



Radial Amp Driver

X-AMP

User Guide

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Radial X-Amp Owners Manual

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Welcome!

The Radial X-amp is an active re-amplifying device 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. Should you have any questions regarding its functions, or wish to explore new areas that are not covered in this manual, we invite you to contact us at info@radialeng.com.

We love to hear from you!

www.radialeng.com

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Specifications and appearance subject to change without notice.
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INTRODUCTION

Designed as a creative tool, the Radial X-Amp is an active re-amplifying device that allows prerecorded instrument tracks to be sent through guitar amplifiers and effect devices.

Although the Radial X-amp is new, the process of re-amping tracks has been around for years. Historians credit jazz guitar great Les Paul as the first to employ the concepts of re-amplifying sound in the 1950s as there was no other way to double tracks or create echo effects. In the 1960s, Phil Spector's work with the Beatles and his famous 'wall of sound' employed re-amping techniques. In the 1970s, Roger Nichols built his own 'Reamper'. Roger used it on all of the Steely Dan records virtually burning out tubes in effort to get the right sound. Only today with the proliferation of affordable high quality multi-track recording has the demand for high-quality recording tools allowed manufacturers to develop devices such the X-amp into commercially viable products.

To use the X-Amp, one would generally record a dry guitar or bass track using a direct box such as the Radial JDI, Radial J48 or Radial JDV and then play the pre-recorded track 'back' through the X-Amp, which in turn would then be connected to a guitar amplifier. The advantages of recording a track this way are many: During session work, 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.

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. 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. And this is just the beginning!

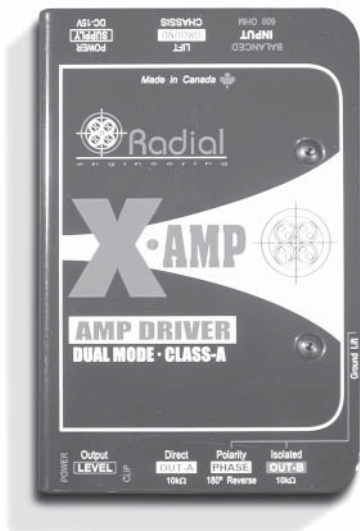
The real advantage of the X-Amp is the amazing clarity and natural tone. Unlike previous re-amping devices, the Radial X-Amp is active. The X-amp features our unique Class-A circuit (the same as used in our highly acclaimed Radial JD7 Injector) to ensure every subtlety is transferred to the amplifier without harsh harmonic distortion, virtually zero phase distortion and exceptionally low inter-modulation distortion.

To further advantage the user, the X-Amp features two outputs: Output-1 is a direct active output while output-2 is transformer isolated. This allows two amps or effect pedals to be used simultaneously without introducing hum or noise caused by so-called ground loops. To further reduce opportunity for noise, the X-Amp features two ground lift switches to allow optimal ground conditions in complex environments.

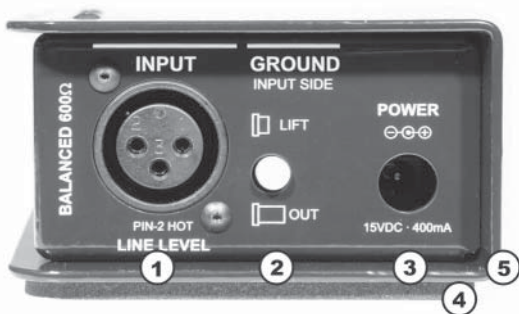
And like all Radial products, the X-Amp is built to handle abuse with 14-gauge welded steel inner frame, baked enamel finish and our innovative bookend design that creates a protective zone around the switches, potentiometer and connectors. A full-bottom no-slip isolation pad provides shock-mounting, mechanical and electrical isolation and ‘stays-put’. The X-Amp will not slide around or fall during a performance.

RADIAL X-AMP LAYOUT

The difference between a good product and a great product can often come down to sound quality and ease of use. As the X-amp has been primarily designed to work in conjunction with guitar amplifiers, you will notice that the XLR input and the DC supply connectors are on the rear and out of the way, while the input connectors are on the front. This allows one to place the X-amp on a guitar amplifier and have immediate access to the 1/4" output connectors without having to reach behind. This also provides clear viewing of the clip LED indicator and the output level control.



INPUT PANEL FEATURE SET



1. Balanced line level input connector

The input to the Radial X-Amp is a balanced 600-ohm line level. This is typically driven from the line level output from a recording device or from a console. The XLR female connector is wired with Pin 2 hot following the AES standard.

2. Ground lift for pin-1 at XLR

A ground lift switch disconnects the pin-1 ground at the XLR side 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 in the sound system caused by so-called ground loops.

3. 15V DC power supply connection

The 15VDC supply is connected here for powering up the X-Amp. There is no power switch and keeping the X-Amp on will not harm the unit. In fact we recommend allowing the X-Amp to warm up for about 20 minutes before use so that the internal circuit can reach a stable working temperature.

4. Full-bottom no-slip pad

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

5. Bookend design

14 gauge steel outer shell creates protected zone around connectors and switches. Internal welded I beam construction for maximum durability. Finished in tough baked enamel. The military grade double-sided PC board provides maximum durability and added resistance against cold solder joints.

OUTPUT PANEL FEATURE SET



6. Power-on LED indicator

The power-on LED will immediately illuminate when the 15VDC supply is connected. There is no power switch on the X-Amp and leaving the X-Amp on will not harm the unit.

7. Output level control

The output LEVEL control sets the level going from the two 1/4" output connectors to the guitar amplifiers. This recessed potentiometer is adjusted using a guitar pick or flat-head screwdriver.

8. Input overload LED indicator

To ensure the signal from the mixer or recorder does not overload the X-Amp, a clip indicator is positioned on the front panel for clear viewing. If this LED illuminates, turn down the mixer!

9. Out-1: Direct 1/4" output to guitar amp 1

This is a transformerless, direct-coupled output and is used to connect to the primary guitar amplifier and provides the primary ground path for the X-Amp. This output is always used and should be connected to a properly grounded amplifier.

10. 180° polarity reverse

The polarity reverse works with the transformer-coupled output-B. This flips the polarity of the output to allow two amplifiers to work 'in-phase'.

11. Out-2: Transformer isolated output to guitar amp 2

This transformer-isolated output allows one to use two amps without introducing noise caused by ground loops.

12. Alternate output ground disconnect (on side)

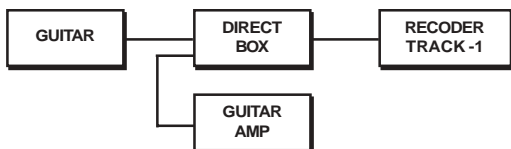
This ground switch is factory set in a LIFTED position and works with Out-2. Connecting a ground at this output is only used when the amplifier on Out-2 is not properly grounded with a 3-prong AC cord.

USING THE X-AMP

Step 1 – Record a dry track

As most re-amping is performed with an electric guitar, we have chosen to discuss the process using this as an example. The same process applies with voice, keyboard, violin and 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 re-amplifying a track, it is important that the source track be as clean and natural sounding as possible. The JDV is particularly adept as it features Drag Control™, an impedance correction circuit that achieves the most realistic tone.



The usual connection when recording for re-amping would be to connect the guitar to the DI box and have the thru connection go to your effects pedals and guitar amplifier. The DI's balanced output would be connected to the mixer and recording device.

By recording this way, you will be able to listen to your guitar amplifier sound while recording a “clean” signal. The clean guitar track will retain 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 amplifiers sonic vibrations excites the guitar strings and can produce constant sustain and harmonic complexities.

The recording of the “clean” guitar tone will contain all the sustain and inflections of the original performance. When Re-amping, the clean guitar track will drive the guitar amp in the same way as when the player was standing next to it. Re-amping recreates the same complex tones between guitar, amp, and loudspeaker as when it was recorded. This will allow you to replay the performance back through various amplifiers and effects devices to create alternative resonance peaks and harmonics.

It is also important to note that you will generally want 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 re-amplified tracks to create new textures.

Step-2 – Driving the signal back to the X-Amp

Using a standard balanced XLR cable, you should be able to drive the X-Amp from your recording console 300 feet away without any appreciable noise. This is the advantage of balanced lines! Make sure you use good quality cable throughout the chain.

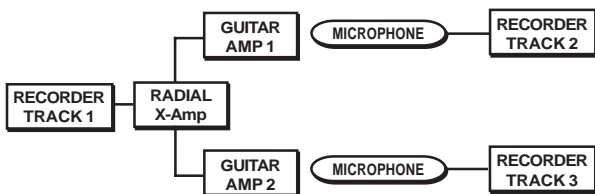
NOTICE: Before connecting the X-Amp to your guitar amplifier, make sure that your guitar amp is equipped with a proper 3-prong AC connector. This important safety ground will ensure safe performance of your amplifier and the X-Amp and reduce opportunity for electrical shock. For safety, only use equipment that has passed electrical safety tests such as UL, CSA or equivalent safety standards as approved in your country.

Start by ensuring all amp and mixer levels are turned down. Connect the recorder output or the mixer output to the XLR input on the X-Amp. Connect the X-Amp power supply. The Power LED on the front control panel should illuminate.

Play the track and turn up the recorders/mixers output until the Clip light on the X-Amp blinks occasionally with peaks in the recording. Now turn the output back so the clip light does not blink at all.

Next, connect the ¼" Direct Out-1 connector to your amplifier in much the same way as you would connect your guitar. This is a direct-coupled output and provides a safety ground path for the X-Amp.

Start by listening to your amp by turning the volume up slowly using a clean setting. This way, you can hear if there is any ground hum. If you encounter hum, try depressing the X-Amps ground-lift switch. For more details on grounding issues and possible solutions, see the section on grounding further in this manual.



Example using two guitar amps recorded to separate tracks

Step -3 - Adjusting the level

The X-Amp is equipped with a level control to ensure the signal coming from the dry track of the mixing console matches the level from your guitar. Because guitar amplifiers do not have input level meters, start by taking note of your amplifier settings by plugging your guitar directly into your amp. Using your ears is the best way to set the level and tone. Now, connect the X-Amp to your amp and adjust the level so that it matches the previous guitar to amp level. If the level is too hot from your mixer, the clip LED indicator will light up. Turn down the level from your mixer.

At this point, you have recorded a dry guitar track on track-1 and most likely saved the performance (wet guitar-amp track) on a separate track. You would now PLAY the dry track into the X-Amp, which would then drive one or two guitar amps. These would be mic'd and then recorded on new tracks. The real magic begins when you start combining these tracks and adding effects.

You are now set to go! Have fun! Experiment!

Using the X-Amp with keyboards

As described above, keyboards may also enjoy the benefits of 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 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 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 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.

Using the X-Amp with guitar 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 noise.

GROUNDING OPTIONS

The radial X-Amp is equipped with two ground disconnect switches. One is located at the XLR input that lifts pin-1 to allow the X-Amp to derive its ground from the Direct Out-1 connector. It is important to note that this connection is the primary ground and should be connected at all times.

A second ground connection is provided for Isolated Out-2 and is set in a 'lifted' as a factory default. This switch is located on the side panel and accessed with a tweaker. Depressing this ground switch will connect the ground from the X-Amp chassis to the output-B ground. Although rarely used, this could be advantageous in situations where the amp that is connected to output-B does not have a proper 3-prong AC connector or has a different ground potential.

FAQs

Can I hurt my amplifier if the X-Amp is set too loud?

No. The X-Amp has been designed to work within the normal operating ranges of guitar amplifiers and effect pedals.

Is there a difference between the direct and isolated outputs?

Out-1 (direct) and Out-2 (isolated) have been designed to sound as close to the same as technically possible. The only difference being that Out-2 employs a custom made isolation transformer to reduce hum and ground-loop buzz. Always connect Out-1 first to ensure proper grounding.

Why do you have to use Out-1 when using the X-Amp?

Out-1 is the primary ground path for the X-Amp and needs to be connected to a properly grounded amplifier so that the chassis can work as a screen against RF and other magnetically induced noise hazards. Keep in mind that the X-Amp employs a floating ground plane and needs to be grounded at either the input or the output.

What should I do if I hear 60 cycle hum in my system?

Try depressing the ground lift switch at the XLR input side. This will disconnect the ground from the mixer and leave you with a direct-coupled ground at the primary guitar amplifier.

I heard that the Radial JDI can be used backwards as a re-amping device?

Yes this is true. The Radial JDI, when driven 'backwards', will also reverse the impedance from low-Z to hi-Z and allow a padded down line level to drive the amp at a 10k-ohm level. The difference however is akin to comparing a passive direct box to an active direct box or like comparing a dynamic mic to a condenser. Active boxes tend to have more 'reach' or better high frequency transfer of upper harmonic detail.

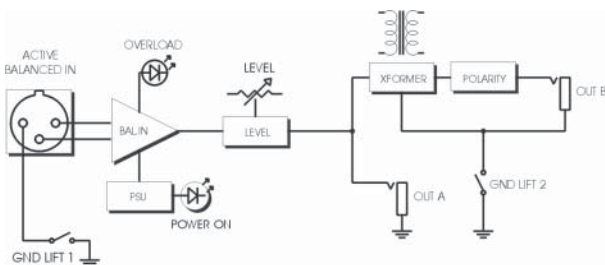
Can I drive effect pedals with the X-Amp?

Absolutely! The X-Amp is perfect for this type of thing! Connect the same way as with an amplifier as described in the manual. Have fun and experiment!

Will my guitar effects sound the same if I bring them back into the mixer without going through my guitar amplifier?

No. Guitar effect pedals are designed to go through the limited bandwidth of a guitar amplifier where the highs are naturally rolled off by the absence of a tweeter. Going direct may sound fun but be aware that you may encounter noise that may have to be rolled off.

Block Diagram and Specifications



X-Amp Specifications	
Input level:	+4dB balanced line level
Input impedance:	600-Ohms
Output impedance:	5k Ohms
Output no.1:	Direct
Output no.2:	Transformer isolated
Output level:	Variable
Dynamic range:	>100dB
Power requirement:	Custom 15 volt supply
Size:	3.5" wide, 2" high, 5.5" deep
Weight:	1 kg or 2 lbs
Warranty:	3 Years

THE HISTORY OF RE-AMPING

We recently looked into the history of re-amping and were amazed at the response we received by asking around. These are brief historical accounts and letters we received. Many thanks to Frank Wells at Pro Sound News and Mitch Galagher at EQ magazine for helping us track down these folks.

When we asked recording historian Doug Mitchell ¹, Associate Professor at Middle Tennessee State University the question: 'Who invented re-amping'. Doug gave us this reply:

The process of "re-amping" has actually been utilized since the very first days of recording in a variety of methods. However, the actual process utilized may not have been referred to as re-amping until perhaps the late 1960s or 1970s. From the early possibilities of recording sound various composers and experimenters utilized what might be termed "re-amping" to take advantage of the recording process and to expand upon its possibilities. In 1913 Italian Futurist Luigi Russolo proposed something he termed the "Art of Noises". Recordings of any sound (anything was legitimate) were made on Berliner discs and played back via "noise machines" in live scenarios and recollected on "master" disc cutters. This concept was furthered by Pierre Schaeffer and his "Musique Concrete" electronic music concept in the 1930s and 1940s. Schaeffer would utilize sounds such as trains in highly manipulated processes to compose new music ideas. These processes often involved the replaying and acoustic re-recording of material in a manipulated fashion. Other experimenters in this area included Karlheinz Stockhausen and Edgard Varese.

With the possibilities presented by magnetic recording the process of what might be termed re-amping was utilized in other "pop" music areas. Perhaps the first person to take advantage of the process was Les Paul. His recordings with Mary Ford often utilized multiple harmonies all performed by Mary. Initially these harmonies were performed with the re-amping process. Later, Les convinced Ampex to make the first 8 track recorder so that he might utilize track comping to perform a similar function. Les is also credited with the utilization of the re-amping process for the creation of reverberant soundfields by placing a loudspeaker at one end of a long tunnel area under his home and a microphone at the other end. Reverberation time could be altered with the placement of the microphone with respect to the loudspeaker playing back previously recorded material.

Wall of sound pioneer Phil Spector is perhaps the most widely accredited for the use of the reamping process and because of his association with the Beatles is potentially regarded today as the developer of the process. However, Phil was

actually refining a process, which had been utilized for decades, and exploring its possibility for use in rock music.

The process of “re-amping” is often used in film sound design as well. In order for sounds recorded in a post production environment to match the scene, it is common for them to be re-recorded utilizing a reamping procedure. In film sound this process is also termed “worldizing”.

The first use of the term “re-amping” is vague. It may have come into the recordist’s vocabulary as early as the late 1960s, but I am not sure when the term was first utilized.

We then posed the same question to Bob Ohlsson ² of Motown fame, (Stevie Wonder, Marvin Gaye, Kinks, Animals, Donovan, Herman’s Hermits) and Bob kindly answered:

I began doing it in 1968 shortly after we got the sixteen-track machines because for the first time we could separately record direct guitars, clavinetts and electric pianos. I had never heard of it being done and am pretty sure I was the first to try it at Motown but I can’t imagine lots of others weren’t doing the same thing. It seemed like a very obvious thing to do in a world where electric instruments were taken direct primarily to cut down on bleed rather than for tonal quality.

We then contacted Roger Nichols ³ (Steely Dan, Crosby Stills and Nash, John Denver, Roy Orbison, Zappa) and when posed the question: “Roger, I know you have been re-amping for a while, when did you start using this process?”

That would be 1972 when I built the re-ampers we used on the first, and almost every Steely Dan album after that. We used it to play direct guitar tracks back through an amp. We were going through a lot of amps. The speakers would get tired or the tubes would melt or something during a night of guitar overdubs.

We would go through one amp to make sure we got the sound we wanted, and then when the right guitar and settings were locked in, we recorded the direct signal and let the amp rest. After the part was completed, we ran the signal back through the guitar amp and it only had to last long enough to print the results to tape. I still have the box around here somewhere.

Interesting enough, in 1980 Jensen Transformers introduced the JT-DBE transformer and in the application note, there is a complete paragraph discussing the use of this transformer to convert low impedance balanced lines to guitar levels. This same application is mentioned in the Radial JDI direct box owner’s manual and referred to as ‘using the JDI backwards’.

In the 1980's Whirlwind also produced a device that could accommodate low-to-hi conversion using a transformer.

In 1994, Reamp® commercialized the process by producing a box that incorporated a transformer and a volume control. This allowed the user to adjust the volume at the amplifier instead of at the mix position. In 1996, the 1st generation Radial™ JDI was introduced.

The first generation Radial JD7 Injector was released in 2001 with a balanced output and input to allow re-amping and subsequent re-distribution of signals to many amplifiers. In 2004, Radial introduced the Radial X-Amp which is an active device that allows a pre-recorded balanced signal to drive two guitar type amplifiers at the same time.

References

1 Doug Mitchell, Associate Professor
MTSU Department of Recording Industry
<http://www.mtsu.edu/~dsmitch>

2 Bob Olhsson Audio Mastery Recording, Project Design and Consulting
Box 90412, Nashville TN 37209

3 Roger Nichols Mastering
11461 SW 93 St. Miami, FL 33176
<http://www.rogernichols.com>

RADIAL ENGINEERING 3 YEAR LIMITED WARRANTY

RADIAL ENGINEERING (a division of J.P Cabletek Electronics Ltd.) "Radial" warrants this product to be free from defects in material and workmanship to the original owner 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 batteries, 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 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 Radial repair center.

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