

# Decoder<sup>™</sup>

## Mid/Side Matrix



# User Guide

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# Radial® Decoder™ User Guide

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Congratulations on your purchase of the Radial Decoder Mid/Side Matrix. The Decoder is designed to make Mid/Side tracking and Reamping fun and easy. This manual covers the setup and operation of the Decoder in the studio environment. Please take a few minutes to read through this manual in order to familiarize yourself with the Decoder's features and applications. Inside you will find important safety features along with tips on how to get the most out of your Decoder.

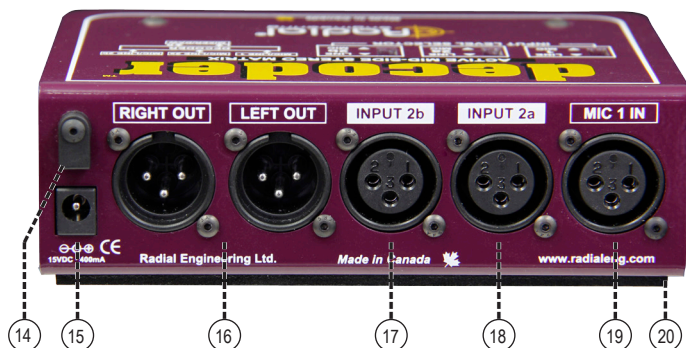
Should you have any questions on an application not covered in this manual, we invite you to log onto the radial website at [radialeng.com](http://radialeng.com) to check the Decoder's FAQ section for the latest updates. If you still do not find what you are looking for, feel free to send us an email at [info@radialeng.com](mailto:info@radialeng.com).

Now have fun creating Mid/Side stereo recordings quickly and more easily than ever before!



## FRONT PANEL FEATURES

1. **1:** Turns preamp 1 (MID microphone) on and off
2. **HPF:** High pass filter to reduce low frequency rumble
3. **48V:** Input-1 phantom power switch is recessed to prevent accidental turn-on which could damage certain mics
4. **GAIN:** Adjusts input level of mic/line input-1
5. **2a:** Turns preamp 2a (SIDE microphone) on and off
6. **GAIN:** Adjusts input level of mic/line input-2a
7. **48V:** Input-2a/2b phantom power switch
8. **HPF:** High pass filter for inputs-2a/2b
9. **LINK:** Duplicates, pans and reverses the phase of input-2a for traditional M/S operation
10. **2b:** Turns on the optional third preamp
11. **GAIN:** Adjusts input level of mic/line input-2b
12. **180°:** Reverses the phase of input-2b when using with a third microphone
13. **FRONT LIP:** Creates protective zone around switches and controls to prevent unintentional changes and protect the Decoder from damage when moving



## REAR PANEL FEATURES

14. **CABLE CLAMP:** Used to secure the power supply cable in mobile installations
15. **POWER:** 15VDC power connection for external power supply
16. **RIGHT & LEFT OUTPUTS:** Balanced +4dBu XLR stereo outputs
17. **MIC 1 IN:** Mic/line input for main 'MID' microphone or line source
18. **INPUT-2a:** Mic/line input for 'SIDE' microphone or line source
19. **INPUT-2b:** Mic/line input for optional third microphone or line source
20. **NO SLIP PAD:** A full pad covers the underside, keeps the Decoder in one place and won't scratch your mixing console

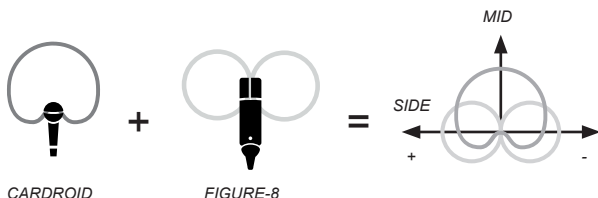


## TOP PANEL FEATURES

21. **INPUT LEVEL SELECTOR:** Allows user to select mic or line level on each channel. Switches are recessed to prevent accidental changes while recording

## OVERVIEW

The Decoder is a multi-channel microphone preamp and M/S stereo matrix that allows the user to easily create M/S recordings without having to configure a recording console. The Decoder can be used for traditional M/S recording with two microphones, or with three microphones for a unique approach. It can also be used to Reamp pre-recorded tracks through its M/S matrix during mix-down.



## WHAT IS MID/SIDE?

Mid/Side is a stereo microphone technique that has been around since the 1930's, and has been used on countless stereo recordings ever since. The idea is that a cardioid or Omni-directional MID microphone is aimed directly at the source to capture the direct sound, and a figure-8 SIDE microphone is pointed 90° off axis to capture the ambient energy. The SIDE mic is then split into two separate channels, and the phase is reversed on the second channel. While it all sounds very complicated, reversing the phase of the copied signal simply allows the user to hear a left and right stereo image as it is captured by the front and back of the figure-8 microphone.

The result is a stereo image that can be manipulated by adjusting the levels between the MID and SIDE microphones. Raising or lowering the level of either will change the width of the stereo image, and the MID microphone will act as a center channel, keeping the source focused and present. The engineer can quickly tailor the balance between MID and SIDE to create a stereo image that is perfect for their application.

M/S is also popular in broadcast as it allows for better mono compatibility than any other stereo mic'ing technique. Because the SIDE channels are out of phase with one another, they cancel one another out when the mix is collapsed to mono. While other stereo mic'ing options tend to disappear in mono mix downs, M/S allows the source microphone to become more focused and present in the mix. The center is never lost!

## MAKING CONNECTIONS

Before connecting, it is good practice to lower all levels or turn audio systems off as this will prevent turn-on or plug-in transients from damaging more sensitive components such as tweeters.

Begin by connecting the left and right XLR outputs jacks of the Decoder to your audio interface or mixing console. Ensure that your inputs are setup for +4dBu line level, and balanced cables are used throughout.

Attach the included 15VDC power supply. The Decoder does not have a power switch, so it is always on when connected. As an extra protective measure, the Decoder is equipped with a cable lock that eliminates the risk of accidentally pulling out the power supply. Using a hex key, loosen the clamp and pass the power cable through the loop. Then re-tighten.



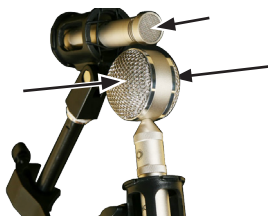
## MID/SIDE RECORDING

The most common method if M/S recording is to combine a cardioid or omni-directional microphone with a figure-8 mic. This is often used to capture a wonderful stereo image of an acoustic guitar, solo violin or ambient recording of a quartet.



## ONE CARDIOID MICROPHONE, ONE FIGURE-8 MIC

1. Setup microphones in the standard M/S configuration. The MID cardioid mic should be aimed at the source, and the SIDE figure-8 directly below it at 90° off-axis. Try to place the capsules as close together as possible to minimize phase issues.



2. Ensure recessed switches on the Decoder's top panel are all set to 'Mic'.



3. Connect the cardioid MID mic to input-1, and the SIDE mic to input-2a on the back of the Decoder.
4. Press LINK button on Decoder's front panel. This sends input-2a (figure-8) to the third channel and lets you use the gain control to adjust the stereo field.

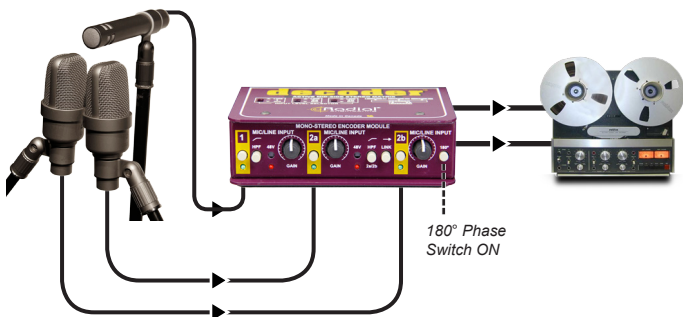


5. Apply phantom power on both channels if required. Be careful to make sure audio signals are turned off to avoid a loud pop when turning on the phantom power. The 48V phantom power switch is recessed to prevent accidental switching.
6. Start by bringing up the GAIN control of input-1 to an audible level on your system.
7. Slowly start bringing up the GAIN controls of inputs-2a and 2b. You will notice the stereo image widens and narrows as you bring up the SIDE's.
8. Experiment by changing the level of MID mic as well. Don't forget to watch the meters on your recorder... it is easy to get carried away!



### THREE CARDIOID MICROPHONES

The Decoder is equipped with a third microphone input. This allows the user to substitute the figure-8 mic with a pair of cardioid microphones to simulate the same effect. Bringing the mic's as close together as possible will minimize phase issues.

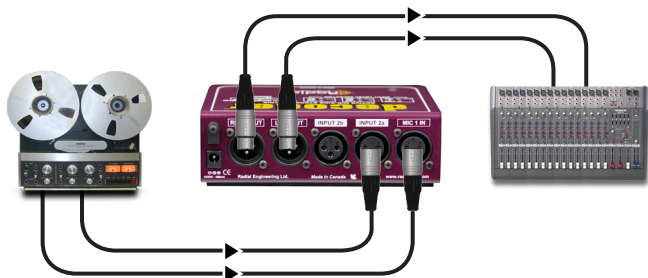


1. Setup the MID microphone by aiming it directly at the source. Connect this mic to input-1 on the Decoder.
2. Setup your left SIDE microphone by placing it directly below and 90° off axis from the MID mic. Connect this mic to input-2a on the Decoder.
3. Setup your right SIDE microphone by aiming it directly opposite of your side mic. Initially the goal is to replicate a figure-8 polar pattern, so try and get the capsules as close together as possible. Side-address microphones work great!
4. Engage the 180° phase reverse on input-2b (button IN).
5. Make sure the LINK button is set to the OUT position so that it does not receive the signal from input-2a.
6. Apply phantom power on channels 1, 2a and 2b if required. Note that the phantom ON switch for channels 2a and 2b are combined and adjacent to the input 2a gain switch. The 48V phantom power switches are recessed to prevent accidental switching.
7. Start by bringing up the GAIN control on input-1 to an audible level on your system.
8. Slowly start bringing up the GAIN controls of inputs-2a and 2b.
9. Start experimenting with different placements of your SIDE mics. Spacing mics far apart or even running stereo room mics through the Decoder can lead to some interesting results!

## MID/SIDE REAMPING - OPERATING AT LINE LEVEL

The Decoder features top mounted switches that let you change the input sensitivity from mic level to line level, thus allowing you to send pre-recorded +4dB (nominal) M/S tracks from your workstation for Reamping. This lets you apply M/S techniques to change the stereo image of a track during mix-down.

From the output of your recorder, send the pre-recorded MID track to the Decoder input-1 and the SIDE track to input-2a. If you are using two SIDE sources, patch the second line into input-2b. Be sure that you are monitoring the return channels from the Decoders outputs to hear the processed stereo image.

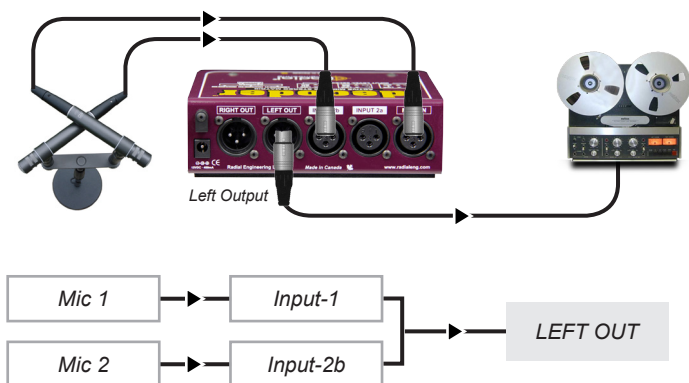


1. Set input level selector switches on top panel to 'LINE' position (up).
2. Ensure that the GAIN controls are turned all the way down on the front panel before proceeding.
3. Engage LINK button on the front panel if only two inputs are being used.
4. Engage 180° button on the front panel if all three inputs are being used (link off).
5. Start playback on your recorder and slowly increase the GAIN on input-1.
6. Once the signal is audible, begin increasing the GAIN on inputs-2a and 2b.
7. Change the stereo image by increasing or decreasing the relative levels of all three inputs.
8. Experiment with Reamping different stereo recordings like overheads or room mics... there are no rules! Have fun!

## USING THE DECODER AS THREE CHANNEL MIC PREAMP

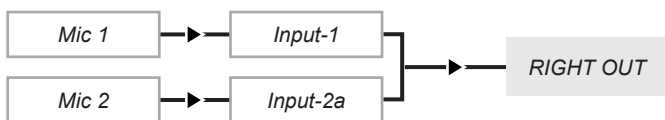
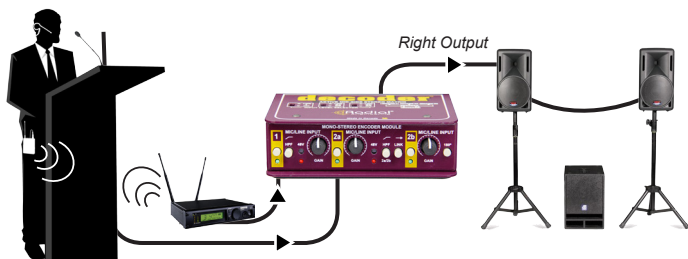
The Decoder is perfectly well suited to be used as a two or three channel microphone preamp with a mixed mono output. This could be for field recording, podium use or other applications where a high performance, yet compact mic pre may be required. Because the Decoder is able to produce as much as 65dB of gain, it is well suited for condenser, dynamic and most ribbon microphones. You can also use the Decoder to power an active direct box like a Radial J48.

### OPTION 1 - TWO CHANNEL MIC PREAMP IN THE STUDIO

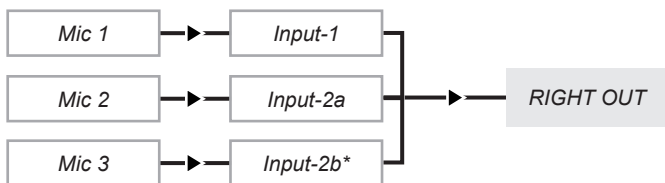
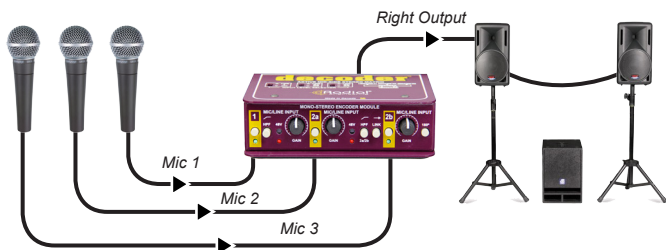


1. Connect the first microphone to input-1 and the second microphone to input-2b.
2. Connect the LEFT output to the input of your recording or PA system.
3. Activate the phantom power if needed. The 48V phantom power switches are recessed to prevent accidental use. Note: Some ribbon mics can be damaged if phantom is present. Please check with the manufacturer to ensure safe use.
4. Bring up the GAIN on the two channels as needed.
5. To change the polarity of the second mic, depress the 180° switch, and then adjust the level using the 2b GAIN switch. Changing the polarity can be used to widen stereo tracks or time-align tracks to bring them into focus. Try it!

## OPTION 2 - PORTABLE PREAMP FOR LIVE SOUND



## OPTION 3 - THREE MICROPHONES MIXED TO MONO OUTPUT



\*Disable link to ensure Input-2a signal is not being duplicated and activate the 180° polarity reverse.



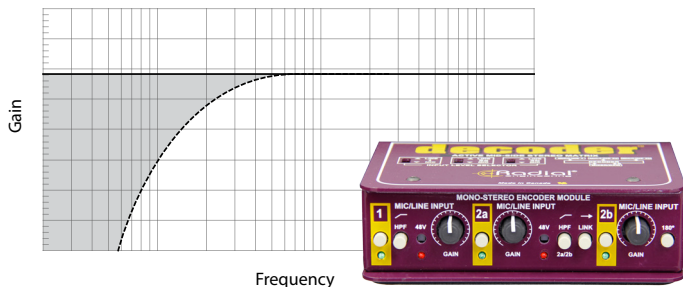
Input-2a and 2b link OFF ... (push OUT)



... Input-2b reverse polarity (push IN)

## HIGH PASS FILTER

There are two high-pass filter switches on the Decoder for input-1 and 2a/b. High pass filters are extremely valuable when recording as they eliminate excessive low frequency rumble and can do wonders at cleaning up a mix. Simply depress the HPF to audition. Note that both 2a and 2b share the same HPF switch.



## 48V PHANTOM

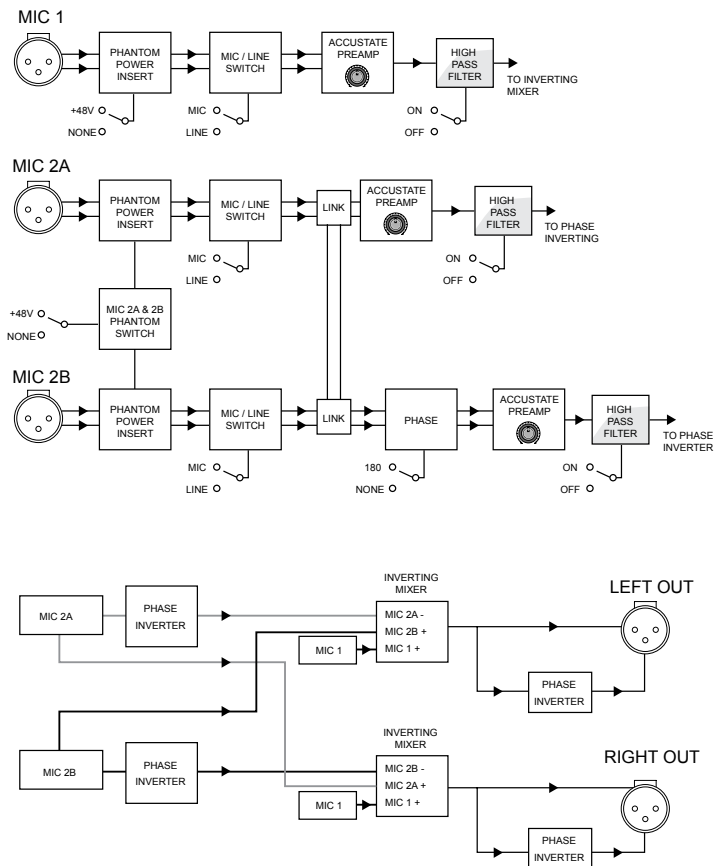
The Decoder is equipped with 48V phantom to remotely power condenser microphones and active direct boxes. There are two switches, one for input-1 and the other is combined for inputs-2a and 2b. These switches are recessed to prevent accidental use. Make sure you turn levels down or audio systems off before activating phantom power as the turn on transients can create a loud pop that could damage components such as tweeters. Although phantom power will not harm dynamic microphones or passive direct boxes, some older ribbon microphones can be damaged if DC current is applied. Please check with the manufacturer to ensure the use of phantom power is safe. As a precaution, always turn off phantom power when using ribbon mics

## POLARITY REVERSE SWITCH

The Decoder is equipped with a 180° polarity reverse that is primarily used to replicate the sound of a figure-8 microphone when using two separate cardioid mics.

You can also use the polarity reverse when using the Decoder as a mic preamp by using the input-2b GAIN control and 180° switch to change the relative phase. This can be particularly useful when combining a near and far mic to create a more solid rendering.

# BLOCK DIAGRAM\*



\* Subject to change without notice.

## SPECIFICATIONS\*

### Radial Decoder

Audio circuit type:	High grade Mic Preamp & Op-amp based M-S Matrix
Frequency response:	20Hz to 20kHz
Total harmonic distortion:	<0.005%
Dynamic range:	96dB
Input impedance:	10K
Mic input gain:	+65dB
Line input gain:	+25dB
Max output:	+17dBu
Output impedance:	300 $\Omega$
Equivalent input noise (EIN):	<-115dBu
Noise floor:	-80dBu @ 40dB of gain
Intermodulation distortion:	<0.01%

### Features

Controls:	Mic/Line Gain 1, 2a & 2b
Switches:	Mic ON, HPF, Phantom Power, 2a to 2b link, 2b phase invert
High pass filter:	100Hz, -12dB / octave

### General

Construction:	14 gauge steel chassis & outer shell
Finish:	Durable powder coat
Size: (W x H x D)	4.5 x 2 x 6" (114 x 57 x 147mm)
Weight:	2.8lbs (1.3Kg)
Shipping size: (L x W x D)	4.75 x 2.5 x 10.75" (121 x 64 x 273mm)
Shipping weight:	3.05lbs (1.4Kg)
Power:	15V 400mA Power Adapter
Conditions:	For use in dry locations only between 5°C and 40°C
Warranty:	Radial 3-year, transferable

\* 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 centre and you must assume the risk of loss or damage. A copy of the original invoice showing date of purchase and the dealer name must accompany any request for work to be performed under this limited 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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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.



Made in Canada 

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

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