

# Firefly<sup>™</sup>

## Tube Direct Box



## User Guide



# Radial® Firefly™

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**Congratulations and thank you** for purchasing the Radial Firefly! You are now the proud owner of what is arguably the most exacting direct box ever made. The Firefly combines state of the art electronics with a tube drive and transformer coupled output to produce a clean warm tone. And hidden inside are a ton of very cool features designed to enable the Firefly to be used in all types of applications for all types of instruments.

Although you will find the Firefly to be super easy to use, we recommend you to take a few minutes to read the manual to ensure you understand the various features and get the most out of this amazing device. If after reading the manual you need further clarification, please visit the Firefly FAQ page on the Radial web site. This is where we post questions and answers from users along with the latest updates. Then, if you still do not find what you are looking for, we invite you to send an email to [info@radialeng.com](mailto:info@radialeng.com) and we will do our very best to get back to you promptly.

Now get ready to plug into one of the most enjoyable pieces of audio equipment ever!

## FRONT PANEL FEATURE SET



1. **TRIM A & B CONTROLS:** Input level controls used to match the gain between the two instruments.
2. **SELECT:** Selects the active input for fast instrument changes. The illuminated LED indicates the active input.
3. **MUTE LED:** Indicates when the mute function is active. Remote controlled via the optional JR•2 footswitch.
4. **DRAG:** Used to retain the natural feel of the instrument by adjusting the load for passive pickups.
5. **LOW CUT:** Variable high-pass filter rolls off low frequency resonance that can cause feedback or muddy up the sound.
6. **LEVEL:** Level control for the balanced XLR output. Variable from mic to line-level.
7. **PROTECTIVE FRONT LIP:** The enclosure design create a protected zone around the switches and knobs to prevent damage.

## REAR PANEL FEATURE SET



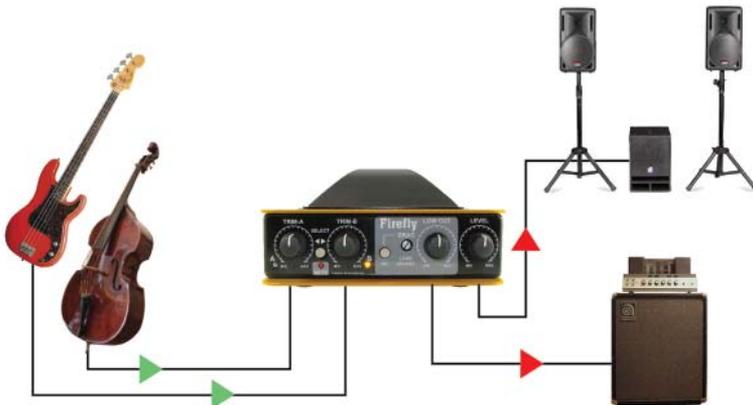
8. **POWER:** Locking 5-pin XLR power supply connection. The external supply helps reduce noise and delivers +/-16 volts (1600mA) that is internally stepped up to 48V for the tube.
9. **OUTPUT:** Balanced XLR output connects to the PA or recording system. Transformer isolated to eliminate hum & buzz caused by ground loops.
10. **180° POLARITY:** Inverts the signal polarity by flipping pins-2 and pin-3 on the XLR output. Used to reduce resonant peaks that cause feedback.
11. **GROUND LIFT:** Disconnects pin-1 at the XLR out. Helps reduce noise caused by ground loops.
12. **THRU / PRE:** This switch changes the signal path of the ¼" THRU output. When set to the inward position the THRU output is direct and provides a clean buffered feed from your instruments. When set to the outward position the THRU output shares the same signal path as the main XLR output including the tube stage, filter and insert loop.
13. **TUNER OUT:** Always-on, high-Z output used to connect an electronic tuner.
14. **REMOTE:** Used to connect the optional JR2 remote footswitch. When connected, this lets you select the active input channel or mute the Firefly for tuning.
15. **INSERT:** Buffered effects loop uses standard ¼" TRS send & receive cable to interface guitar pedals and studio rack effects.
16. **THRU:** High-Z thru-put for stage amp. Configurable 'pre or post' tube and insert.
17. **INPUTS A & B:** High-Z inputs lets you switch between two instruments for quick on-stage changes. The input level is set using the TRIM-A & B controls.

## OVERVIEW

The Firefly is a direct box. What this means from a 'technical' standpoint is that the Firefly is designed to deliver the sound of the instrument to the recording system or PA without introducing artefact. But the sheer fact that the Firefly employs a tube as part of the circuit means that the tube will add warmth and natural even order harmonics to the signal. Technically, DI boxes like the Radial JDV™ are much more accurate while the Firefly is designed to add character. That being said, the Firefly remains a direct box and therefore, it must perform the task... and do it well.

The primary task of a direct box is to convert the unbalanced high impedance signal from an instrument to a balanced low impedance signal suitable for a PA system or for recording. The output from a direct box is usually equivalent to a mic level signal. This enables the DI to 'comfortably live' along side microphones, using the same mic splitters, mixing console inputs and microphone preamps. Standardizing the signal makes it easy to switch around cables on hectic stages when trouble shooting. And although the Firefly is able to produce a much hotter output than a typical DI box, turning down the master volume is all that is required to match things up.

Several extra features have been added to the Firefly to increase functionality on stage and better adapt to the various instruments that may be connected. For instance; two inputs make it easy to swap instruments. Drag Control lets you adjust the load on the pickup for optimum signal transfer. The 4 meg-ohm input impedance lets you properly load piezo pickups so that they sound right. You can also add options such as a remote control for input switching and quiet tuning on stage. And of course you can rack mount the Firefly in a single space using the optional 19" rack adaptors.



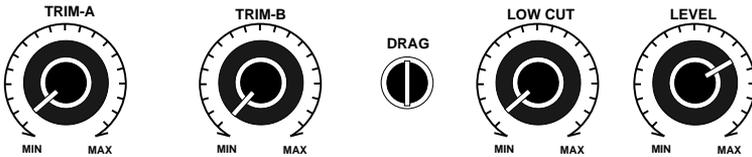
TYPICAL SETUP

## MAKING CONNECTIONS

Before making connections, always ensure all levels are turned down or equipment is turned off. This will help you avoid turn-on transients that could harm more sensitive components such as tweeters from being damaged.

Connect the power supply to the Firefly. This mid-cable supply is equipped with a 4-pin XLR connector at one end and a universal IEC connector at the other end. The power supply will accept input voltages from 100V to 240V thus enabling the Firefly to be used in countries around the world. It comes with the appropriate power cable to comply with local electrical systems.

Start by setting the A & B TRIM controls and the LOW-CUT filter fully counter-clockwise to the 7 o'clock position (minimum setting). Set the DRAG control about halfway to the 12 o'clock position and ensure the ON button is set to the inward position. Set the master LEVEL control to the 2 o'clock position.



Cable connections are made at the rear panel. Connect the instrument to INPUT-A using a standard 1/4" guitar cable. Connect the XLR output to your mixing desk or preamp using a standard XLR cable. Make sure the three rear panel recessed switches are in the outward position by checking with a tweaker or small screwdriver.



## Test at low volume

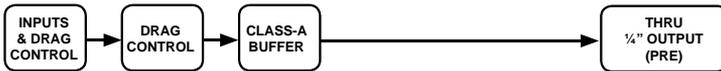
You are now set to start testing audio. Always test at a low volume first before turning up. This will help you avoid loud transients from damaging more sensitive components. Turn up the gain on your mixing desk or preamp to a low level. Set the input SELECT button to input-A. The LED will illuminate to show you which input is active. Slowly increase the input TRIM-A until you reach a comfortable listening volume. If you like, plug in your second instrument and adjust the TRIM B to match. Simply depress the AB selector switch to toggle between instruments.

### Connect an amplifier

You can now connect to your stage amplifier if you are using one. A standard 1/4" guitar cable connects from the THRU output to the input of your amp.

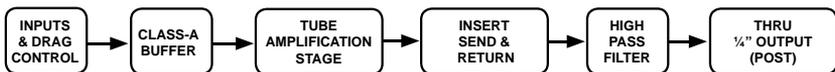


The buffered THRU output can be toggled between PRE or POST settings by depressing the set & forget recessed THRU/PRE switch on the rear panel. When set to PRE (inward position) the instrument signal is sent directly to the stage amp before it is processed by the tube, effect loop and low cut filter.



*Simplified Block Diagram of PRE signal path*

However, when set to POST (outward position) the THRU output is identical to the main XLR output. Most musicians will likely opt for the POST setting to send the tube processed sound to their amp in order to gain the added warmth of the tube. Simply leave the PRE/POST switch in the outward position if this is your preference.



*Simplified Block Diagram of POST signal path*

**Connect an electronic tuner**

The Firefly is equipped with an ‘always-on’ TUNER output that is designed to hook up an electronic tuner to provide constant visual feedback while performing. The TUNER output is buffered and electronically isolated to prevent noisy digital tuners from bleeding clock noise into your instrument sound.



Because the TUNER output is tapped after the Class-A input stage and before the tube stage it can be used in the studio to split the instrument signal to send a “clean” tone to another preamp.

**JR2 remote footswitch**

For even more control over the Firefly, you can add the optional JR2 footswitch. This two button footswitch can activate the MUTE function for silent on-stage tuning via the always-on TUNER output and toggle between instrument inputs A & B.



1/4" TRS to TRS



XLR to TRS

### Adding effects

As with any preamp or direct box, you can connect effects in line between your instrument and the Firefly the same way you would when connecting pedals in front of your amp. With this set up, each instrument can have its own set of effects.



The Firefly is also equipped with a ¼" TRS INSERT jack that enables you to share effects between both instruments. This rear mounted jack requires a standard studio insert cable whereby one end is equipped with a ¼" TRS and the other equipped with two ¼" plugs designated as send and receive. Simply connect the send to the input of the first pedal in the chain and the output to the receive plug. With this setup, when you change instruments the signal will automatically be routed to the pedals.



## SETTING UP THE FIREFLY FOR VARIOUS INSTRUMENTS

The Firefly is designed to adapt to just about any instrument whether it employs a magnetic pickup, piezo or combination with an active buffer.

### Magnetic pickups and Drag control

One of the more subtle yet indispensable functions is Drag Control™. Drag is designed to be used with magnetic pickups such as the ones found on most electric guitars, basses and the type that can be placed in the sound hole of an acoustic guitar. Magnetic pickups are very similar to transformers in that they react differently depending on the load that is presented. So when connected to a tube amp, they become part of the circuit and sound a particular way. When presented with a high impedance buffer, the sound changes. Guitarists often complain that they hate wireless systems or pedals, preferring true bypass devices. Drag Control lets you reintroduce the load on the pickup to replicate the tone and feel as if connected directly to a tube amplifier.



*Magnetic pickup in acoustic guitar sound hole.*

Start with Drag Control set to the 12 o'clock position. Turning the Drag Control clockwise will brighten the tone (less Drag) while turning the dial counter-clockwise will darken it (more Drag). Turn the Drag Control on by pushing in the switch and use a small screwdriver or guitar pick to adjust. Listen to find the tone that best suits your preference. 12 o'clock simulates the tone of a Stratocaster connected to a Fender Twin.

### Active instruments

For active instruments such as a keyboard, active bass or an active acoustic guitar with built-in preamp, the Drag control will have very little or no effect as the signal is already buffered. The advantage to using the Firefly is to warm up the tone by passing the signal through the tube and audio transformer. This will produce a 'vintage' effect that is pleasing to the ear.



*Acoustic guitar with active preamp.*

### Piezo transducers

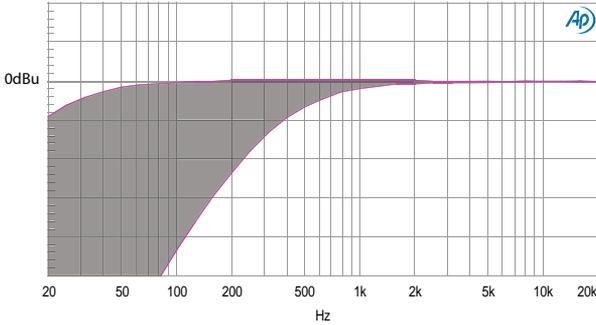
The Firefly is equipped with a special high input impedance that is ideally suited for piezo equipped instruments. Piezos are finicky devices that tend to squawk or sound peaky unless treated properly. When the Drag Control is turned off, (switch in out position), the input impedance jumps to 4 meg-ohms. This provides the piezo with the right type of impedance to properly load the pickup and smooth out the sound.



*Passive piezo transducer on acoustic guitar.*

### Adjusting the high pass filter

One of the most effective features built into the Firefly is the high-pass filter. This variable control lets you eliminate low frequency resonance from the instrument and produce a cleaner more defined sound. This is beneficial for both studio recording and on a live stage.



Freq Response Graph For High Pass Filter

In the studio, low frequencies can often blend together causing modulation and beating as they compete in the same frequency bands. By rolling off unneeded bottom end, you can more easily combine instruments and create a less congested recording. This ‘Nashville’ trick is often used to size various acoustic instruments such as contra bass, acoustic guitar, banjo and fiddle to create a more uniform and pleasing mix. Start with the high-pass filter set completely counter-clockwise. This essentially dials the filter out of the circuit. Slowly increase the cut-off frequency by rotating the control clockwise. You will hear it as it takes effect. Try experimenting with various cut-off points to get a feel as to what sound best to you.

In live situations, the high –pass filter is particularly effective at eliminating low frequency resonant feedback. By cutting out excessive lows, you will also gain more control over the mix. Cutting lows reduces the demands on the PA system which in turn reduces distortion. And if you have ever played electric guitar you know that feedback occurs much more readily with a distorted sound... so yes, the same applies with acoustic instruments: less distortion equals less feedback.

### SETTING THE OUTPUT CONTROLS

The Firefly XLR output is equipped with two switches: a 180° polarity reverse and a ground lift. Start by setting both of these to the outward position.



#### 180° polarity reverse

The 180° polarity reverse can perform various functions. When pushed in, this toggles the electrical phase at the balanced XLR output by swapping pin-2 and pin-3. If you so happen to be using some older equipment that does not follow the AES standard (pin-2 hot), this can be used to reverse the polarity and bring the Firefly into proper electrical phase.

More often than not, the polarity reverse will be used for other uses. For instance, in the studio, you may be combining the direct feed from the Firefly with a microphone. Depending on where the microphone is positioned in the room, you may find that reversing the polarity can help fatten the tone.

On stage, reversing the polarity is sometimes used by the front of house engineer to better phase-align the bass amp with the PA system. This can be very effective in smaller clubs where today's high powered bass rigs can compete with the PA. With acoustic guitars, sometimes the sound from the PA can cause huge peaks on stage known as hot spots or room modes. These cause the instrument to prematurely resonate which in turn causes feedback. Reversing the polarity will electrically 'move' the peak and often solve the problem.

**Lifting the ground**

Pushing in the ground lift switch lifts the ground connection on pin-1 at the XLR output. When you do so, this assumes that the instrument and Firefly are being grounded by another device such as a stage amplifier. Lifting the ground lifts the audio ground which in turn will often eliminate hum and buzz caused by ground loops. After you have connected the system, if you hear hum or buzz, try pushing in the switch to lift the ground.

**REMOTE SWITCHING AND MUTING**

The Firefly is equipped with a remote control jack for the optional Radial JR2 remote control footswitch. This compact switcher features two footswitches and three LEDs. Power is supplied by the Firefly thus eliminating the need for batteries or secondary power supply. Connection between the two devices is done with a balanced cable with 1/4" TRS connector at one end and choice between a 1/4" TRS or XLR at the other. The XLR has the added benefit of being able to be locked.



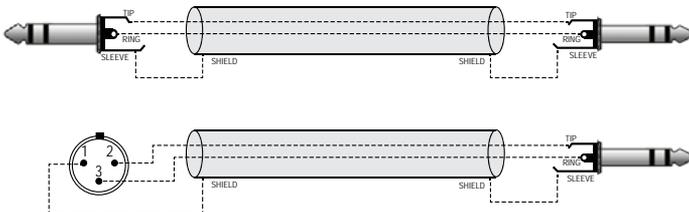
With the JR2 connected, you can remotely select between inputs A and B to select the desired instrument. The second switch is used to mute the Firefly for quiet on stage tuning via the always-on TUNER output. Depressing the footswitch illuminates the LED indicators to let you know which function is active.



JR2 Connected with a 1/4" TRS cable



JR2 Connected with locking XLR ~ TRS cable

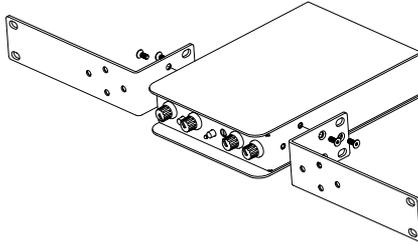


Wiring diagram for JR2 connection cable.

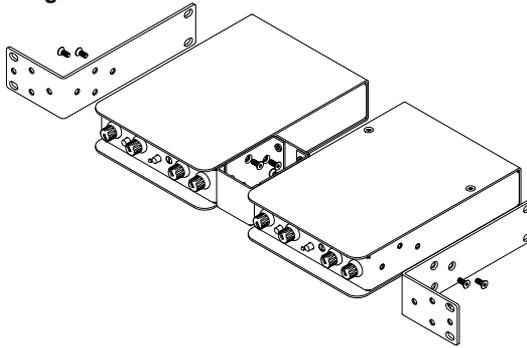
### RACK MOUNTING THE FIREFLY

For touring the Firefly may be mounted into a standard 19" rack using the optional rack mount kit. This three piece kit (*part number: R800 2020 02*) enables one or two Fireflies to be rack mounted in a 1RU rack space.

#### Single unit mounting:



#### Double unit mounting:

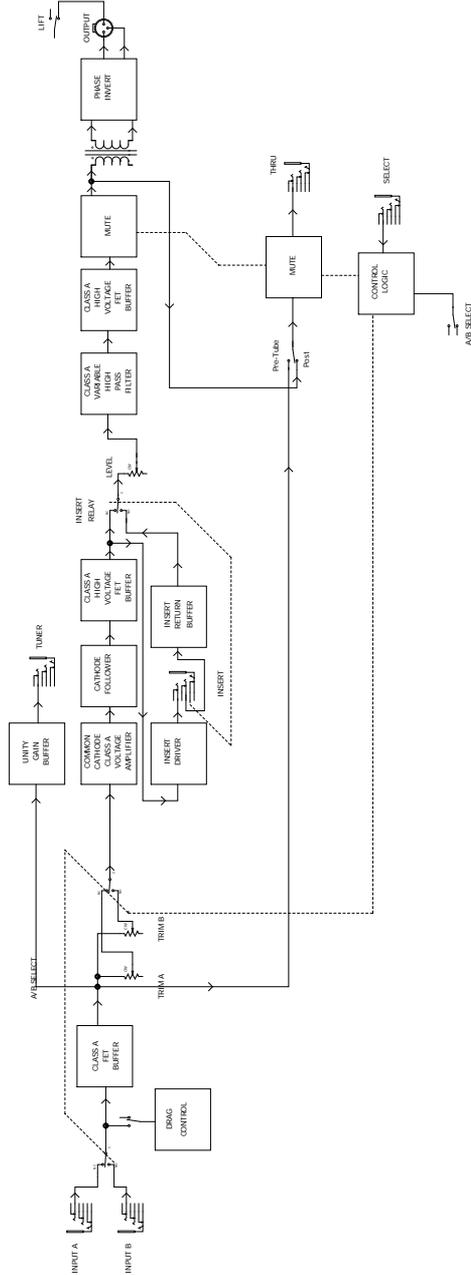


### SPECIFICATIONS

Frequency response.....	20Hz ~ 20kHz
Maximum Gain - 1/4" input to XLR out .....	+22dB
Noise .....	-98dBu
Dynamic range .....	100dB
Equivalent input noise .....	-100 dBu
Input impedance (drag control off).....	4Meg-Ohms
Input impedance (drag control on).....	Variable from 22k ~ 500k Ohms
Output impedance at XLR .....	200 Ohms (nominal)
Low-cut filter: .....	Variable from 25Hz ~ 500Hz (-3dB point)
Size (W, D, H) & weight .....	5.75" x 8.25" x 1.75" (2.75" with handle)
	146mm x 210mm x 45mm (70mm with handle)
Weight .....	3.95lbs. (1.80kg)
Power supply.....	+/-16v (1600mA) 5-pin XLR power supply

*All specifications average – depending on tube or termination. Please see web page for further details.*

### BLOCK DIAGRAM



## 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 an 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.

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Specifications and appearance are subject to change without notice.

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