



True to the Music

# J48™

## Active Direct Box User Guide



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# RADIAL J48™ USER GUIDE

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Features and specifications are subject to change without notice.

## INTRODUCTION

Congratulations on your purchase of the Radial J48 direct box. The J48 is a unique direct box that has been designed to handle the new generation of battery-equipped acoustic guitars and basses that often overload typical direct boxes and cause distortion. Best of all, the J48 does so without the use of batteries.

The secret is the J48's internal digital switching power supply that converts 48V phantom power to produce a higher internal rail voltage. This allows the J48 to handle transients of up to 9 volts without choking. More dynamic headroom results in less square wave distortion. In fact, every aspect of the J48 design has been optimized for maximum headroom while introducing minimal phase, harmonic and inter-modulation distortion.

But this is not all. The Radial J48 features a transformer that isolates 48V phantom power to help eliminate ground loops while removing hash and system noise. This ensures that what you put in - you get out. Nothing altered, nothing changed: just the pure and natural tone of the instrument.

We invite you to read through this manual before using your Radial J48 so that you can maximize its' potential. Please log onto [www.radialeng.com](http://www.radialeng.com) for further details and FAQ updates. We also invite you to forward any comments, questions or suggestions to [info@radialeng.com](mailto:info@radialeng.com). We love to hear from you!

Enjoy.



## INPUT AND OUTPUT PANEL FEATURE SET



### 1. -15dB pad switch

A provisional -15dB pad reduces the input signal to the circuit to ensure a clean and distortion-free signal is obtained.

### 2. 48V check LED

Used in conjunction with the low-cut filter switch to check for phantom power.

### 3. Merge switch

A unique 'merge' function mixes the input and thru-put connectors into a pair of left-right inputs with mono output at the XLR.

### 4. 1/4" input and thru-put jacks

These are used to connect the instrument to the direct box and the direct box to the instrument amplifier.

### 5. Protective bookend cover

The innovative bookend cover provides protection to switches and connectors against damage during hectic stage set-ups.



### 6. XLR male output

This male XLR output connector is wired to the AES standard with pin-1 ground and pin-2 hot and puts out a 600 Ohm mic level signal.

### 7. Polarity reverse 180° switch

This toggles the XLR pin-2 and pin-3 to interface with older equipment. Also used when combining two sources (mic & DI) on the same instrument to avoid phase cancellation.

### 8. Low-cut filter switch (-6dB down at 80Hz)

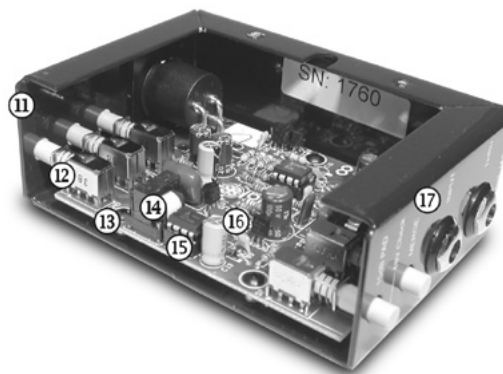
Gently rolls off bass to reduce rumble and acoustic resonance. Dual function switch also used to check presence of 48V phantom power.

### 9. Ground-lift switch

This ground-lift switch breaks the ground between the input & the output to eliminate hum and noise caused by ground loops.

### 10. Full bottom no-slip pad

Provides mechanical isolation to reduce slipping and electrical isolation from amplifier frames and handles.



#### 11. **Welded I beam construction**

14 gauge steel welded I-beam construction for maximum durability and a lifetime of trouble free performance.

#### 12. **Silent, high cycle switches**

Super high repetition switches withstand heavy use and heavy fingers. "Make before break" design eliminates pops and clicks when toggling switch positions.

#### 13. **Double sided circuit board**

The military grade double-sided PC board provides maximum durability and added resistance against part failure.

#### 14. **Power supply transformer**

The transformer in the power supply helps eliminate ground loops by isolating the power coming in from the XLRs' 48V phantom feed.

#### 15. **Digital DC to DC switching power supply**

Steps up phantom power to produce higher internal rail voltage. This provides more headroom and results in less distortion and a more natural sound.

#### 16. **Oversized capacitors**

Oversized capacitors produce maximum headroom.

#### 17. **Baked-on enamel finish**

Looks great on stage or in the studio for years to come.

## THE J48 QUICK START

This section is for advanced users. It provides a quick set of instructions for those that are familiar with direct boxes. For up and coming engineers, we suggest that you read through the manual before using your Radial J48.

**Caution!** *When connecting or disconnecting any audio device always ensure the power is off or all levels are set to zero. This practice will reduce the probability of noise, such as a capacitor discharge, from being sent through the amplifier to the speakers, which could cause a big “bang” in your sound system or even cause a speaker to blow. This is especially true with phantom powered equipment.*

The Radial J48 is an active direct box and as such requires standard 48V phantom for powering as found on most consoles and pre-amps. Before you start, make sure the phantom power has been turned on at the console. You can check for the presence of 48V phantom by depressing the low-cut filter switch. **If phantom is present, the LED on the front panel will illuminate for a brief moment.**

Make sure all switches are set in the ‘out’ position. Plug the instrument into the INPUT. Connect the THRU to the guitar amplifier or keyboard mixer, and the XLR OUTPUT to the PA or recording mixing console.

With the PAD set to 0dB (outward position), slowly turn up the input level at the mixer and listen. The J48 should be able to handle most instrument levels without any problems. For exceptionally high signal levels such as from digital pianos, samplers and high-output basses, inserting the –15dB pad will reduce the input level to the active circuit. If you hear distortion, simply depress the –15dB pad. To reduce low frequency mud and run-away acoustic resonance, the J48 is equipped with a low-cut filter that gently rolls off bass (-6db at 80Hz). This has the added benefit of increasing the dynamic range when depressed.

Since the Radial J48 employs a transformer in the power supply, you are actually isolating the input and the output electrical connection. This will eliminate most buzz and hum caused by so-called ground loops. If you encounter 60-cycle hum or noise, it is likely that you have a different ground potential at the input and output of the J48. Depressing the ground lift (break) switch will generally solve the problem.

The J48 also features a polarity reverse. This reverses pin-2 and pin-3 at the XLR. The J48 is wired following the AES standard with pin-2 hot. Reversing the polarity is generally not required unless the instrument is being both DI'd and mic'd. If so, the polarity reverse switch would allow both the mic and the J48 to be set ‘in-phase’ should these be reversed.

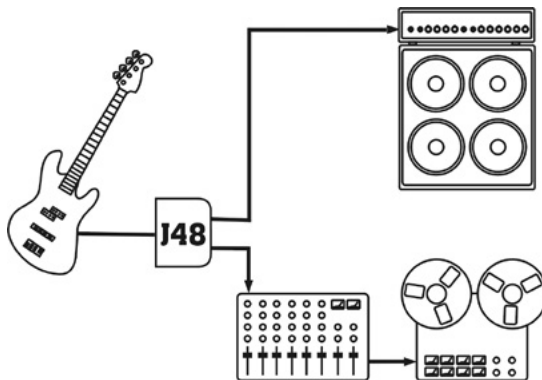
You are now ready to go! Now, close your eyes and listen. The J48 is without a doubt one of the most musical DI boxes manufactured today.

## DIRECT BOX BASICS

### What is a direct box anyway?

The name 'direct box' comes from direct insert box. This is why these marvelous contraptions are also called DI's. 'Direct Insertion' means exactly that: *To insert a signal directly or take an audio signal from the source and send it **directly** to a mix point or recorder.* We take this very seriously with all our direct boxes and as such, have designed these to reproduce the most accurate 'picture' of the source signal no matter what the instrument.

Direct boxes perform several important functions: they are designed as impedance matching and signal balancing devices. This means that they take the high impedance of a guitar or keyboard and 'transform' it to the low impedance used in a balanced sound system. Balanced signals inherently cancel noise and due to their lower impedance, are capable of very long cable runs. Balanced signals are the norm in professional recording, broadcast and live sound. By properly matching the impedance you will enjoy better sound, less noise and an extended frequency response.



*Typical DI box setup*



## Getting to know your Radial J48

As a rule, all direct boxes follow the same basic procedures when connecting them to a sound system. The instrument plugs into the IN jack, the musician's instrument amplifier connects to the THRU jack, while the mixer or recorder is connected from the XLR OUTPUT. Since the XLR output connection to the mixer taps the signal **before** it goes to the musician's amplifier, this allows the mixing engineer to 'capture' the signal **before** it is modified by the musician, thus resulting in the purest source possible. *It is important to note that what may sound good on stage may not necessarily sound good in the venue.*

By sending an unaltered signal to the front of house mix position (FOH), the engineer is able to get the sound he is looking for with minimal phase and harmonic distortion. This is likely the main reason why Radial direct boxes are so popular. Radial DI's do not alter the sound in any way before it gets to the mix position.

## High to low impedance conversion and balancing

The Radial J48 features a 220k Ohm input impedance for the instrument. As the signal passes through the J48 to the XLR output, it is converted to a balanced 600 Ohm low impedance signal. This allows long cable runs without introducing noise into the audio signal path. It is important to note that the output of the Radial J48 is mic level. This allows the J48 to be used along side microphone signals without introducing cross-talk or causing saturation when driving the signal through the mic-bridging transformers of a splitter snake.

## Phantom powering

The Radial J48 is an active direct box. This means that it employs a powered circuit called a buffer to convert the impedance and balance the signal. The J48 derives its power from the mixing console using remote phantom power. Phantom power is a clever 48V-DC supply that comes from the mixer and runs on top of the audio through the XLR mic cable without affecting the audio. It was originally designed to provide power to capacitive or condenser microphones.

When direct boxes first appeared, they used batteries. The problem with batteries is that when they run low, they cause the circuit to distort. It's pretty simple: less power = less headroom. Phantom power solved the problem by providing a remote power source that could eliminate the battery. Eureka! Phantom power gave us a stable power supply and no batteries to worry about.

### **Dynamic headroom**

Years ago when the first phantom powered active direct boxes came around, the “instrument” of the day was a passive Fender Bass. These instruments would typically generate 1 or 2 peak volts at best. This seemed to work well. Then all of a sudden, someone decided to put a battery powered pre-amp in the instrument and the output levels increased. Today basses and acoustic guitars will easily output voltages as high as 7 volts. The result: overload!

With more input voltage, you need more dynamic handling to handle the transients. This means you need a higher internal rail voltage. The Radial J48 converts the 48V phantom using a similar approach to today's super-high output power amplifiers whereby a digital switching power supply is employed to raise the internal rail voltage from the typical 3 volts to 9 volts. Headroom!

Because the J48 is able to handle these transients without overloading, you eliminate square wave distortion. Because of larger internal capacitors, the circuit is not constantly working at its peak. Harmonic distortion is reduced, inter-modulation distortion goes down and phase distortion is minimized. The Radial J48 coasts along producing a less stressed and more musical sound.

### **Buzz and hum caused by ground loops**

Probably the most challenging aspect when setting up a sound system is reducing system noise. The most common problem is buzz and hum due to ground loops. This is generally caused by two separate ground paths with different voltage potentials interacting together, such as an AC powered keyboard connected through a DI to a mixer. Although lifting the ground can help, this is often not sufficient. Often times, engineers will revert to passive direct boxes such as the Radial JDI just to avoid ground loops. The Radial J48 employs a transformer as part of the internal switching power supply design. The transformer isolates the current from the phantom power supply, eliminating the ground loop. Clever.

### **Plug and play easy**

Ultimately, a good direct box should be “plug and play” easy to use. The J48 is a sophisticated device on the inside that is designed to be easy to use on the outside. By understanding the design, we feel that you can make better use of the features that are built into this marvelous direct box.

## THE J48 FEATURES AND FUNCTIONS

### The 1/4" input and thru-put connectors

The JDI features two 1/4" jacks on the input panel. These are designed to accept instrument inputs from basses, guitars, keyboards, drum machines, etc. The left 1/4" input jack is normally connected to the source instrument. The right 1/4" jack is normally used as a parallel 'thru' connector and feeds the instrument signal to the musician's on-stage amplifier.

Using the 'thru' jack with an on-stage amplifier allows both the musician and the engineer to work with the original signal direct from the instrument (*Fig. A*). This way, the musician can set up his stage sound with his own EQ while the audio engineer can process the instrument to sound good in the venue through the PA system.

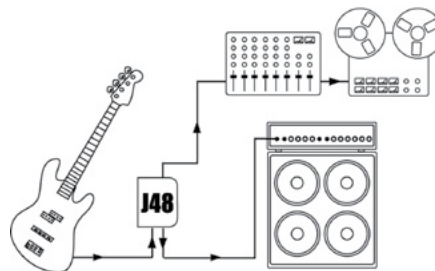


Fig. A: J48 used with on-stage instrument amplifier.

Some instruments do not use on-stage amplification. It is common for instruments such as acoustic guitar to be connected directly to the PA system through the JDI using only the balanced XLR output (*Fig. B*). This allows the signal to feed the stage snakes, monitor mixer for fold-back and main PA, just like microphone signals do. In this case, the thru jack would not be used.

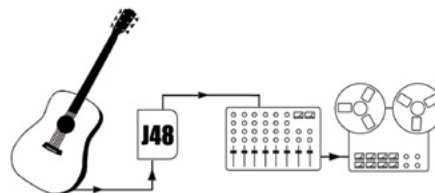


Fig. B: J48 used with acoustic instrument direct to audio system.

### **High input impedance**

The J48™ presents the instrument with a high input impedance to minimize pickup loading. This means that low output instruments such as old Jazz or P-basses will not sound different when connected to the instrument amplifier. Note that the instrument is now feeding both the instrument amp and the direct box signal simultaneously. The J48's high input impedance only taps a minute amount of signal and then sends this signal through a buffer which then sends out a balanced signal to the PA system. For the most part, with today's high output instruments, loading is less of an issue. The big concern is overload distortion due to limited dynamic range.

### **Input distortion**

A major concern today is input distortion and dynamic headroom. Just about every acoustic guitar (and many basses) incorporate a built-in active pre-amplifier that boosts the pickup output signal. Furthermore, the musician turns the volume up and pushes his active EQ beyond the nominal (0dB) level. Since these high gain pre-ampts often generate as much as 7 volts, the high output signal distorts the input of most active direct boxes causing harsh square wave distortion. Even though the console may provide 48V phantom power, there is so little current available that most direct boxes are unable to produce enough peak-to-peak rail voltage to handle the signal. This is why acoustic guitars often sound 'thin' and 'scratchy'. It is all the more distressing with bass guitars and keyboards that have tremendous energy in the low end (bass frequencies). Once the signal is distorted, you cannot fix it in the mix. The J48 is designed to handle these signal levels without fear of overloading and is one of the main advantages you will enjoy with your J48.

### **Input distortion and using the -15dB pad**

Occasionally, you may encounter some devices with extremely high output levels than can overdrive the J48s input circuit. The J48 is equipped with a pad to handle these situations. Engaging the -15dB pad reduces the input sensitivity to ensure a clean and distortion-free signal is obtained. Typical devices that may require a pad include digital pianos, samplers, electronic drums, CD players, or the headphone output from an MP3 player.

### **The merge switch**

The J48 features a unique 'merge' function that turns the input and the thru-put into a 'left-right to mono' mix. Depressing the merge switch introduces a resistive mixer circuit that sums the two channels at the XLR output. This innovative function allows two sources such as a stereo keyboard or CD player to merge 'mono', saving valuable channels on the snake and on the mixer when you have more sources than available inputs. To 'merge' simply connect two instruments with similar output levels into the IN and THRU jacks, depress the MERGE switch to the ON position and you are set to go. The internal resistive mixer is set up to do this without posing any problems such as phase canceling.

## The ground lift switch

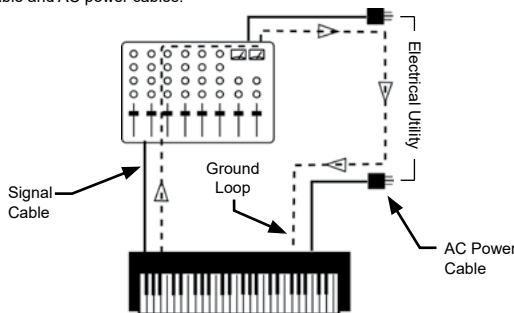
It is common practice to ground all electrical devices in a sound system. Proper grounding assures safe use and generally helps reduce system noise. As the Radial J48 is an interface, it is often placed between two grounded AC powered devices such as a keyboard and a mixer. Often, these two devices will be connected to different AC outlets or may have very different ground reference potentials. When connected together, these can sometimes cause 60-cycle hum or a loud system buzz. This noise is often referred to as a ground loop.

The Radial J48 features an isolation transformer in the power supply that will help eliminate most of this type of noise. But in severe cases, depressing the ground lift switch can help. When lifted, you are actually breaking the internal ground path between the input and the output.

It should be noted that when you are 'going direct' or connecting a bass or acoustic guitar to the Radial J48 without using the thru-put, the ground switch should be set in the out position (grounded). If you are using the thru-put to your personal amp, then your amp and the mixer will have ground paths and breaking the ground would then be considered.

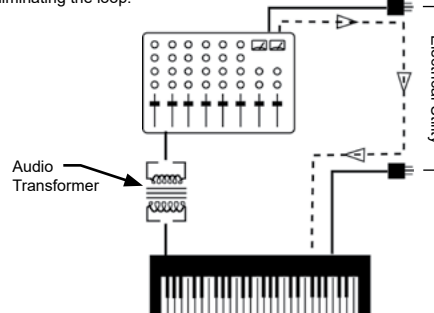
### The Problem:

Ground loop formed between connected equipment by the signal cable and AC power cables.



### The Cure:

An audio transformer (DI box) is introduced at the signal cable eliminating the loop.



### The balanced XLR output

The J48 features a mic level, balanced output jack that uses a standard XLR male connector. This jack is wired to the AES (Audio Engineering Society) standard with pin-1 ground, pin-2 hot and pin-3 cold. Today, pretty much all equipment is manufactured using this standard. Connection is made to the mic-level input of the mixing console or to a standard mic pre-amplifier. The J48 is ideally suited for interface with concert snake systems and splitters where mic and direct box signals are directed to several destinations at the same time such as recording, monitor, broadcast and front-of-house mix positions.

### Phantom powering

The J48 derives its power from the 48V phantom power supply, typically found on all mixers and mic preamplifier channels. This standard powering system will not harm dynamic microphones or other equipment that may be connected to the mixer.

### The 180° polarity reverse switch

A polarity reverse is provided that toggles the XLR pin-2 and pin-3 as the 'hot' or positive signal. This provides several operational benefits: interfacing with older mixing consoles that have pin-3 hot is simply a matter of depressing the polarity reverse. Also, when combining a mic'd and direct signal from the same instrument, one sometimes encounters phase cancellation problems. Reversing the polarity on the J48 will often alleviate this. While recording, this same process provides the engineer with another 'tonal palette' and experimenting with different settings can lead to some very pleasing results.

### Mechanical attributes

One common feature you will find on all Radial products is our relentless pursuit of durability. Open up the J48 to look inside. You will note that the J48 is essentially two boxes in one. A heavy-duty welded I-beam steel frame houses the PC board, circuit and connectors. The PC board is two-sided which means that all components are soldered twice. Furthermore, it is practically impossible to torque the PC board once installed. This ensures years of performance without failure.

The innovative 'book-end' construction features front and back recessed panels that protect the switches and connectors from being damaged during transport or from overzealous roadies. Five minutes before a show is no time for a switch to be broken. Worse yet, testing and sorting out noise and ground problems and doing sound checks can sometimes take hours. This can easily be hampered by a simple throw of a switch. ***You'll be glad our switches are tough to switch!***

The finish is a baked enamel that will provide years of performance and still look great! The J48 is also outfitted with a full bottom no-slip pad. This performs several important functions. To begin with, it provides plenty of 'stay-put' on hectic stages. This keeps the DI's from falling off amplifiers or sliding around when they are stacked. The no-slip pad also works as an

electrical isolator when placed on guitar amplifiers. Some guitar amplifier chassis' are bolted directly to the amp carry handles and these can sometimes be electrically charged. The isolation pad helps minimize shock hazards, especially with older amplifiers. If the pad ever wears down, it can be replaced by ordering a spare from the factory.

### J-Rak and J-Clamp mounting kit

The J-Rak is an innovative rack shelf/chassis that lets you rack-mount up to eight Radial JDI's, J48's or the other similarly sized Radial J-Class products into a high-density 2-RU space. Each unit can be front or rear mounted allowing the system designer to have the XLRs on the front or rear of the rack, depending on the application. The J-Clamp is a mounting adapter that allows any of the Radial J-Class products to be permanently mounted in locations such as in podiums, under board room tables and inside amplifier and effect racks. Features a heavy-duty steel shell with built in mounting flange and user-writable tabs.



Radial J-Rak™



Radial J-Clamp™

## FREQUENTLY ASKED QUESTIONS

### ***What is the difference between active & passive?***

Active DI's have a built-in buffer that requires power to run, while passive DI's use a transformer to convert the signal. Both transform or convert the instrument's high-impedance output to a low impedance balanced microphone level. This allows long cable runs without adding unwanted noise. Passive boxes have the advantage of providing isolation over typical DI's, which can reduce ground hum and noise in systems. The J48 features an isolation transformer in the power supply to help address this problem.

### ***Which is better - active or passive?***

Both have their place just like dynamic and condenser microphones. Passive DI's are often easier to use because they do not require power, while active DI's tend to have more reach. As a rule, passive direct boxes are best suited for electrically powered devices like keyboards, while active boxes are often preferred for instruments like acoustic guitars and basses.

### ***Can you explain loading?***

Years ago, most bass guitars used low output pick-ups such as those found on Fender basses, while acoustic guitars used piezos. Musicians found that connecting the instrument 'thru' a passive direct box to their amplifier and then to a mixer caused the sound to change. Splitting the signal to the instrument amplifier and the mixer created the added second load. This of course would reduce the level going to the instrument amplifier and cause the sound to change. Active DI's like the Radial J48 buffer or pre-amplify the signal so that loading is never a problem.

### ***What makes the Radial J48 so special?***

Let's begin by understanding how active DI's work: active direct boxes are in fact preamplifiers. They boost the instruments' signal to a manageable level. This means that active direct boxes require power to run. As such, they must either get their power from batteries or phantom power from the console. When using batteries, they must be fresh for the direct box to work properly. As soon as the power is low, the direct box will distort. This is why engineers dislike batteries and prefer phantom power. But phantom has limitations; phantom power was originally developed to supply low-current condenser microphones. The AES specification for phantom is 48 volts with only a few milliamps of current. We tested a popular acoustic guitar with built-in pre-amp and found that when pushed to the max, the output peaked at 7 volts. Considering that most DI's can barely manage 3 volts, it's no wonder guitars often sound harsh in a PA system. The Radial J48 was specifically designed to solve this problem by increasing the internal rail voltage so that these high output instruments would not overload the DI's input.



***How does Radial increase the rail voltage?***

We take the input voltage and drive it through a special custom made DC-to-DC transformer. The transformer is coupled to a timing chip that essentially drives the signal the same way as the newer switch-mode or digital power amplifiers work. This brings the current up to a workable level and creates a higher internal rail voltage to handle the dynamics.

***What is phantom power?***

Phantom power is a 48 volt DC supply that comes from the mixing console that was originally designed to provide power to condenser microphones. The Radial J48 takes the phantom power and converts it using an internal switching power supply. This allows the J48 to handle higher transients without the distortion associated with most active direct boxes.

***Why does the LED not stay on?***

We felt that every milliwatt of power should be diverted to provide maximum sound quality. Phantom power is limited and LEDs require almost as much current as the whole J48 circuit.

***What happens if I am not getting any sound?***

Check to make sure the phantom power is on at the console. Then check all your cables. Nine out of ten times, cables are the culprits when it comes to no sound.

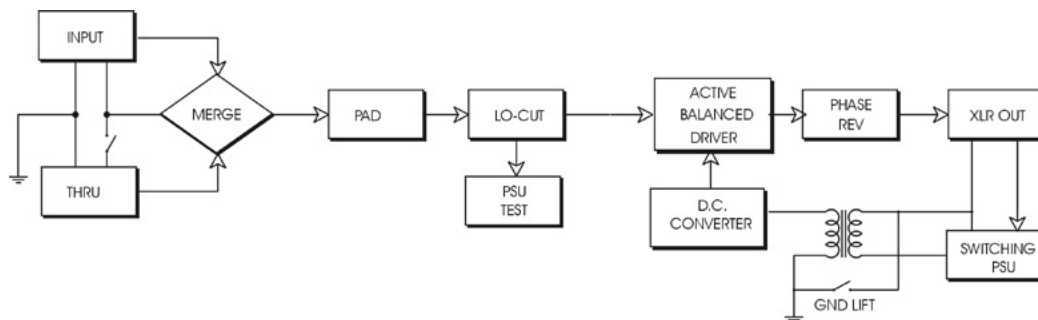
***Is a flat frequency response better than a colored response?***

This is a good question. When buying a large condenser microphone, you are not getting a flat mic, but getting a color or flavor for your sound palette. Most studios boast a selection of mics and the sign of a good engineer is one that knows which mic to use on what instrument in order to get a particular tone. With direct boxes, it is usually not the case. If the sound of the guitar is not right, one will usually change the guitar, not the direct box. Therefore, we believe the role of the direct box is to transport the original signal as faithfully as possible from the instrument to the destination and allow the engineer and producer to make the artistic choices. Here's more food for thought... should the direct box change the tone of the instrument? If it makes your Strat sound fat, will it make your Les Paul muddy? We think a properly designed DI should be faithful to the source. The Radial J48 direct box is natural and uncolored.

***If my J48 ever fails, what do I do?***

Simply contact your dealer or call Radial and we will issue a return authorization number and you can send it back to us for repair. We do suggest that before you do so, visit the dealer where you bought it and have them check it before sending it away. Often times, cables can be the problem.

## BLOCK DIAGRAM AND SPECIFICATIONS



<b>J48™ MK2 Specifications</b>	
Type:	Active 48V with switching supply
Input impedance:	Unbalanced 220K-Ohms
Output impedance:	Balanced 600-Ohms
Frequency response:	20Hz ~ 20kHz
Noise Floor	-99dB
Total harmonic distortion:	0.002% @ -5dBu
Phase distortion:	1° @ 100Hz; 11° @ 20Hz
Maximum input:	+10dBu
Size:	3.3" x 5.0" x 2" (84 x 127 x 48mm)
Weight:	1.55 lb (720 g)
Construction:	Welded 14-gauge steel
Finish:	Baked enamel coat

## RADIAL ENGINEERING 3 YEAR TRANSFERABLE WARRANTY

RADIAL ENGINEERING LTD. ("Radial") 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 will repair or replace (at its option) any defective component(s) of this product (excluding finish and wear and tear on components under 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 reserves the right to replace the product with a similar product of equal or greater value. 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 or to an authorized Radial repair center 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 transferable 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 Radial repair center.

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 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.



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This device complies with section 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

# **X·AMP<sup>™</sup>** **Reamp<sup>®</sup>** **STUDIO REAMPER<sup>™</sup>**

US Patent # 6,005,950



## **USER GUIDE**

Radial Engineering Ltd.

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Made in Canada 

# Radial® XAMP™ REAMP®

## User Guide

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### INTRODUCTION

The Radial X-Amp is an active Reamper that has been developed with one goal in mind: To explore new musical sounds and spur on the creative process.

Like all Radial products, this 'creative tool' is made using the very finest components and care to ensure the very highest quality sound possible. And like any tool, the best way to get the most out of it is by understanding the functions, the intent behind the design and of course some of the safety features and instructions that have been provided. To this end, we recommend reading this manual before operating your X-Amp.

We are confident you will find the Radial X-Amp to be fun to use, musical and that it will open new doors to creativity. If you have question after you have read the user guide please visit the X-Amp FAQ page on our web site. If you still can not find what you are looking for, feel free to send us an email at [info@radialeng.com](mailto:info@radialeng.com) and we will do our very best to reply to you in short order. We love to hear from you!



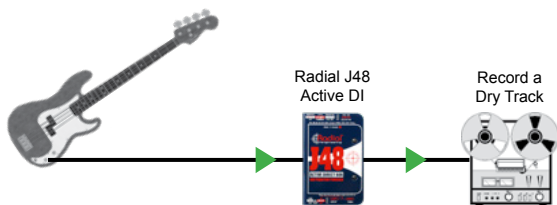
>>>>>>>>CAUTION<<<<<<<<<

Please read the caution statement on the last page  
before connecting your Radial X-Amp

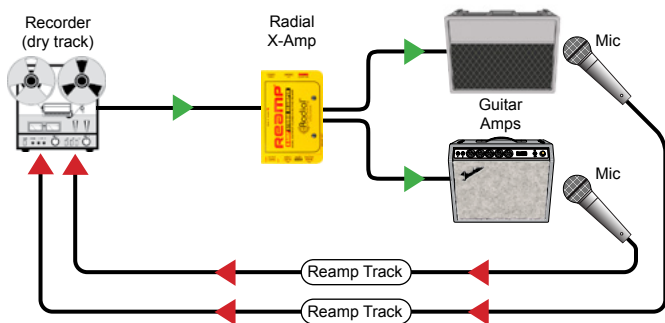
## OVERVIEW

Designed as a creative tool, the Radial X-Amp is an active device that allows pre-recorded instrument tracks to be sent through guitar amplifiers and effect devices. Since guitar amps and recording devices work at different signal levels, they are not directly compatible. In essence, the X-Amp allows these devices to 'speak' to each other. The Radial X-Amp is an active 'impedance and level-matching device' that converts line level signals from a mixing console or tape recorder to guitar level signals to drive one or two guitar amplifiers without introducing ground-loops or noise.

To start Reamping, one would generally record a dry guitar or bass track using a direct box such as the Radial JDI, Radial J48 or Radial JDV.



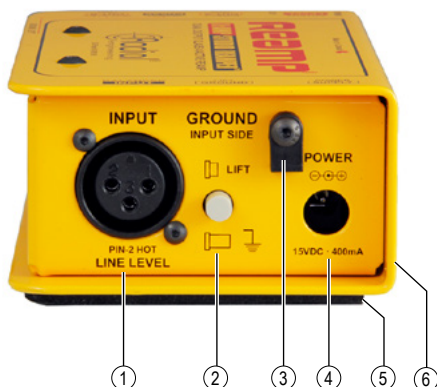
Afterwards, the pre-recorded dry track is routed through the X-Amp, which in turn is connected to a guitar amplifier. The 'Reamped' sound is recorded to new tracks.



The advantages of recording a track this way are many: Once the original track has been recorded, the engineer and producer can try different amplifiers and sounds without tiring out the player with relentless repetition. For the player-engineer, the track can be recorded, then the player can then sit in the control room and listen to a variety of guitar effects or amplifiers before committing a final sound to the track.

The X-Amp can also be used on other instruments. Keyboard tracks can be given extra life by warming up their sound by sometimes driving them through distortion pedals or tube guitar amps. Vocal tracks can also be twisted into new sounds by introducing these fun effects.

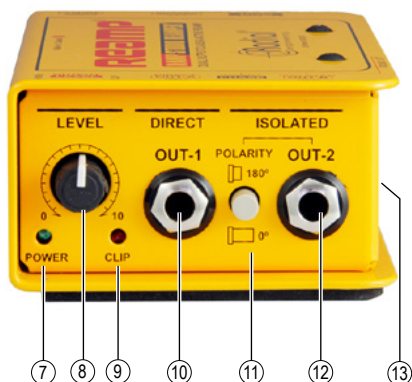
## FEATURE SET: INPUT PANEL



1. **LINE LEVEL XLR INPUT:** The input to the Radial X-Amp is a balanced line level female XLR. This is typically fed from the output of a recording device or mixing console. The XLR connector is wired with pin-2 hot following the AES standard.
2. **GROUND:** A ground lift switch disconnects pin-1 ground at the XLR input. Depressing this switch assumes you will be providing a ground path via the OUT-1 to your amplifier. Lifting the ground often helps reduce hum or buzz caused by so-called ground loops.
3. **CABLE CLAMP:** Used to secure the power supply cable and prevent accidental power disconnection.
4. **POWER:** The 15VDC power supply is connected here. Plug in to activate the X-Amp.
5. **FULL-BOTTOM NO-SLIP PAD:** Provides mechanical isolation to reduce slipping and electrical isolation from amplifier frames and handles.
6. **BOOKEND DESIGN:** 14 gauge steel outer shell creates a protective zone around connectors and switches. Internal welded I beam construction for maximum durability.
7. **POWER LED INDICATOR:** The power LED will immediately illuminate when the 15VDC supply is connected.



## FEATURE SET: OUTPUT PANEL



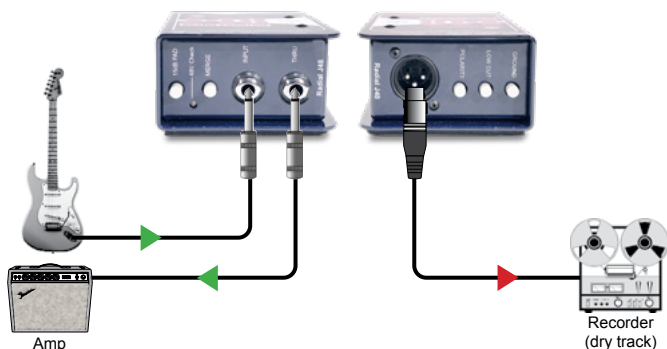
8. **LEVEL CONTROL:** The output LEVEL control sets the volume level going to the guitar amplifiers. This potentiometer is recessed to prevent accidental change and is adjusted using a guitar pick or flat-head screwdriver.
9. **CLIP LED INDICATOR:** To ensure the signal from the mixer or recorder does not overload the X-Amp, a clip indicator on the front panel provides clear viewing. If this LED illuminates, reduce the signal level.
10. **DIRECT OUT-1:** This ¼" output connects to guitar amp-1. This is a transformerless, direct-coupled output and is used to connect to your primary guitar amplifier. This provides the primary ground path for the X-Amp. *This output must always be connected to a properly grounded amplifier.*
11. **POLARITY 180°:** The polarity reverse works with the transformer-coupled OUT-2 ¼" output jack. This flips the polarity of the output to allow two amplifiers to play 'in-phase'.
12. **ISOLATED OUT-2:** This ¼" transformer isolated output connects to your second amplifier. Transformer isolation allows use of two amps without introducing hum and buzz caused by ground loops.
13. **GROUND LIFT OUT-2 (located on side):** This recessed switch gives you the option to bypass the transformer isolation and convert the OUT-2 into a direct and grounded output. It is factory set to LIFTED (inward position) to provide a safe and noise free connection to amplifiers. See page 9 for more information about using this feature.

## STEP-1: RECORD A DRY TRACK WITH A DIRECT BOX

As most Reamping is performed with an electric guitar, we have chosen to discuss the process using this example. The same process applies with bass, voice, keyboard, violin or any other instrument.

Start by recording a dry track using a high quality direct box (DI) such as the Radial JDI, Radial J48 or Radial JDV. Keep in mind that cheap DI boxes sound less realistic, have limited dynamic range and tend to have less warmth. When Reamping a track, it is important that the source track be as clean and natural sounding as possible.

The usual connection when Reamping is to connect the guitar to the DI box and have the thru connection go to your guitar amplifier. The DI's balanced output is then connected to the mixer and recording device.



*Recording a clean, dry track with a Radial direct box.*

By recording this way, you are able to listen to your guitar amplifier's sound while recording a 'clean' signal. The clean guitar track retains all of the inflections and sustaining effects that you would normally hear and 'feel' when you perform. Note that when playing with a loud, heavily distorted sound, the guitar interacts with the amplifier. The amplifier's sonic vibrations excite the guitar strings which in turn can produce sustain and harmonic complexities.

The recorded 'clean' guitar tone will contain all the sustain and inflections of the original performance. When Reamping, the clean guitar track will drive the guitar amp in the same way as when the player was standing next to it. Reamping recreates the same complex tones between guitar, amp, and loudspeaker as when it was recorded. This allows you to replay the performance back through various amplifiers and effects devices to create new sounds.

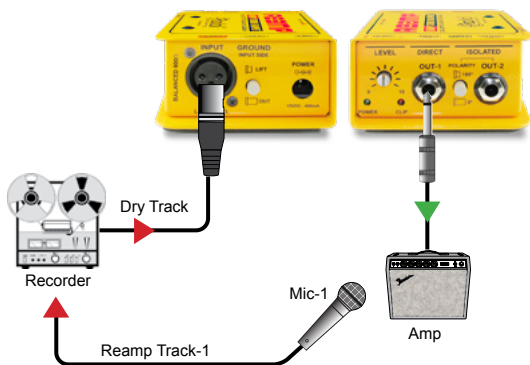
It is a good idea to record the wet track (effects pedals and amplifier) at the same time with a traditional microphone set-up. This way, you can mix the original track with Reamped tracks to create new textures.

## STEP-2: CONNECTING THE X-AMP TO YOUR AMP

Start by ensuring all amp and mixer levels are turned down. Place the X-Amp near your amplifiers in the studio. As soon as you connect the 15v/400mA power supply, the power LED on the front panel illuminates indicating the X-Amp is active and ready to use.

**NOTICE:** Before connecting the X-Amp to your guitar amplifier, make sure that it is equipped with a grounded 3-prong AC power cable. This important safety ground will ensure safe performance of your amplifier and the X-Amp. For safety, only use equipment that has passed electrical safety tests such as UL in the United States, CSA in Canada or the equivalent safety standards recognized in your country.

Use a balanced XLR cable to connect the output of your recorder or mixer to the input on the X-Amp. Next, use a high-Z ¼" guitar cable to connect the DIRECT OUT-1 to your amplifier's input.



Reamping the dry track and recording new tracks.

**NOTICE:** If you plan on connecting an amplifier to the second isolated OUT-2 jack it is very important your first grounded amplifier stay connected to direct OUT-1 at all times, even if not in use or powered on. The amp serves as an important safety ground.

Before connecting a second amplifier or effect pedals you should proceed to step-3 and finish setting up your first amp. This will help test the overall system and reduce troubleshooting.

### STEP-3: ADJUSTING THE LEVEL

Start by setting the X-Amp's input LEVEL control to the 12 o'clock position. Play the dry track and turn up your recorder/mixer output until the CLIP LED on the X-Amp blinks occasionally with peaks in the recording. Now reduce the recorder/mixer level a bit so the clip light does not blink at all. This will ensure the X-Amp's output signal is clean.



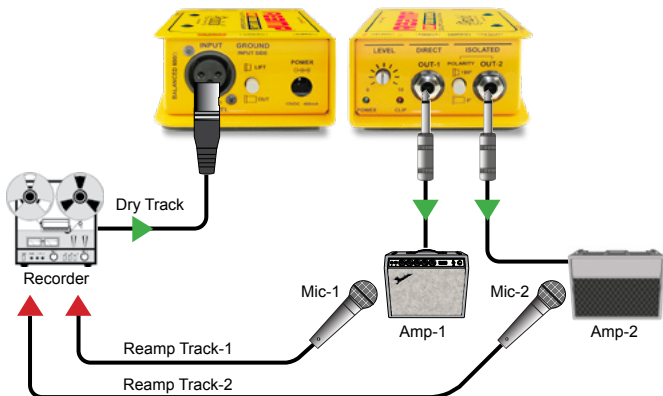
Next test the connection to your amp. It's a good idea to set up a clean sound on your amp at first. This way you can hear if there is any distortion or ground loop hum. Turn your amp up to a comfortable listening volume. If you encounter hum or buzz, try depressing the X-Amp's input side GROUND LIFT switch.



Play the dry track while adjusting the X-Amp's LEVEL control. This control is used to ensure the signal coming from the dry track matches the level from your guitar. Because guitar amplifiers do not have input level meters this is done by plugging your guitar directly into your amp and taking note of the level and tone. Afterwards, connect the X-Amp to your amp and adjust the LEVEL control so that the level and tone is the same as when the guitar is connected directly.

### STEP-4: ADD A SECOND AMP

At this point you can also connect a second amplifier to the ISOLATED OUT-2 1/4" jack. This output is transformer isolated to eliminate hum and buzz caused by ground loops, a common problem when using two amps.



Recording two Reamped tracks at the same time.

## STEP-5 TESTING PHASE

The OUT-2 1/4" jack also features a 180° POLARITY reverse switch that is used to ensure both amplifiers are in-phase. To test for phase alignment place the amps side by side and turn up the volume on each amp equally. The POLARITY switch allows you to quickly invert the phase of your second amp. Try the switch in both the 0° and 180° positions and use the one that sounds the fullest. If you change amps or add effect pedals you may re-introduce a phase issue. After re-configuring your Reamping setup it's a good idea to quickly test for phase alignment by pressing the POLARITY switch and comparing the sound.



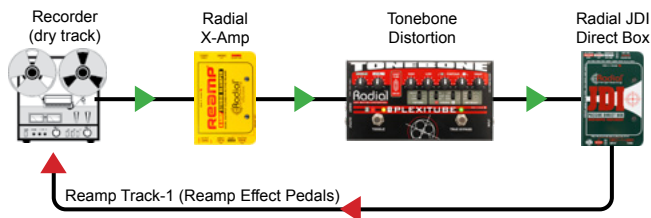
You are now set to go! The real magic begins when you start combining these tracks and adding effects. Have fun! Experiment!

## USING THE X-AMP WITH KEYBOARDS

Keyboards may also enjoy the benefits of Reamping with the X-Amp by following the same procedures. There's no better way to turn a solo synthesizer track into a 'barn burner' than to pass it through a distorted tube guitar amplifier or Radial Tonebone tube distortion pedal. Players like the legendary Jan Hammer used this trick to create those amazing 'guitar' solo sounds. This is also a great way to get more 'growl' from those 'clean' B3 sounds. Half the magic of a traditional Hammond comes from the tube amp and Leslie being pushed to the limits. This is why Keith Emerson also used distorted guitar amps to record and perform. Try mixing sounds between clean and distorted ones and have fun!

## USING THE X-AMP WITH EFFECT PEDALS

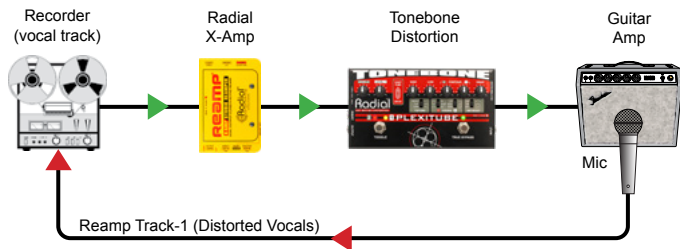
You can also use the X-Amp with guitar effect pedals. This is accomplished either by driving the pedal through a guitar amplifier or by sending the output of the effect pedal to a direct box like the Radial JDI and then to the mixer. We recommend the JDI for this application as the isolation transformer in the JDI will help eliminate potential noise caused by ground loops.



*Reamping through a Tonebone distortion pedal and using a direct box instead of a mic.*

## USING THE X-AMP WITH VOICE

Often times voices can be too clean and lack that 'seasoned' rough edge. By driving a voice track through the X-Amp into a distortion pedal like the Radial Tonebone Classic or through an overdriven amplifier, one can introduce some great vocal effects. Double the clean track with distorted track and then mix them to suit. A subtle extra edge is often all that is needed to warm up a stale track.



*Reamping a vocal track through a Tonebone distortion pedal.*

## OUT-2 GROUNDING OPTIONS

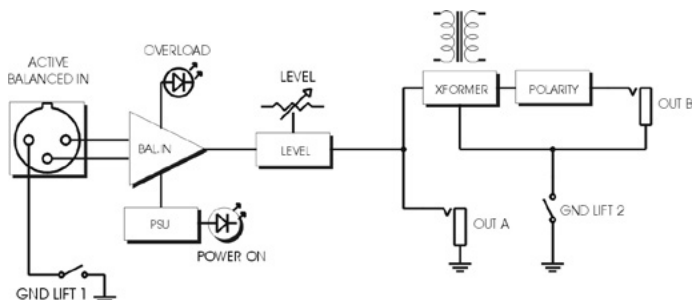
A second ground lift is provided for ISOLATED OUT-2. This switch is located inside the X-Amp and is accessed using a small screwdriver through a hole on the side panel. By factory default it is set to 'lifted' (inward position) allowing the transformer to isolate the signal ground between your recording system and your second amp. Setting the switch to 'grounded' (outward position) will bypass the transformer isolation.

In some situations it could be advantageous to connect the ground to your second amplifier. If you encounter noise and have tried lifting the input ground, try toggling the OUT-2 LIFT switch and use the setting that works best.



*GROUND LIFT OUT-2: Use a small screwdriver to access the ground lift switch for OUT-2. Set inward to lift the ground (factory default) or outward to connect ground.*

## BLOCK DIAGRAM



## SPECIFICATIONS\*

Audio circuit type:	100% discrete class-A
Frequency response:	20Hz ~ 15kHz ( $\pm 1.0$ dB)
Signal to noise ratio:	88dB below instrument level (-20dBu)
Dynamic range:	119dB
Noise floor:	OUT-1 -110dB; OUT-2 -108dBu
Maximum input:	+22dBu
Total harmonic distortion:	0.02% @ -15dBu
Inter-modulation distortion:	0.02% @ -20dBu
Input impedance:	600 $\Omega$
XLR input:	Balanced line-level, AES standard (pin-2 hot)
Ground lift (input):	Disconnects pin-1 at the XLR input
Output level:	Adjustable
Output type:	High-Z instrument-level, Out-1 direct, Out-2 transformer isolated
Polarity:	180° polarity reverse on Out-2
Power:	+15VDC/400mA adapter included
Construction:	14 gauge steel chassis & outer shell, powder-coat finish
Size:	3.3" x 5.0" x 2" (84 x 127 x 48mm)
Weight:	1.55lb (720g)
Shipping Size:	5"x2.75"x10.75" (127x70x273mm)
Shipping Weight:	2.6lb (1.18kg)
Conditions:	For use in dry locations only between 5°C and 40°C
Warranty:	Radial 3-year, transferable

\*Specifications are subject to change without notice.

## THREE YEAR TRANSFERABLE LIMITED WARRANTY

RADIAL ENGINEERING LTD. ("Radial") 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 will repair or replace (at its option) any defective component(s) of this product (excluding finish and wear and tear on components under 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 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 604-942-1001 or email [service@radialeng.com](mailto:service@radialeng.com) to obtain a RA number (Return Authorization number) before the 3 year warranty period expires. The product must be returned prepaid in the original shipping container (or equivalent) to Radial or to an authorized Radial repair center 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 and transferable warranty. This 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 Radial repair center.

THERE ARE NO EXPRESSED WARRANTIES OTHER THAN THOSE ON THE FACE HERE-OF 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 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.



**CAUTION:** Only use the Radial X-Amp Reamp with amplifiers that are equipped with a properly grounded AC power cable and display electrical safety certifications such as the UL in the United States and CSA in Canada or the equivalent standards as approved in your country. If you are not sure about your amp please consult a qualified technician for advice before using this device or connecting any equipment to it.

To meet the requirements of California Proposition 65, it is our responsibility to inform you of the following:

**WARNING:** This product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

Please take proper care when handling and consult local government regulations before discarding.



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

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