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JDI DUPLEX

PASSIVE STEREO DI

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JDI DUPLEX
STEREO PASSIVE DIRECT BOX USER GUIDE



TABLE OF CONTENTS PAGE

Overview and DI basics 1
Features and functions 2
Making connections and quick start 3
Stereo and mono keyboard 4
Using the 3.5mm input 5
Using the RCA inputs 6
Balanced audio source 7
Using the PAD and 180° polarity 7
Using the ground lift 8
Rackmounting 8
Removing the switch caps 8
Block diagram and specifications 9
Warranty ..... Back cover

Thank you for purchasing the Radial JDI Duplex - arguably the world's finest passive stereo direct box. The Duplex combines an incredibly accurate audio signal path with tons of connectivity and a rugged construction that will provide years of dependable use. This latest version also adds a rack mount option that enables one or two Duplexes to be mounted in a single rack space.

As with all Radial products, a lot of effort has gone into providing maximum flexibility with an easy to use feature set. Before you start making connections, please take a few minutes to familiarize yourself with the many functions that have been included. If you have a question after you have read the user guide please visit the Duplex 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 and we will do our very best to reply to you in short order.

Now get ready to enjoy the smooth natural sound of the world's finest passive stereo direct box.

OVERVIEW

The Radial Duplex has often been dubbed the 'Swiss Army Knife' of direct boxes. And there is good reason for that. A real Swiss-made knife combines tons of useful tools into a small, yet very functional package and if handled correctly, will provide a lifetime of service! The Duplex is exactly the same.

From the outside, one immediately notices a ton of connectors and switches (23 to be exact) that surround the Duplex and bestow the incredible flexibility. A series of ¼" connectors make for easy interacting with musical instruments, such as a keyboards or bass guitars and amplifiers. RCA connectors enable the Duplex to be used with consumer electronic devices such as CD or video players. A 3.5mm mini TRS connector enables you to connect a smartphone, laptop or tablet via a headphone output. This is augmented with a pair of XLRs that enable the Duplex to be used to bridge and isolate two balanced line level devices together.

Once the signal is inside, the Duplex elegantly balances the signal via high performance audio transformers and produces a mic-level output that is perfectly suited to run along microphones in a low-Z balanced audio environment. This makes connecting to mixing consoles or studio preamps easy and worry-free. You merely turn up the volume and the Duplex springs to life. The simplicity is augmented with a number of functions that provide solutions to various challenges that may pop up during a concert, AV show or recording session.

PASSIVE DI BASICS

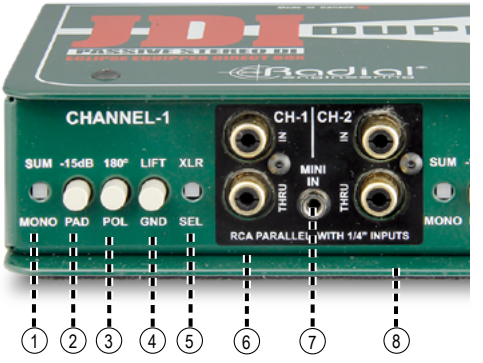
A direct box has the primary role of converting an unbalanced high-impedance signal to a balanced low impedance signal. Unbalanced signals typically 'max out' at around 8 meters (25') before noise begins to be audible. Balancing the signal allows distances of 100 meters (300') or more without noise. Balanced lines employ twisted pair cable that naturally rejects hum and buzz and lowering the impedance reduces the capacitive effect of the cable to retain high frequencies that would otherwise be attenuated.

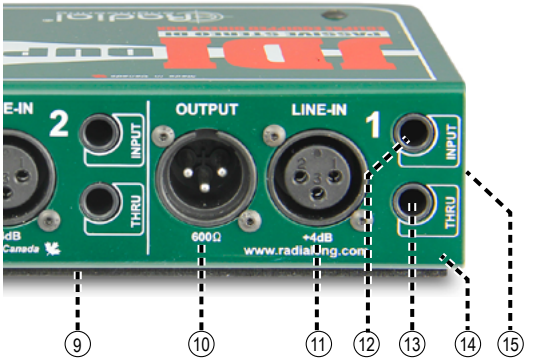
DI boxes are typically equipped with an input connector for the instrument, a thru connector to feed the stage amp and a balanced XLR output for the PA or recording system. The engine inside the Duplex is a pair of high-performance Jensen audio transformers. These are carefully designed to reduce loading while maintaining both a broad frequency response and minimal phase shift. The transformer is surrounded by carefully designed filters that bleed off RF (radio frequency noise) and a mu-metal outer can further reduces noise by protecting the sensitive coils from outside magnetic fields.

Transformers are particularly effective at managing high level signals that will often overload the electronic input stage of a mixing console. A transformer acts like a natural limiter that rounds-out transients producing a smooth tone that is often compared to the finest vintage gear. There is good reason for this because vintage audio gear uses transformers! Transformers have another advantage; they employ a magnetic bridge that isolates the input from the output, blocking stray DC voltages which are often the root cause of noise in audio systems.

FEATURES & FUNCTIONS

1. SUM MONO: Converts the channel IN and THRU jacks into left and right inputs and passively mixes them to mono.
2. -15dB PAD: Reduces the input sensitivity by -15dB to prevent distortion.
3. 180° POL: Inverts signal polarity at the XLR output by toggling pins two and three.
4. GROUND LIFT: Disconnects pin-1 at the XLR output to reduce noise caused by ground loops.
5. XLR SEL: Activates the +4dB XLR line input and disconnects the ¼", RCA and 3.5mm input jacks.
6. RCA IN: Stereo input for line-level sources like CD players.
7. 3.5mm IN: For line-level sources like laptop computers.
8. BOOK-END DESIGN: Creates a protective zone around the jacks and switches.
9. FULL BOTTOM PAD: Provides electrical insulation and mechanical isolation.
10. XLR OUTPUT: 600 Ohm balanced mic-level output for runs to 300m (1000') without noise.
11. +4dB XLR INPUT: For balanced line-level sources like mixing consoles and pro VTRs.
12. ¼" PHONE IN: For instruments and line-level sources like keyboards and drum machines.
13. ¼" THRU: Through-put connects to on stage amplifier or personal monitoring system.
14. I-BEAM REINFORCED: 14-gauge steel enclosure with rigid i-beam construction makes it impossible to torque the PC board and eliminates cold solder joints.
15. POWDER-COATED: Durable and environmentally friendly powder-coated finish for years of use.





MAKING CONNECTIONS

Before making connections, ensure all signal levels are turned down or equipment is shut off. This will help eliminate turn-on or plug-in transients that could cause damage to more sensitive equipment such as tweeters.

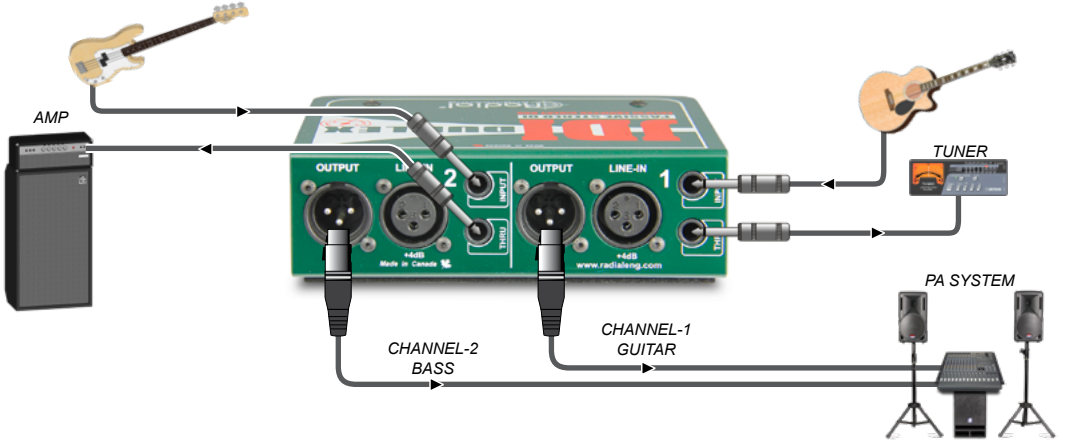
The JDI DUPLEX quick start

This section is for advanced users. It provides a quick set of instructions for those that are familiar with direct boxes and gets right down to action! We suggest that you read through the entire manual for a better understanding of your Duplex. See the 'Features and Functions' section for information about using the mono sum, polarity and line-level inputs.

QUICK START:

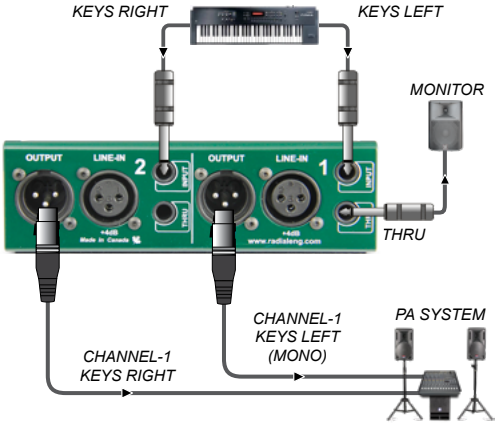
The Radial Duplex is a passive direct box and does not require any external power such as phantom or batteries. Follow these steps for each channel.

1. Make sure all switches are in the outward position including the two recessed switches. Use a small screwdriver to access the recessed switches.
2. Connect the XLR OUTPUT to the PA or audio mixer.
3. Plug the instrument into the ¼" INPUT jack.
4. Connect the ¼" THRU jack to the instrument amplifier, keyboard mixer, or electronic tuner.
5. Slowly turn up the input level at the mixer and listen.
6. If you hear distortion, depress the –15dB PAD switch.
7. If you hear buzz or hum depress the GND LIFT switch.



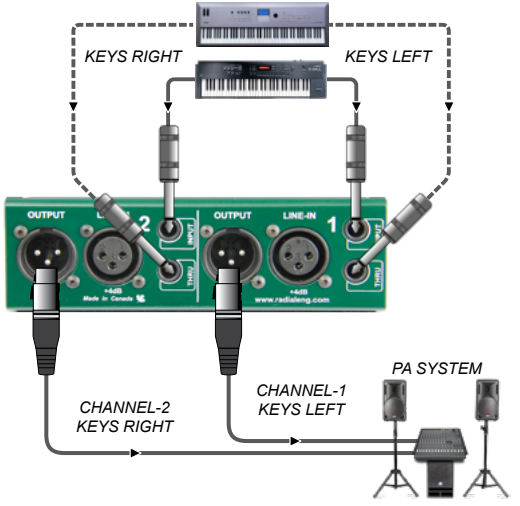
Stereo or mono keyboard

The Duplex features ¼" INPUT and THRU jacks for each channel allowing you to patch the instrument signal through to a personal monitor system. The XLR outputs connect to the PA or recording system. You can connect a stereo keyboard by simply doubling up the connection using channel-2.



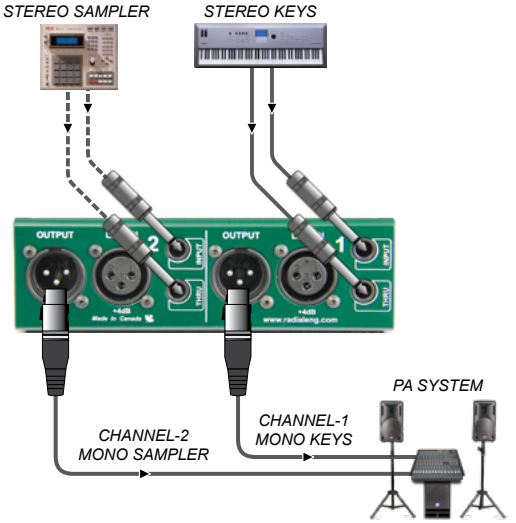
Two stereo keyboards

You can retain full stereo operation with two keyboards by connecting the keyboard's left and right outputs as shown and engaging the MONO SUM switch on both channels. Pushing the MONO SUM switch inward turns the THRU jack into a second input. Connected this way, the left signals from both devices are summed to one Duplex channel and the right signals are summed to the other. You can adjust the relative levels using the keyboards volume controls.



Keyboard and drum machine

Engaging the MONO SUM also makes it possible to connect a stereo device to one channel and have the Duplex mix it down and deliver a mono signal to the PA system. Used this way you can connect one or two stereo devices in mono. The balanced XLR outputs connect back to the PA or recording system.

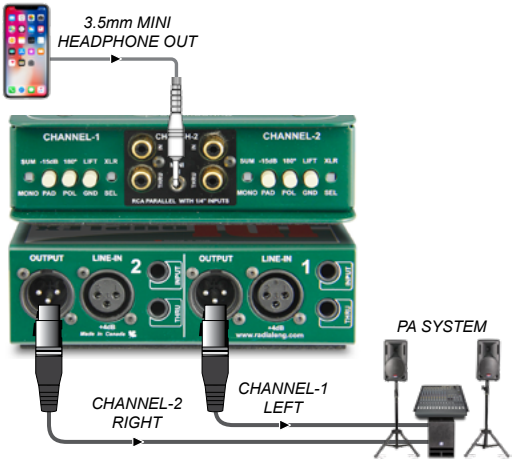


Connecting consumer audio devices

Today, laptop computers and tablets have become part of most audio shows and DJ setups. The Duplex is equipped with a variety of connectors to meet the challenge. This includes left and right RCA input connectors and a 3.5mm TRS connector to match up with the headphone output commonly found on laptops, smart phones and tablets.

Using the 3.5mm mini jack

To use a music player or laptop using it's 3.5mm headphone output, connect the device to the stereo 3.5mm mini jack input. As described earlier, the balanced XLR outputs connect back to your PA or recording system.

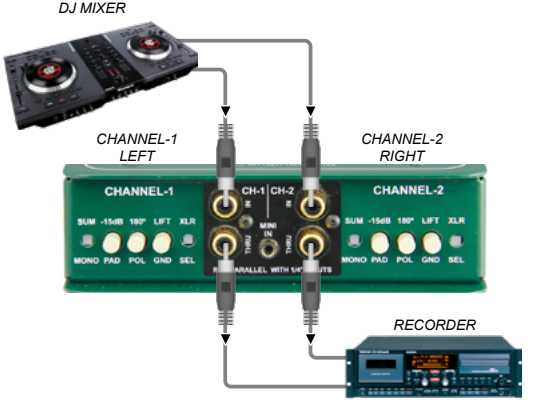


Using the RCA jacks

The Duplex features RCA INPUT and THRU jacks for each channel allowing you to patch in to a personal monitor system. You can also use the MONO SUM switch to connect one or two stereo devices in either mono or stereo depending on how you choose to patch it. As described earlier, the balanced XLR outputs connect to the PA or recording system (not shown in the diagrams).

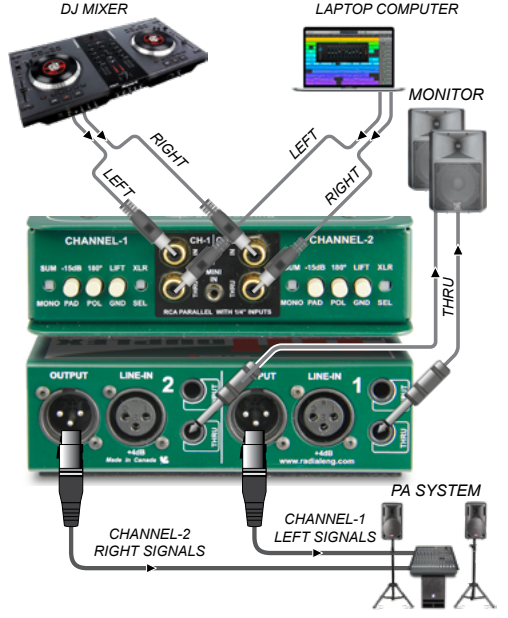
Basic stereo connection

When connecting a stereo device like a DJ mixer to the Duplex, the MONO SUM and XLR SEL switches should be set to their outward positions. Use good quality cables to connect to the channel-1 and channel-2 RCA IN jacks. The RCA THRU jack can be used to pass the stereo signal on to another audio system.



Dual stereo devices

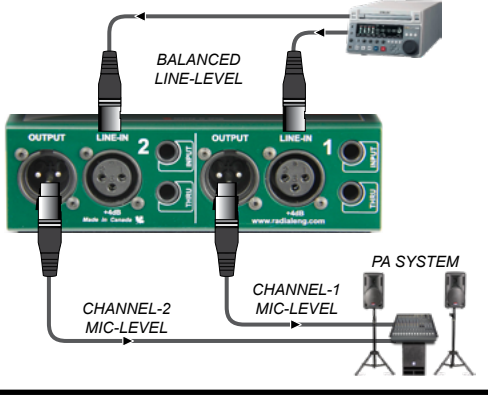
You can retain full stereo operation with two devices by connecting the left and right outputs as shown and pushing the MONO SUM switch inward on both channels. Connected this way, the left signals from both devices are summed to one Duplex channel and the right signals are summed to the other. You can adjust the relative levels using the device's volume controls. You can even connect a personal monitor to the ¼" THRU jacks.



Connecting balanced sources

You may run into a situation where you need to take a +4dB balanced line-level source and convert it to a mic-level. This is particularly important in snake systems where the signal path is optimized for a microphone between -40dB and -20dB. If one were to connect a +4dB signal, the mic splitting transformers would likely overload and crosstalk would likely be introduced due to the +4dB line-level signal being significantly louder than the mic-level signal.

To address this situation, each Duplex channel is equipped with a female XLR input labeled LINE-IN that is pre-padded to bring a +4dB level down to mic-level. To use the XLR LINE-IN set the XLR SEL switch to it's inward position. The switch is recessed to prevent accidental use. A small screwdriver can be used to access the switch. When the balanced XLR input is active, the ¼", RCA and 3.5mm input jacks are disabled.



Using the -15dB pad

Occasionally you may be confronted with a super powerful source that could overload and saturate the transformers inside the Duplex. This could, for instance, be the output signal from a DJ mixer. If this scenario presents itself, depressing the -15dB PAD switch reduces the input sensitivity and cleans up the signal. If you hear distortion, set the PAD switch to it's inward position. You may have to increase the input level at the mixing desk to compensate.



180° polarity reverse

There are two primary reasons to have a 180° polarity reverse on a direct box. The first has to do with ensuring the electrical phase of the DI is in line with the equipment in use. Some older audio systems employed pin-3 on the XLR as the hot output before the AES standard (pin-2 hot) was universally adopted.

The second has to do with the audible phase problems. For instance, in a small club, when combining a direct feed from a bass guitar and bass amplifier with the sound of the PA, you may find that the two signals are competing with each other causing phase cancellation at the mix position. By reversing the phase on the direct signal, the problem can be reduced. If using the Duplex with an acoustic guitar, a similar problem could occur whereby the sound from the stage monitors could

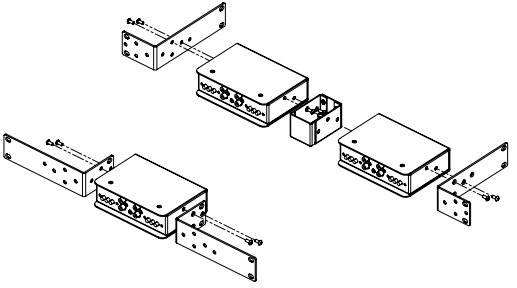
conflict with the sound of the PA system and room acoustics creating a hot spot that is prone to feedback. Reversing the polarity can often move the problem out of the way without having to resort to excessive EQ'ing.

Lifting the ground

The Duplex is equipped with transformers that isolate the input ground from the output ground and eliminates hum and buzz caused by so-called 'ground loops'. This is accomplished by lifting the audio ground between the Duplex and the mixing console by depressing the LIFT GRN switch. When set inward, the switch disconnects pin-1 on the XLR output and allows the transformers to isolate the signal ground.

Rack mounting the Duplex – Part #R800 9422 00

One of the innovations on the new Duplex is the ability to have it rack mounted by adding the optional rack-mount kit. This kit enables one or two Duplex units to be rack mounted in a single 19" (1RU) rack space.



Optional kit lets you rackmount one or two Duplex direct boxes in 1RU.

Removable Switch caps

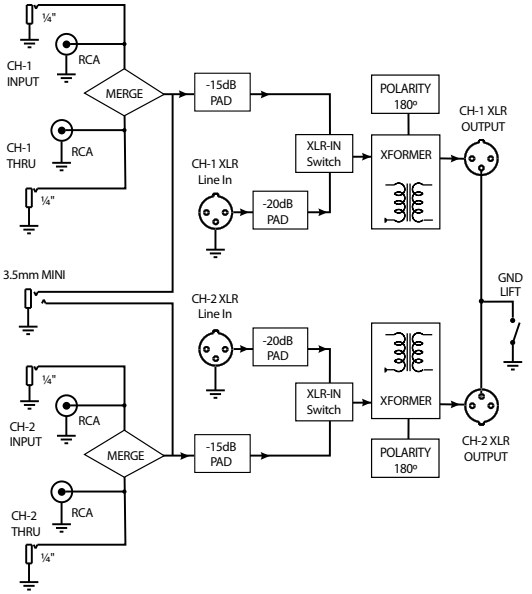
When using the Duplex on a run of shows, it may be preferable to set the switches at the beginning of rehearsals and then remove the switch caps to prevent the functions from being accidentally switched by stagehands.

The easiest way to remove the switch caps is to take the Duplex outer sleeve off and then gently push the switch caps outward from the inside. You can also use a pair of needle nose pliers to pull them off, but be careful not to mar the switch caps when doing so. After the tour is over, simply push the switch caps back on and they will revert to normal use.



Push switch caps off from inside.

Block Diagram



Specifications

Audio circuit type: ..... Passive, transformer based
Number of channels:.....Dual channel (stereo)
Frequency response: .....20Hz ~ 20KHz (± 2dB)
Dynamic range: 135dB
Maximum input: .....+20dB @ 1kHz
Total harmonic distortion: .....0.001%; 1kHz/+4dBu; 600 Ohm load
Phase deviation: ..... -1° @ 20Hz; 0.5° @ 150Hz; 600 Ohm load
Input impedance - unbalanced: .....140k Ohm PAD off; 10k Ohm PAD on
Input impedance - balanced FXLR: .....10k Ohm
Output impedance - balanced MXLR: .....600 Ohms
Transformer:.....Jensen JT-DB-E, 12:1 ratio
Shield:.....Dual Faraday, mu-metal can
Input pad: ..... -15dB (¼" and RCA inputs only)
Sum mono: ..... Resistive summing mixer
180° polarity reverse: ..... Toggles pins 2 and 3 at the XLR outputs
Ground lift: .....Disconnects pin-1 at XLR output
XLR input: ..... +4dB balanced female XLR
XLR configuration: .....AES standard (pin-2 hot)
Connectors:.....1/4", RCA, 3.5mm TRS in, XLR-F in, XLR-M out
Construction: .....14 gauge steel chassis & outer shell
Finish: ..... Power coated
Size: (W x H x D) .....160mm x 48 x 127mm (6.3" x 1.9" x 5")
Weight: 1kg (2.2lbs)
Shipping Size: W x H x D:.....210 x 159 x 83mm (8.25" x 6.25" x 3.25")
Shipping Weight:..... 1.43 kg (3.15 lbs)
Power: .....Passive, no power required
Conditions:.....For use in dry locations only between 5°C and 40°C
Warranty: .....Radial 3-year, transferable

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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.

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