



# JPB-2016 Common-Mode Speaker Line Filter



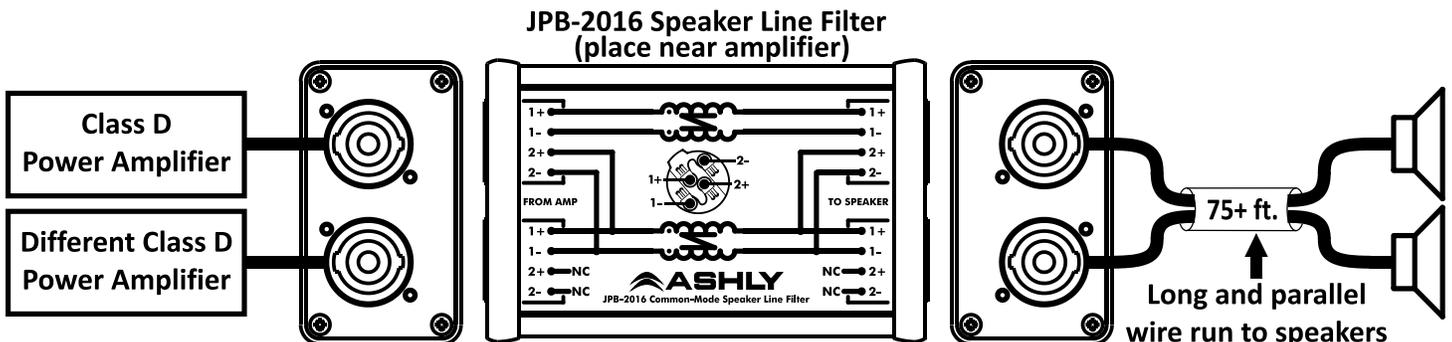
**Introduction:** The JPB-2016 Common Mode Speaker Line Filter is used to eliminate undesirable heterodyne tones caused by capacitive coupling of multiple Class D power amplifier outputs. Heterodyning is the combination of two or more frequencies to create sum and difference tones, in this case within the audible range. Heterodyne tones can occur when output cables from more than one Class D amplifier are run close together over a long distance, even with no audio signal present. Ashly Class D amplifiers currently include all nX, NE two-channel, NE multi-channel, Pema, SRA, and TRA models. The JPB-2016 is wired using Neutrik® speak-ON NL-2 or NL-4 type connectors.

**Theory:** The carrier signals on each output channel of an individual multi-channel Class-D amplifier are typically synchronized, or frequency “locked” to a single common carrier frequency (~ 300 KHz.). Therefore heterodyning between multiple channels of the same physical amplifier cannot occur. NOTE: The heterodyning mechanism is actually created by similar, but not exactly the same high-frequency carrier signals feeding back into the outputs of each respective amplifier. Those signals then interact inside the Class-D amplifier output stage which will then generate the heterodyne tones. i.e. If one amplifier running a 300 MHz carrier leaks into the output of another amplifier running at 309 MHz, the amplifiers can multiply those two signals together creating both sum and difference tones, with the difference tone being only 9 KHz, which is within the range of hearing. (Sounding a little like an old AM radio.)

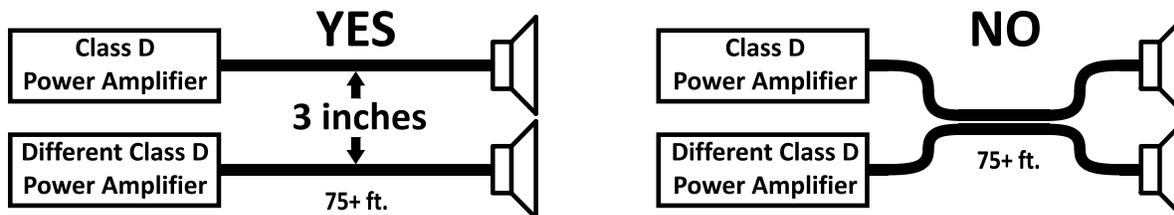
The JPB-2016 common-mode speaker line filter rejects high-frequency signals coming back into the power amplifier output, not the reverse. Because both + & - speaker lines are acting as antennas, and the 300 MHz carriers capacitively couple equally into both sides of the speaker line, one good way to reject an incoming high-frequency carrier is to place a common-mode filter at the output which will have virtually no effect on the differential-mode signal traveling from the amplifier to the speaker, but will block common-mode interference coming back into the amplifier.

Because different “Model Series”, and brands of amplifiers will most likely operate at different carrier frequencies, at least greater than 20 KHz apart, the difference tones that high cannot be heard. The heterodyne tone problem is most often observed when running multiple individual amplifiers of the same exact model series, and then running their speaker lines closely together within the same conduit or wire bundle for long-distance runs which will increase the capacitive crosstalk coupling between the speaker lines.

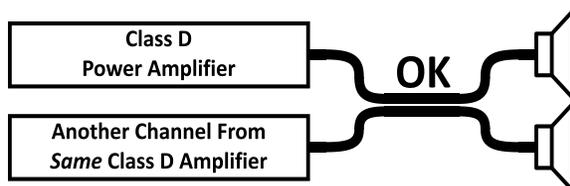
This is because running the speaker wires close together creates a capacitor. The longer the run the higher the capacitive coupling from one line to another, and thereby one amp to another. This effect has been observed with closely bundled speaker lines running distances as short as 75 feet but more typically occurs at lengths of 200 feet or more. NOTE: In all but the shortest speaker lines, separate Class-D amplifiers should NEVER share a common multi-core speaker cable. Multi-core speaker wire will maximize high-frequency crosstalk (i.e. at 300 MHz) as distance increases, potentially exacerbating the problem of heterodyning between the amplifiers. Multi-core speaker wire will work perfectly fine in the audio range, and will not create the potential for heterodyning when wired from a single Class-D multi-channel amp (2, 4, 8, channels etc), however using multi-core speaker wire with separate Class-D amplifiers where the carrier frequencies may not be synchronized greatly increases the risk of heterodyne tones.



Another simple technique when routing long speaker lines from separate Class-D amplifiers is to leave some physical distance (~ 2 to 3 inches minimum) between each bundle run that is tied to each separate amplifier as shown below.



Finally, speaker lines coming from the same Class D amplifier do not require any line filter or physical separation. Since the carrier frequency is the same on all channels from the same amplifier, speaker lines can be run close together without concern for capacitive crosstalk causing heterodyne tones.



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## Ashly Audio Inc. LIMITED WARRANTY (USA ONLY)

(For other countries, please contact your respective distributor or dealer from where the unit was first purchased.)

For units purchased in the USA, warranty service for this unit shall be provided by ASHLY AUDIO, INC. in accordance with the following warranty statement.

ASHLY AUDIO, INC. warrants to the owner of this product that it will be free from defects in workmanship and materials for a period of FIVE years from the original-date-of-purchase, with the exception of touch-screen displays and motorized faders which are warrantied for THREE years from the original-date-of-purchase.

ASHLY AUDIO INC. will without charge, repair or replace at its discretion, any defective product or component parts upon prepaid delivery of the product to the ASHLY AUDIO, INC. factory service department, accompanied with a proof of original-date-of-purchase in the form of a valid sales receipt. This warranty gives you specific legal rights, and you may also have other rights, which vary from state to state.

**EXCLUSIONS:** This warranty does not apply in the event of misuse, neglect, or as a result of unauthorized alterations or repairs made to the product. This warranty is void if the serial number is altered, defaced, or removed. ASHLY AUDIO, INC. reserves the right to make changes in design, or make additions to, or improvements upon, this product without any obligation to install the same on products previously manufactured.

Any implied warranties, which may arise under the operation of state law, shall be effective only for FIVE years (THREE years for touch-screen displays and motorized faders) from the original-date-of-purchase of the product. ASHLY AUDIO, INC. shall be obligated to only correct defects in the product itself. ASHLY AUDIO, INC. is not liable for any damage or injury, which may result from, or be incidental to, or a consequence of, such defects. Some states do not allow limitations on how long an implied warranty lasts, or the exclusion, or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you.

### OBTAINING WARRANTY SERVICE:

For warranty service in the United States, please follow this procedure:

1) Please return the product to ASHLY AUDIO, INC. freight prepaid, with a written statement describing the defect and application that the product is used in. ASHLY AUDIO, INC. will examine the product and perform any necessary service, including replacement of defective parts, at no further cost to you.

2) Please ship your product to:

ASHLY AUDIO, INC.  
Attention: Service Department  
847 Holt Road  
Webster, NY 14580-9103



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Phone: (585) 872-0010 Fax: (585) 872-0739 Toll Free (800) 828-6308 [www.ashly.com](http://www.ashly.com)

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