

# TOSSOVER™

## 500 Series Frequency Divider



## User Guide

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Congratulations on your purchase of the Radial Tossover™ - a frequency divider and band-pass filter designed for 500 series power racks. Although the Tossover is intuitive and easy to use, we recommend that you take a few minutes to read this short manual to make sure you take full advantage of the many features that are built in.

Should you find yourself asking a question that is not addressed, we invite you to view the Tossover FAQ page on our web site. This is where we post the latest hints and of course questions from users. If you still do not find what you are looking for, feel free to send an email to [info@radialeng.com](mailto:info@radialeng.com) and we will do our very best to respond to you in short order.

Now get ready to divide and conquer audio like Napoleon!

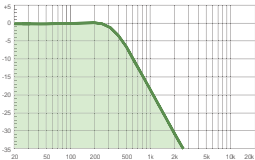


### WARNING NOTICE TO USER!

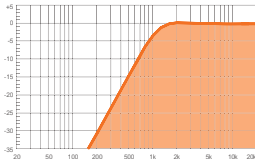
Although preventative safety measures have been designed into Radial 500 series products **we strictly advise against hot swapping modules** or plugging and unplugging them when the Workhorse or other 500 series rack is powered on. Hot swapping can cause connection sparks at the card-edge connector that could send damaging transients to other equipment. This also greatly reduces the life span of the contacts. Damage due to hot swapping is not covered under warranty. There are no user serviceable parts inside.

### OVERVIEW

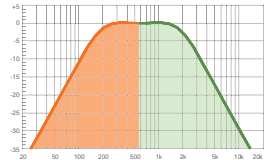
The Tossover features two variable filters with selectable attenuation slopes. The first is a low-pass filter where all frequencies above the cut-off point are attenuated. The second is a high-pass filter that attenuates all frequencies below the cut-off point. When both filters are used together the Tossover becomes a band-pass filter.



LOW PASS



HIGH PASS

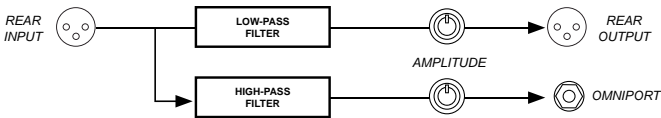


BAND PASS

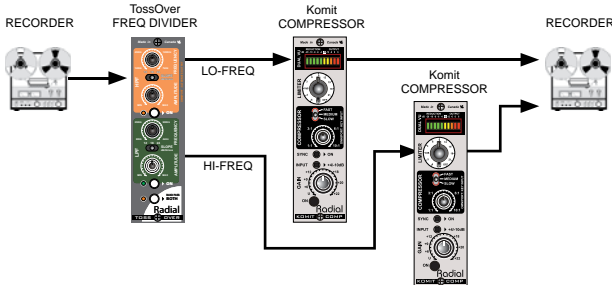
The filters can be used individually or in series. Each filter features a dedicated ON/BYPASS control allowing individual use of the filters.



The Tossover works in all 500 series racks. When inserted in a Radial 500 series rack the Omniport output is available and provides a second output allowing two-way operation where high-pass and low-pass bands may be processed separately.



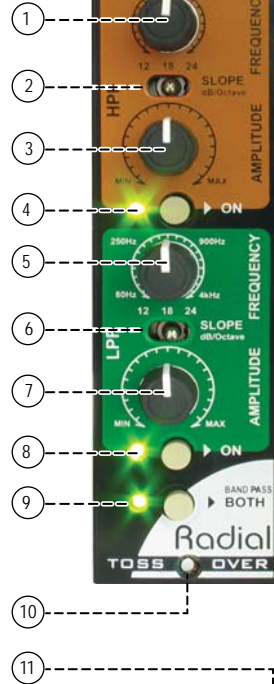
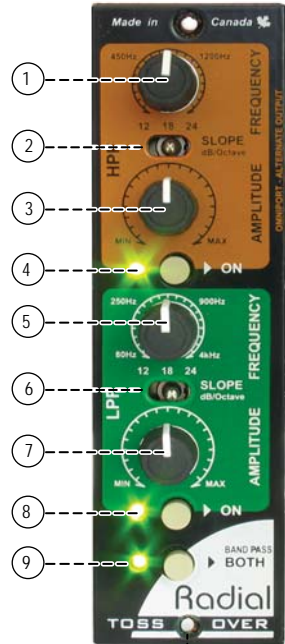
Applications for the Tossover include filtering out unwanted high, low or mid-range frequencies, signal processing applied to specific frequency regions as in multi-band compression and creative sound design where ultimate control over a track is required.



This example show the Tossover used to divide a signal for multi-band compression.

**FEATURE SET**

1. **HPF FREQUENCY:** Used to adjust the high frequency cut-off point above which the signal will be allowed to pass.
2. **HPF SLOPE:** Three position switch sets the crossover slope for 12dB, 18dB or 24dB per octave for soft, medium and increased filter effect.
3. **HPF AMPLITUDE:** Used to adjust the output level of the signal after it passes through the high pass filter. Controls output level for both filters when used in series mode.
4. **HPF ON:** Turns on the high pass filter section. An LED will illuminate when the filter is active.
5. **LPF FREQUENCY:** Used to adjust the low frequency cut-off point below which the signal will be allowed to pass.
6. **LPF SLOPE:** Three position switch sets the crossover slope for 12dB, 18dB or 24dB per octave for soft, medium and increased filter effect.
7. **LPF AMPLITUDE:** Used to adjust the output level of the signal after it passes through the low pass filter. It is disabled when used in series mode.
8. **LPF ON:** Turns on the low pass filter section. An LED will illuminate when the filter is active.
9. **BOTH (BAND PASS):** Combines the two filters in series to create a band-pass filter.
10. **OMNIPORT:** ¼" TRS connector (found on Radial Workhorse power racks) is the alternate output for 2-way mode.
11. **OUTPUT SELECT:** Mini-toggle switch near the 15-pin card edge selects which of the two filters will be routed to the XLR or the Omniport when using the Tossover with a Radial 500 series rack.

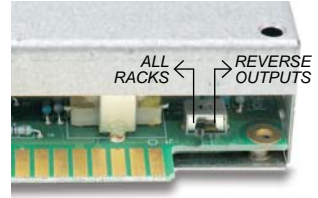


## GETTING STARTED

Although the Tossover is easy to use, we suggest you follow these simple instructions before getting started. As with all audio equipment, always ensure levels are turned down and equipment is turned off before making any connections or inserting the Tossover into a 500 series power rack. This common practice ensures turn-on transients will not damage more sensitive components such as tweeters.

### Preset the Output Switch

Before inserting the Tossover in your 500 rack, observe the setting of the mini-toggle switch located at the rear of the module next to the 15-pin card-edge. The default setting for all 500 series racks is 'HIGH' as labeled on the circuit board (towards the card edge connector). If you are using the Tossover in a Radial Workhorse rack you can use the 'LOW' setting (away from the card-edge connector) to reverse the routing between the main XLR output and the Omniport.

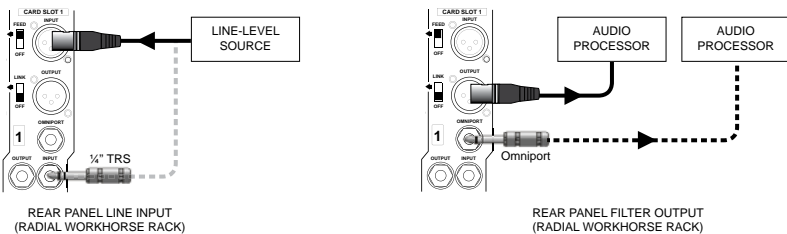


After inserting the Tossover into your 500 series rack secure it using the supplied machine screws to ensure it does not accidentally become dislodged during use. To prevent damage to the rack frame do not over-tighten the mounting screws.

Most 500 series racks are equipped with balanced XLR connectors. When you insert the Tossover into your 500 series rack, it will automatically route the rear panel XLR connections to the module's input and output. This is augmented with 1/4" TRS and D-sub connectors if using the Tossover in a Radial Workhorse 500 series rack. The Tossover follows the AES standard with pin-2 hot, pin-3 cold. Most devices are wired this way but older vintage equipment should be checked to confirm compatibility with AES standards.

### Making Connections

Connect a balanced line-level audio signal from your source device to the Tossover input using a standard XLR patch cable. Connect the output to your audio system so that you can audition the Tossover. We recommend that you first listen to the Tossover until you have had a chance to familiarize yourself with the filter functions. Using your own voice to test is always best as it gives you a familiar starting place.



### Omniport

If you are using the Tossover in a Radial Workhorse 500 series rack the Omniport 1/4" TRS jack can function as a second balanced output. This lets you use the Tossover as a 2-way divider where the main output and the Omniport are each dedicated to one filter. The Omniport output is balanced where tip is positive; ring is negative; and sleeve is ground.

### USING THE FILTERS

The Tossover is designed to work either as a frequency divider or a filter that can be used in three different ways:

- High-pass filter (HPF): Enables the high frequencies to pass while filtering out the lows
- Low-pass filter (LPF): Enables the low frequencies to pass while filtering out the highs
- Band-pass filter (BPF): Filters out the highs and lows when both filters are turned on

The difference between a frequency divider and a filter really comes down to application. A filter is used to warm up or clean up a track like a subtle equalizer while a frequency divider is used to separate part of the signal and send it along to another device for further processing.

The BOTH switch determines if the filters will be used separately or together to create band pass filter. When depressed, the signal passes through the low pass filter and then, through the high pass filter. In this mode, the amplitude or output level is set by the high-pass filter control.

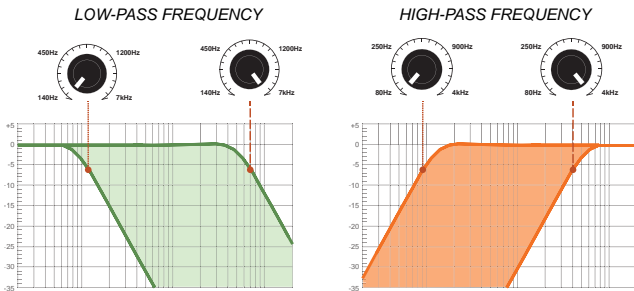


When used individually with the BOTH switch disengaged, you can select which of the two filters outputs will be sent to the XLR output on your 500 series rack by moving the mini toggle switch in the desired position. If you are equipped with a Workhorse, this toggles the output between the XLR and the Omniport.



### Setting the frequency and amplitude

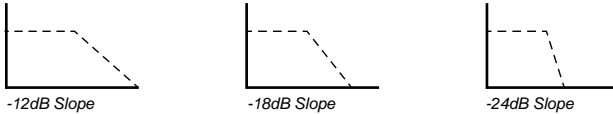
The filter's FREQUENCY control sets the cut-off point where attenuation begins. In the case of the high-pass filter all frequencies BELOW the cut-off point are attenuated. Similarly, the low-pass filter removes all frequencies ABOVE the cut-off.



While auditioning your voice or program music through the Tossover turn on the low-pass filter, and sweep the FREQUENCY control through its full range. You may need to adjust the AMPLITUDE control upward to hear the effect as much of the signal gain will be attenuated. Note that the low-pass AMPLITUDE control is disabled when the BOTH switch is depressed. In this case the overall output level is set using the high-pass AMPLITUDE control.

### Setting the filter slopes

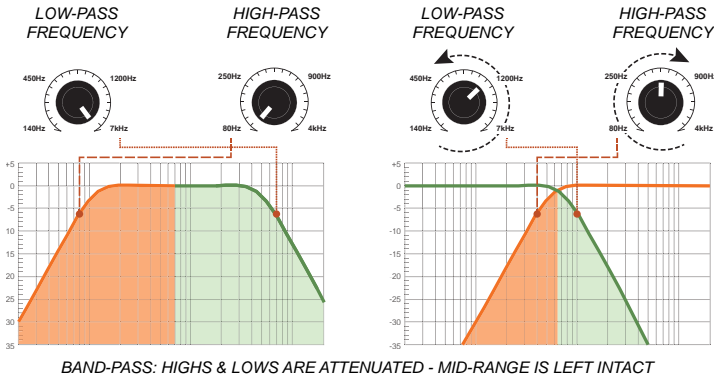
Both filters may be set to one of three attenuation slopes using the three-position switch. The slope is the amount of attenuation per octave in decibels. Select the -12dB/per-octave slope to gently roll off unwanted frequencies while maintaining the original character. Select a more severe -18dB or -24dB/per-octave slope to remove frequencies above or below the cut-off point. Generally, the steeper the slope the greater the effect and the less natural it will sound.



When using the Tossover as a frequency divider, the more radical the slope the more 'separation' you will notice between the low and high bands. There are no rules. Like a synthesizer the Tossover is designed for experimentation.

### Band-pass filter

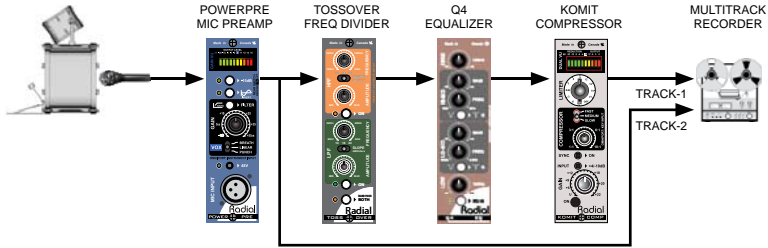
The Tossover's filters can be combined to create a band-pass filter where the mid-range is left intact and frequencies above and below the band-pass are removed. To create a band-pass filter, set the low-pass FREQUENCY control all the way clockwise (5 o'clock) and the high-pass all the way counter-clockwise (7 o'clock).



This will create a wider band in the mid-range where there is no attenuation. Next, begin to narrow the band by rotating both FREQUENCY controls in opposite directions. As you turn the controls you will hear the mid-band narrowing. For best results use the same SLOPE setting for both filters.

### Using the Tossover to extract frequencies

With a Tossover you can extract the high, mid or low ranges from a track allowing you to process a group a frequencies separately. A good example could be dividing a kick drum track so that certain bass frequencies can be accentuated using an EQ and compressor. Simply adjust the filter to the desired cut-off point and send the output of the Tossover to an EQ and compressor.



The result can be recorded to a new track or mixed with the original to create composite track. You can use this same trick on a snare to add more sizzle to the snap. For fun try it on a vocal track by introducing a distortion pedal to add grit and character to the top end without affecting the mids or lows.

### Using the Tossover as a low-pass filter

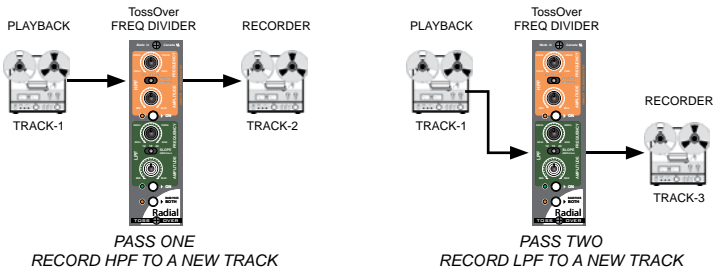
You can also use the Tossover as a simple low pass filter. This could, for instance be used to warm up an overly bright bass track. Start by rotating the cut-off frequency all the way clockwise, turn the filter on and then slowly turn the knob counter-clockwise to audition the effect. Use the on-off switch to compare the wet & dry sounds or mix with the original to set the balance.

### Using the Tossover as a high pass filter

A major problem when recording certain acoustic instruments is low frequency resonance. With the Tossover, you can filter out low frequencies starting at 140Hz. Simply set the frequency cut-off control fully counter-clockwise and then slowly increase the cut-off to where it sounds right. Try changing the slope to see how it affects the overall tone.

### Using both filters in parallel

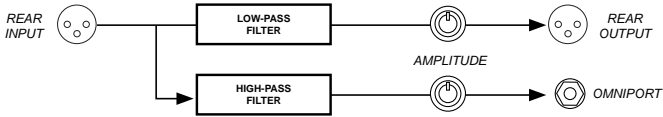
When the Tossover is inserted in a non-Radial 500 series rack, you can still record the output of each filter separately by making two passes. Start by recording the output of the low-pass filter to a track on your multi-track recorder. Then rewind the program and record the output of the high-pass filter in a second pass to a new track. You can then mix the results.



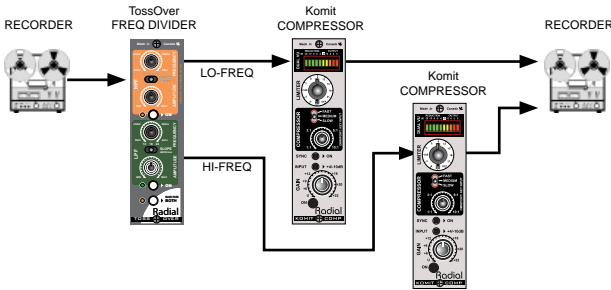


### Using both filters in parallel (Workhorse rack)

If you are equipped with a Radial Workhorse 500 rack, you can use the Omniport to output each filter separately to create two frequency divided stems. These two stems can then be processed simultaneously using different effects and dynamic controllers on each.



To achieve this, set the BOTH/BAND-PASS button on the front panel to the outward position. Set this way, each filter will be routed to separate outputs for '2-way' frequency dividing. In the example below the low and high frequencies stems from the TossOver are patched into separate dynamic processors.

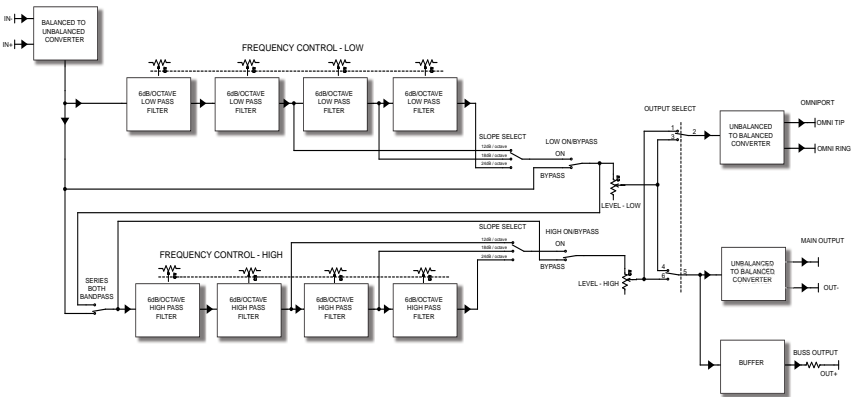


This setup allows much finer control of the dynamics. For instance, the low-end can be compressed to tighten up the bass without causing 'pumping and breathing', an audible high frequency side effect of compressors. On the high-end stem, a limiter setting is used to protect the recording device from over-modulation while retaining the original 'air' of the recording. After processing, the stems can be recorded to separate tracks or mixed together and recorded to one composite track.

### RADIAL TOSSOVER 500 SPECIFICATIONS

Circuit type.....	Sallen-Key filters with custom antilog controls
Frequency Response .....	20Hz to 20kHz
Maximum Input .....	+12Bu
Maximum Output .....	+20dBu
THD + N .....	<0002% @+4dBu
Equivalent Input Noise.....	-95dBu
Noise .....	<-91dBu
Gain .....	+6dB
Intermodulation Distortion.....	0002%
Input Impedance .....	20K Ohms
Output Impedance .....	100 Ohms
High Pass Filter Range.....	130Hz to 5kHz
Low Pass Filter Range .....	85Hz to 4kHz
Filter Slope .....	12, 18 or 24dB per/octave
Omniport Function .....	Alternate Output
Power requirement .....	+/- 16V at 85mA current draw

### RADIAL TOSSOVER 500 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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This product is intended for professional use only.  
The user should be familiar and experienced with  
the 500 series rack and module format.



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Specifications and appearance are subject to change without notice.

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