial Engineering  
1588 Kebet Way, Port Coquitlam BC V3C 5M5  
tel: 604-942-1001 • fax: 604-942-1010  
email: [info@radialeng.com](mailto:info@radialeng.com) • web: [www.radialeng.com](http://www.radialeng.com)

## <<<<<< CAUTION >>>>>>

### Please read before connecting electronic devices to your JX2!

Caution must be used when connecting electronic equipment to the JX2 switchbone. The JX2 bridges all electronic equipment connected to it so faulty wiring or incorrect grounding of any of the equipment may cause a shock hazard to be present and/or damage to the JX2 or other connected equipment. Because grounding schemes differ between manufacturers, it is important to check for correct polarity, in particular with older amplifiers using 2-prong unprotected A/C cords. If the polarity is reversed on an ungrounded amplifier there may be a potential of 120V present between the amp chassis and ground. Radial Engineering takes no responsibility for this or how the JX2 is connected or used. It is the user's full responsibility to ensure that proper electrical polarity is maintained on all equipment connected to the JX2 and that proper building electrical codes have been followed wherever the JX2 is being used.

To reduce opportunity for shock hazard or damage to the JX2 or connected equipment, plug the 1/4" connectors into the amplifiers first and then to the JX2. This is especially important when using old amplifiers that do not have 3-prong plugs as the possibility exists to touch the chassis ground with the connector plug tip when the plug is inserted into the jack.

**Cautions for amplifiers with ungrounded 2-prong A/C cords:** Before connecting any input to an ungrounded amplifier, power the amp up and listen to the residual hum. If the amp has a two-position ground polarity reverse switch, set the switch in the position that produces the least residual hum from the speakers. If there is no polarity switch, reverse the A/C plug at the outlet to find the least residual hum.

**To ensure an ungrounded amplifier does not present a shock hazard:** Test for voltage potential by connecting a voltmeter between the amplifier chassis and the JX2 chassis. If voltage is present, reverse the amplifier's A/C supply polarity and test again.

Note that due to this potential problem, damage to the JX2 or other connected equipment caused by improper A/C polarity is not covered by warranty.

# TONEBONE™

## JX•2 Switchbone User Guide

INDEX	PAGE
Caution .....	1
Introduction.....	3
Concept .....	3
Grounding .....	4
Feature set .....	5
Getting started.....	6
Switch LED indicators .....	7
Drag™ Control .....	8
Boost Circuit .....	8
Set-ups .....	9
Questions & Answers .....	Inside back cover
Warranty .....	Outside back cover

Greetings from Radial! You are now an official Bonehead!

The following manual has been written to assist you with your new Radial JX2 Switchbone. Please take the time to read it so you can take maximum advantage of all the features that have been designed into this marvelous device and are familiar with the safety procedures.

Should you have any questions on the Switchbone, please visit our web site [www.tonebone.com](http://www.tonebone.com) for up-to-date information. Occasionally, take a few minutes to peruse the questions and answers section for helpful tips that will surely emerge as more and more Switchbones are sold. If by chance you have a question that is not covered in this manual or on our web site, please feel free to contact Radial at [info@radialeng.com](mailto:info@radialeng.com) and we will do our very best to get you an answer quickly. These questions are often the source for more FAQs on our site and serve to help other Boneheads.

In the interim, enjoy! The Switchbone has been developed to help you make music more fun and hopefully, enhance your creative spirit.

Now get out there and fire up that double stack!

## 1. INTRODUCTION

The Radial JX2 Switchbone was born from the demand we received from users like you. The Switchbone is in fact a pared down version of the popular Radial JD7 Injector, a studio recording device that allows as many as 7 amplifiers to be driven from one guitar.

The Switchbone has been optimized for stage use and allows a guitar to drive two amplifiers and a tuner from one guitar input and do it without introducing buzz, hum, or distortion.

Sounds easy enough... but it is not. For those that have tried connecting two amplifiers together using Y-cords or some of the other AB-Y boxes that have come before, you are familiar with the many challenges: Drop in gain, tone changes, buzz and hum just to name a few. The Radial Switchbone is a remarkable device that deals with all of these problems and brings forth a design that is easy to use, musical and truly effective.

Please take the time to read this manual before you plug in. It will help you get the most out of your Radial Switchbone and also eliminate potential shock hazards that can occur when connecting equipment together.

## 2. CONCEPT

The Radial Switchbone begins with the concept that most 'tone crazy' players will generally use two amps on stage. (Of course more is better, but then someone would have to carry all those amps to the gigs!)

When one drives two amplifiers with one guitar, the signal from the pickup is divided in two and the sound changes. To get around this problem, the Switchbone employs a unique Class-A amplifier circuit that has been optimized for use with guitars. With customers like Eric Johnson, Carlos Santana and Neal Schon, we are not allowed to alter the sound of their favorite vintage axe. The sound must be real!

This leads to the next problem: Your guitar has now gone from being passive to essentially becoming active. Your pickup is no longer connected directly to the amplifier. It is being 'buffered' (amplified). The natural relationship is lost. To compensate for this, we have introduced a feature called Drag™ control to allow you to reintroduce the natural loading that is lost. With load-correction, the instrument goes back to normal. It breathes!

Finally as soon as you connect two amplifiers together they hum, they buzz and sometimes even spark with hundreds of volts! This is due to the way that each manufacturer builds their amplifiers. Some use positive ground, others negative. Some use the chassis as a ground plane and some old designs from the 50's and 60's that do not have proper 3-pin safety U grounds. The Radial Switchbone incorporates a transformer isolated output, a ground lift switch and a polarity reverse switch to allow your two amplifiers to be used in tandem. These are designed to separate and isolate the electrical current of each amplifier and eliminate ground loops.

Of course, once you get these amps connected together, you have to control them! This is where the Switchbone also shines! The Switchbone is easy to use. The foot switch layout and LED readout follows a 'common sense' and intuitive approach that is very natural. We have also added a boost circuit to allow you to 'step-up' the output to both amps simultaneously for a solo or extra saturation when playing through a distorted sound. We have even added a separate output for your tuner. This also takes the tuner out of the audio circuit thus ensuring you get the direct tone of your guitar.

## CAUTION:

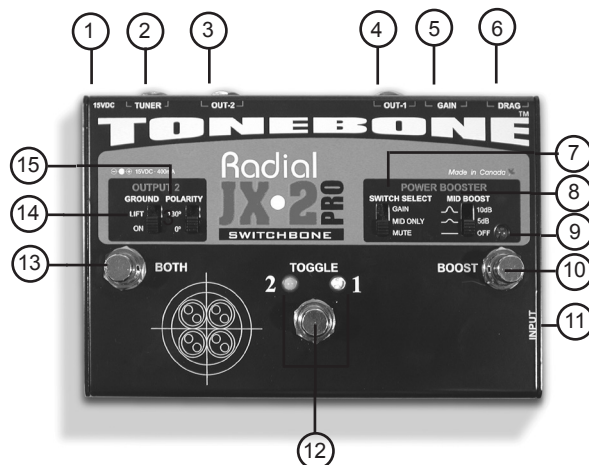
When connecting two amplifiers together you must ensure that they are properly grounded as per the electrical code!

Unfortunately, we are unable to test every amplifier on the market and cannot assure that the electrical system in your house or venue has been wired correctly. You must ensure that proper electrical codes have been maintained and only equipment that has been certified by your country's electrical code is being used.

### An important note about grounding:

Since guitar circuits are high-gain and high impedance, RF noise, hum and buzz are easily induced. Connecting equipment with different grounding schemes often results in ground loops and more noise. The Radial JX2 addresses these problems by employing a floating ground architecture which requires an earth ground. This is accomplished via the Channel-1 output. Channel-1 provides an electrical ground from the JX2 chassis to the primary guitar amplifier, therefore **always connect Channel-1 to a guitar amp with a 3-prong grounded A/C power cord** to enable a proper ground and keep noise out.

**To ensure an ungrounded (2 prong) amplifier does not present a shock hazard:** Test for voltage potential by connecting a voltmeter between the amplifier chassis and the JX2 chassis. If voltage is present, reverse the amplifier's A/C supply polarity and test again.

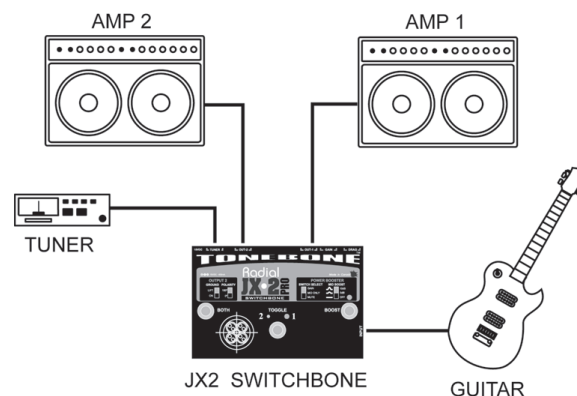


1. **15VDC** Supply center positive. Only use the Radial power supply that came with your Tonebone.
2. **TUNER** output keeps tuner out of audio signal path.
3. **OUT-2** is transformer isolated for your 2nd amp.
4. **OUT-1** is your primary connection for proper grounding this needs to be connected at all times.
5. **GAIN** is used to adjust the power booster gain level.
6. **DRAG™** load connection let's you dial in the proper load for your pick-ups.
7. **SWITCH SELECT** allows you to assign the Boost Foot Switch to mute, mid boost only, or gain and mid boost.
8. **MID BOOST** selector lets you add desired amount of mid range on the power boost circuit.
9. **BOOST** on or off LED monitors the Boost status.
10. **BOOST** on or off foot switch.
11. **INPUT** from your guitar.
12. **TOGGLE SWITCH AND LED INDICATORS** Foot switch toggles input signal between out-1 and out-2. LED indicators show output status.
13. **BOTH** Foot Switch turns BOTH 1 & 2 amps on or off.
14. **GROUND** lift disconnects the ground at output 2(B), to reduce noise.
15. **POLARITY** reverse toggles output 2(B)'s polarity to bring your amps or pedals into phase.

### 3. GETTING STARTED

The Radial Switchbone comes equipped with a 15VDC power supply. Connect this to your pedal and then to the AC power outlet. Before connecting your guitar and amplifiers, make sure the amplifiers are turned off. The Switchbone will automatically turn on as soon as it is connected to power. Before you start, make sure that the **BOOST** light is off (boost turned off) and the **BOTH** switch/LED is also off. The only LED that should be on is either 1(A) or 2(B) output above the toggle select.

**CAUTION:** Make sure you have read the electrical connections and tested your amps for proper grounding as detailed previously.



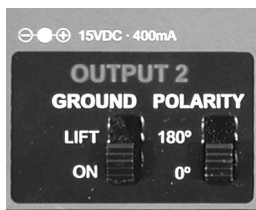
To reduce opportunity for shock hazard or damage to the JX2 or connected equipment, plug the 1/4" connectors into the amplifiers first and then to the JX2. This is especially important when using old amplifiers that do not have 3-prong plugs as the possibility exists to touch the chassis ground with the connector plug tip when the plug is inserted into the jack.

Connecting your amplifiers is easy. Output 1(A) should be for your main amplifier. Output 2(B) will be the alternate. The 2(B) output incorporates the isolation transformer, ground lift switch and 180 degree polarity reverse. Output 1(A) is the ground channel and should connect to an amplifier that is equipped with a proper U safety ground.

You can insert effect pedals before or after the JX2 Switchbone to create all kinds of pedal set-ups. This is discussed in 'Set-ups' later in this manual.

Once your set-up is connected, make sure your amp volumes and effect pedals are OFF before you turn on your amps. The following tests should be done with both amps set on a clean setting so that you can hear any potential noise, phase and hum problems.

Start with 1(A) by turning your amp volume up. Now do the same by switching to 2(B). Once both channels are working and are set to relatively the same volume, depress the **BOTH** foot switch. Both amps should now be on.



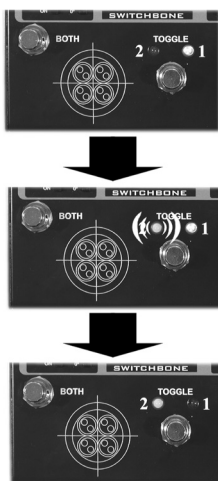
Now listen to the residual noise. Try lifting the ground switch on output 2(B). If you cannot hear a difference, then leave the ground connected. Now try reversing the polarity. This will give you a sense of spacious-ness when *out of phase* and a more unified and centered sound when *in phase*.

The polarity reverse has been designed to allow you to connect to two different amplifiers or two amp channels and compensate for the way these have been wired. It should be noted that many effect pedals also reverse the polarity as sound passes through them.

#### 4. SWITCH LED INDICATORS

With the Switchbone, you do not have to tap dance to get your set-ups. The innovative 'Toggle mode<sup>™</sup>' switch allows you to toggle between two amps with the touch of a switch. Each amp has an LED indicator that lets you know what is on.

When the **BOTH** switch is depressed, the **BOTH** LED will go on and the newly activated amplifier LED will begin to flash. The flashing light tells you that when the **BOTH** is disengaged, this amp output will turn off. The cool thing about this feature is that when both amps are on, you can hit the **TOGGLE** switch and the flashing LED will toggle from Amp-1 to Amp-2. This means that you can pre-determine which amp will be turned off by simply depressing the **TOGGLE** switch so that the amp that you intend to shut off is in the flashing mode. No tap dancing!



#### Example:

When amp 1 is on, the channel 1 LED next to the **TOGGLE** switch will be lit.

Depress the **BOTH** switch and the 2nd channel is now activated. The new channel LED will flash.

Hit the **TOGGLE** foot switch and the flashing LED will toggle between the two channels.

To go back to single channel operation, depress the **BOTH** switch again and the flashing channel will go off.

#### 5. DRAG<sup>™</sup> CONTROL

Drag<sup>™</sup> control was originally introduced on the Radial JD7 Injector as a means to correct the loading that is lost when a guitar signal passes through an 'amplification stage' or a buffer. Here's the scoop: When you connect your guitar directly to your amp, the amplifier's input impedance reacts with the pick-up and this relationship plays a critical role in the tone of the instrument and amplifier combination. Since the Switchbone is essentially a pre-amplifier, it actually turns your passive guitar into an active one. The problem is that your guitar no longer 'sees' your amplifier. It is seeing a 'perfect' load from the Switchbone. But no matter how perfect 'perfect' is, sometimes perfect may not sound right. With one simple control, Drag<sup>™</sup> allows you to reintroduce the relationship that is lost.



Start with **DRAG** set to 12 o'clock. This is about normal for a Fender Strat and a Twin. As you go clock-wise, you are reducing Drag. This sounds like a slightly high frequency or presence boost. Move the control until it sounds right to you. We have purposely recessed the Drag<sup>™</sup> control so that once set, it is not easily changed. Use a guitar pick like a screwdriver to make the adjustments.

#### 6. BOOST CIRCUIT

The Switchbone is equipped with a power booster to allow you to kick up the output level for solos, or to compensate when using only one amp. The boost level is variable and is controlled by the recessed potentiometer next to the Drag control.



There are also two slider switches that are associated with the boost circuit. The first switch assigns the way the foot switch is being used. There are 3 settings:

**Position 1 – MUTE:** disengages the boost function and turns this into a mute switch. This allows you to monitor the Tuner output without having

any sound pass through to the output of the JX2. Be careful! This is usually the first place to look if you are not getting any sound out of your Switchbone!

**Position 2 – MID boost ONLY:** This bypasses the boost function and directs the signal through a mid boost. The mid boost is used to increase sustain for soloing. There are three settings on the mid boost circuit. Flat, 5dB and 10dB. These have been carefully selected to provide a functional increase that will match most guitars.

**Position 3 – Mid Boost and GAIN boost:** This is the most often used setting. This allows both gain and mid boost to be boosted as needed. Simply adjust the boost level and away you go.

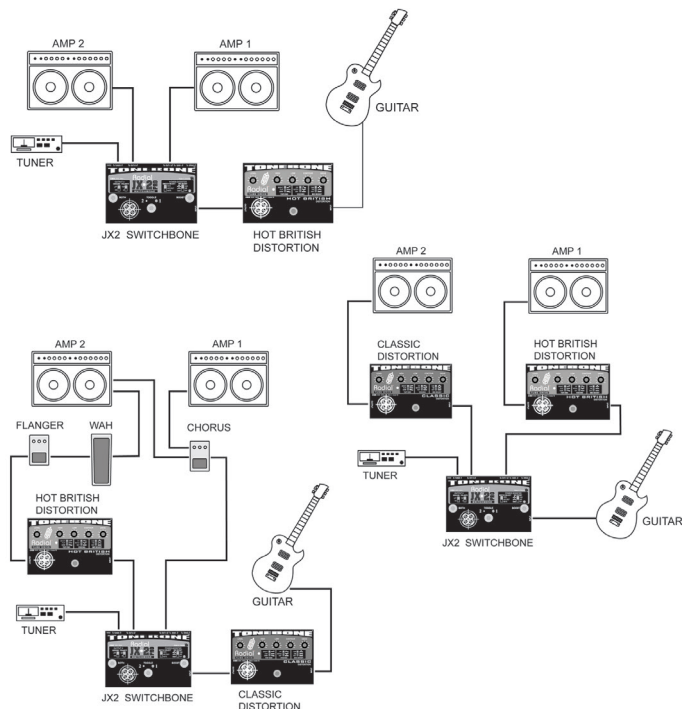
## 7. SET-UPS

The Radial Switchbone has been designed for maximum flexibility on pedal boards or as a stand alone amplifier switcher / controller. As such, the Switchbone can be positioned at the input of the signal chain, the output or in between. Where you use the Switchbone is entirely based on how you intend to use it. As such, the combinations are truly endless and the only way to truly approach the subject and bring value to you the player is by discussing options and a philosophical approach to creating your sound. (Of course all the while having fun!)

Take a moment to consider how the boost circuit will work within a given set-up. For instance, if you are using an amplifier that is distorted, the boost will not increase perceived loudness but increase the saturation or distortion. This would for instance, add greater sustain during a solo.

Activating the **BOOST** with a clean amplifier will on the other hand increase the loudness. Therefore if one were to use the Switchbone after a distortion pedal, one could get a boost for soloing. Used in front of a distortion pedal would once again yield more saturation.

As shown here, the Switchbone can be used in countless configurations based on how your guitar amps are designed, the type of sounds you are looking for and what effect pedals you use. Ultimately, it will open the door for new sounds and combinations never before realized.



## SWITCHBONE QUESTIONS & ANSWERS

### Can I use any two amplifiers with the Switchbone?

Yes...the Switchbone should be able to be used with any two guitar amplifiers without problems. Make sure you follow the set-up procedures to ensure your equipment is safe. If you are not sure consult a qualified technician.

### What happens when I reverse the polarity of the 2nd amp?

The polarity reverse allows you to correctly line-up the polarity of the devices that you are using. For instance, some amplifiers will be 'out of phase' with others and some amp channels even on the same amplifier will be out of phase with each other. The Switchbone allows you to compensate or create new sounds by purposely setting one channel out of phase with the other.

### What is the difference between out-of-phase and polarity reverse?

In guitar lingo these terms are interchanged however in true electrical terms they are different. Reversing the polarity is switching the positive and the negative wires around. Phase is actually in the time domain. A signal can be 30 degrees out of phase with another causing the sound to be muddy. 180 degree absolute phase shift is essentially identical to reversing the polarity.

### What is an AB box?

An AB box is a switcher that allows the musician to select one amp (A) or the other (B). These are usually passive devices that are simply a switch wired to two outputs.

### What is an AB-Y box?

This is a box that allows AB functionality as above with the added features of being able to turn both amps on at the same time like a Y-jack.

### How does the Switchbone eliminate Switch noise?

Most AB boxes cause a click or thump when switching. The Switchbone uses a series of expensive devices called photo cells (2 per switch) to perform this task. We go to this extreme because when a guitar amp is set to distortion the input sensitivity is increased dramatically and clicks and pops caused by switching are amplified.

### Why do most AB-Y boxes sound so bad?

The problem is mostly due to the Y or when driving more than one amplifier at the same time. The moment you try to drive more than one amplifier, the guitar level will drop by half or 3dB unless amplified. This causes the guitar to lack punch and definition. You can fix the problem by introducing an amplifier but unless done very carefully, the sound of the guitar will change. Then of course you have to deal with the hum, buzz and polarity problems.

### Why is there a mid boost connected to the power boost circuit?

Guitars live in the mid range. This means that if you want your guitar to cut through the mix during a solo or if you intend to increase sustain, adding mid range is critical.

### Will Drag™ Control still work if pedals are in front of the Switchbone?

Yes although it is most noticeable with true bypass pedals.

### Can I use the Switchbone in the studio?

Yes of course! The Switchbone is extremely clean and will work fine in the studio. You can also use it to 're-amplify' your amps or effects by recording a dry track, and then sending the signal to the Radial X-Amp which converts low-impedance signals to high-impedance guitar signals. The X-Amp would then be connected to the Switchbone.