

Owners Manual

MPS 2240

Triple Darlington Mobile Pro Power Amplifier

Phoenix Gold is
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AMPLIFIER FEATURES: MS275 & MPS2240

- MS275:** 2x75 Watts per channel
MPS2240: 2x24 Watts per channel
- TRI-LINEAR™ output configuration allows simultaneous stereo and bridged mono operation.
- Adjustable Bass EQ 0 to +12dB at 45Hz
- Pulse Width Modulated MOSFET Switching Power Supply
- RIBBON-WINDING™ of Power Toroid
- MS275:** Stable into Bridged Mono 2Ω loads, 1Ω Stereo
MPS2240: Stable into Bridged Mono 1Ω loads, ½Ω Stereo
- High-Current Triple-Darlington Output Design
- Two layer, 2 oz. GOLD-PLATED G10 Glass-Epoxy Printed Circuit Board
- Thermal overload protection
- Overcurrent/Overload protection
- Variable input sensitivity 200mV to 2V
- Fully muted turn-on circuitry
- Optically isolated power and signal grounds
- VI limiting circuitry with overcurrent LED
- Extensive burn-in and QC testing for the ultimate in reliability
- Made in the good ol' U.S.A.

Output Power per Channel at 1% THD (all channels driven)

Into 4 ohms @ 12.0 VDC	24 watts x 2
Into 4 ohms @ 14.4 VDC	35 watts x 2
Into 2 ohms @ 14.4 VDC	60 watts x 2
Into 1 ohm @ 14.4 VDC	93 watts x 2
Into 1/2 ohm @ 14.4 VDC	150 watts x 2*
Bridged into 4 ohms @ 14.4 VDC	125 watts x 1
Bridged into 2 ohms @ 14.4 VDC	185 watts x 1
Bridged into 1 ohm @ 14.4 VDC	300 watts x 1*

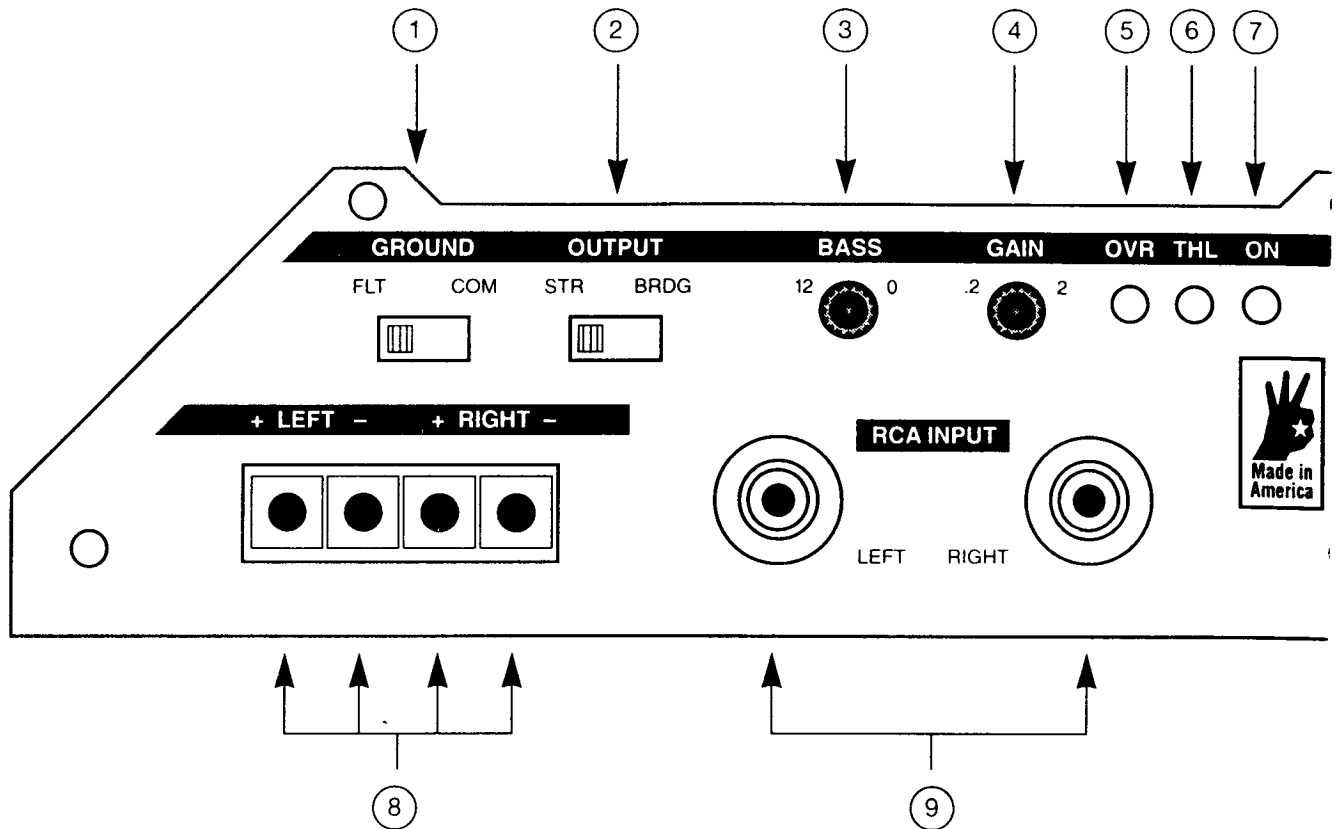
Frequency Response	±1dB from 20Hz to 20kHz
Signal to Noise Ratio	>100dB
Lowest THD.....	0.02%
Damping Factor	500 to 1
Input Sensitivity	200 millivolts to 2 volts
Input Impedance.....	30k ohms
Input Voltage Range.....	10.5 volts to 15.0 volts
Typical current draw at idle.....	3 amps
Continuous current draw @ full power**	30 amps
Peak current draw @ full power***	40 amps
Bass Boost	+12 dB @ 45 Hz
Recommended Fuse Size	40 amps
Dimensions.....	8.5"L x 11.4"W x 2.4"H

* Low impedance operation requires cooling fans, large gauge power cable and at least 1 farad of capacitance. MINIMUM SPEAKER LOAD IS 1 OHMS BRIDGED OR 1/2 OHM STEREO.

** Average continuous current draw when playing typical music material

*** Average peak current needed for musical peaks (<20 ms) when playing typical music material.

AMPLIFIER CONTROLS AND FUNCTIONS



1. GROUND (FLT/COM) SWITCH

Use the Ground Switch to get the lowest system noise in your installation. This switch should normally be in the common (COM) position. The floating (FLT) position isolates the input signal ground from amplifier chassis ground.

2. OUTPUT (STR/BRDG) SWITCH

The Output Switch sets the MS275/MPS2240 to stereo (STR) or bridged (BRDG) mode. If you desire to operate the amplifier in normal stereo or TRI-LINEAR™ mode, leave the switch in the stereo (STR) position. For bridged mono operation, set the switch to the bridged (BRDG) position: this causes the left input signal to drive both channels (the right input is not used.)

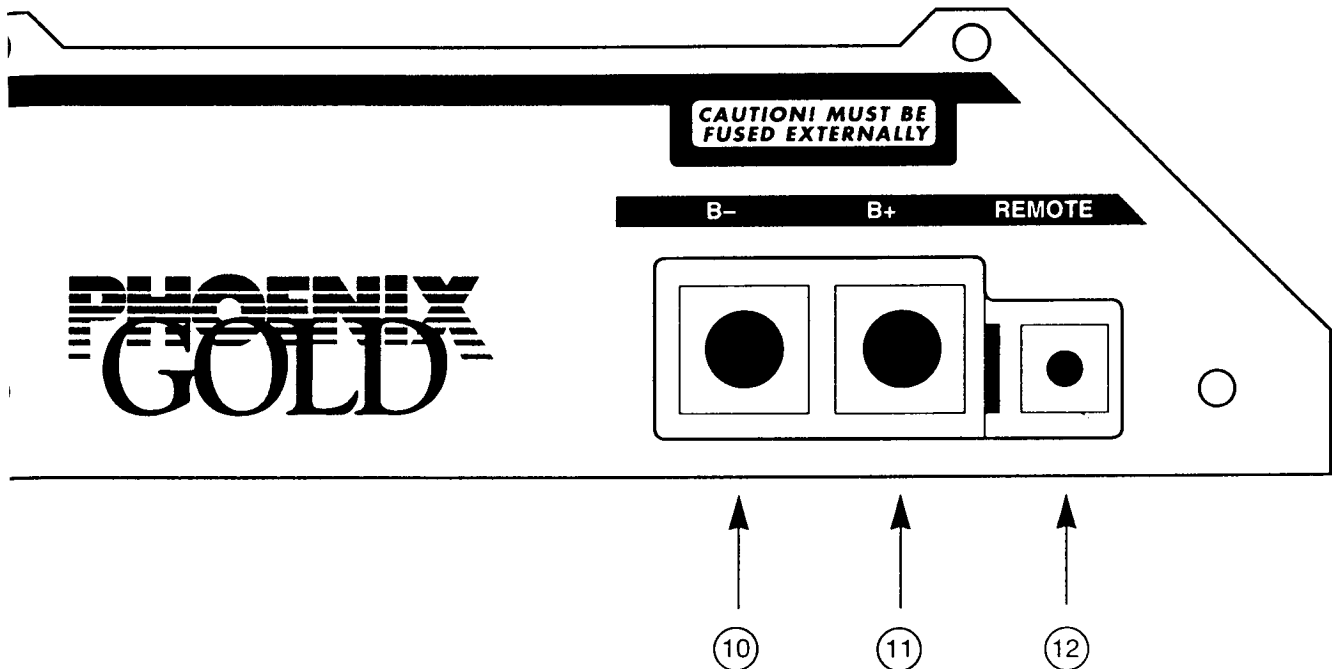
3. BASS ADJUSTMENT

The Bass Adjustment circuit allows for matching of the subwoofer/ enclosure in any vehicle. Continuously variable from 0 to +12dB at 45Hz.

4. GAIN ADJUSTMENT

The Gain Adjustment allows for the correct matching of any signal source (CD player, AM/FM cassette deck, etc.) from its pre-amp output into the MS275/MPS2240. In the minimum gain position (2V) a 2VRMS input signal

AMPLIFIER CONTROLS AND FUNCTIONS



will drive the amplifier to full output power. At the maximum gain position (.2V) a 200 μ VRMS input signal will produce full power.

5. **OVR: OVERLOAD LED**

The Overload LED lights when the amplifier has either:

- A. Passed more than 25 Amps of current in the output stage, or
- B. Passed more than 350 total Watts RMS! Obviously a bit more than rated power. This is another part of the amplifier's protection system.

6. **THL: THERMAL PROTECTION LED**

The Thermal Protection LED lights when the amplifier has "thermaled" or shut off temporarily to protect itself because the temperature of the heatsink has reached 90°C or 200°F. However, the amplifier will turn on automatically after it cools.

7. **ON: POWER ON LED**

The Power On LED lights when Amplifier is **on**, with 12 Volts at B+, B- and remote terminals.

AMPLIFIER LOCATION

The MS275/MPS2240 has been designed to dissipate heat more efficiently than any other amplifier manufactured today. However, prolonged operation at high volumes or extremely low impedances without the aid of a **fan shroud** can cause the unit to overheat and protect itself. Regardless of where you decide to mount the MS275/MPS2240, make sure that there is at least a 2" clearance above and around the amplifier.

The amplifier may be mounted either upright (Figure 1) or horizontally (Figure 2), but **never** upside down (Figure 3); that causes the rising heat to “feed back” into the amplifier, causing a premature system shut down.

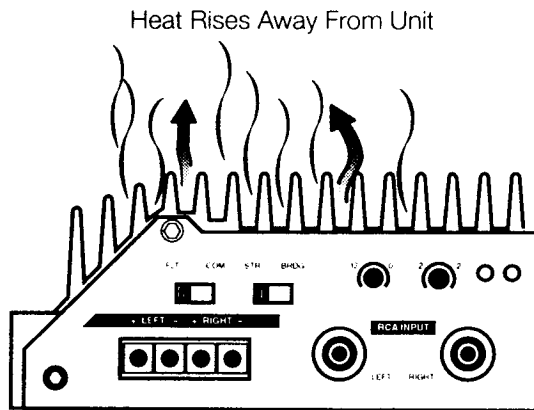


Figure 1

Heat Rises Through Heatsink Causing Each Fin To Heat More Rapidly.

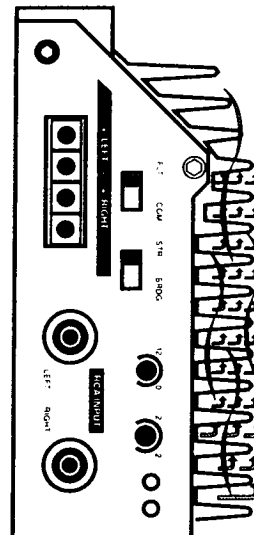


Figure 2

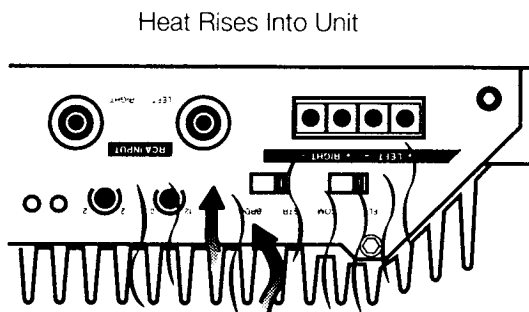


Figure 3

The MS275/MPS2240 should be protected from exposure to moisture. It is best to mount the amplifier:

1. On the floor or side panel of the trunk.
2. Under the seat.
3. Any other location where the amplifier has good ventilation for the heatsink.

Place amplifier in the position that you wish to use, making sure there is room for the amplifier cables to reach the amplifier's sockets.

AMPLIFIER MOUNTING

Mounting considerations:

- Is there enough space for the signal input plugs?
- Will the speaker and power cables be able to enter the terminal connectors straight?
- Will your mounting position allow easy viewing of indicator LEDs and amplifier controls?

Follow these steps to mount your new amplifier properly:

1. Use the MS275/MPS2240 as the template. Mark the mounting surface with a felt pen or pencil. Placing masking tape on the surface first will make these marks more visible.
2. Drill $\frac{1}{8}$ inch pilot holes.
3. Mount the amplifier with the four (4) #8 by $1\frac{1}{4}$ inch panhead phillips screws provided.

The mounting shown in Figure 4 is excellent; it allows the heat sink fins to act as a chimney, keeping the amplifier cool over longer periods on time.

Warning! Do not drill any holes while using the amplifier as a template! It is very easy to damage the amplifier's powder coated surface in this manner.

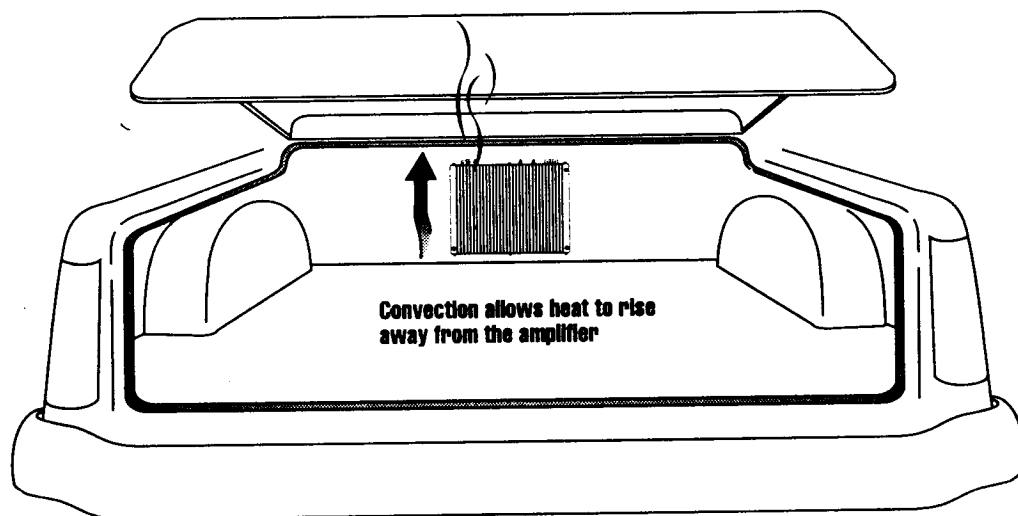


Figure 4: Trunk Mount

ELECTRICAL INSTALLATION

Note: Disconnect battery ground before installation.

1. Always use the largest gauge power/ground cable possible. The MS275 accepts up to 7 gauge wire (Phoenix Gold Model# PS7R/PS7B, PRO7R/PRO7B.) The MPS2240 accepts up to 4 gauge wire (Model# PS4R/PS4B, PRO4R/PRO4B.)
2. Always place a fuse or circuit breaker no more than 18 inches from the battery. This protection is only for the vehicle, not the amp and should be no greater than 30 Amps per amplifier. (See Figure 5)

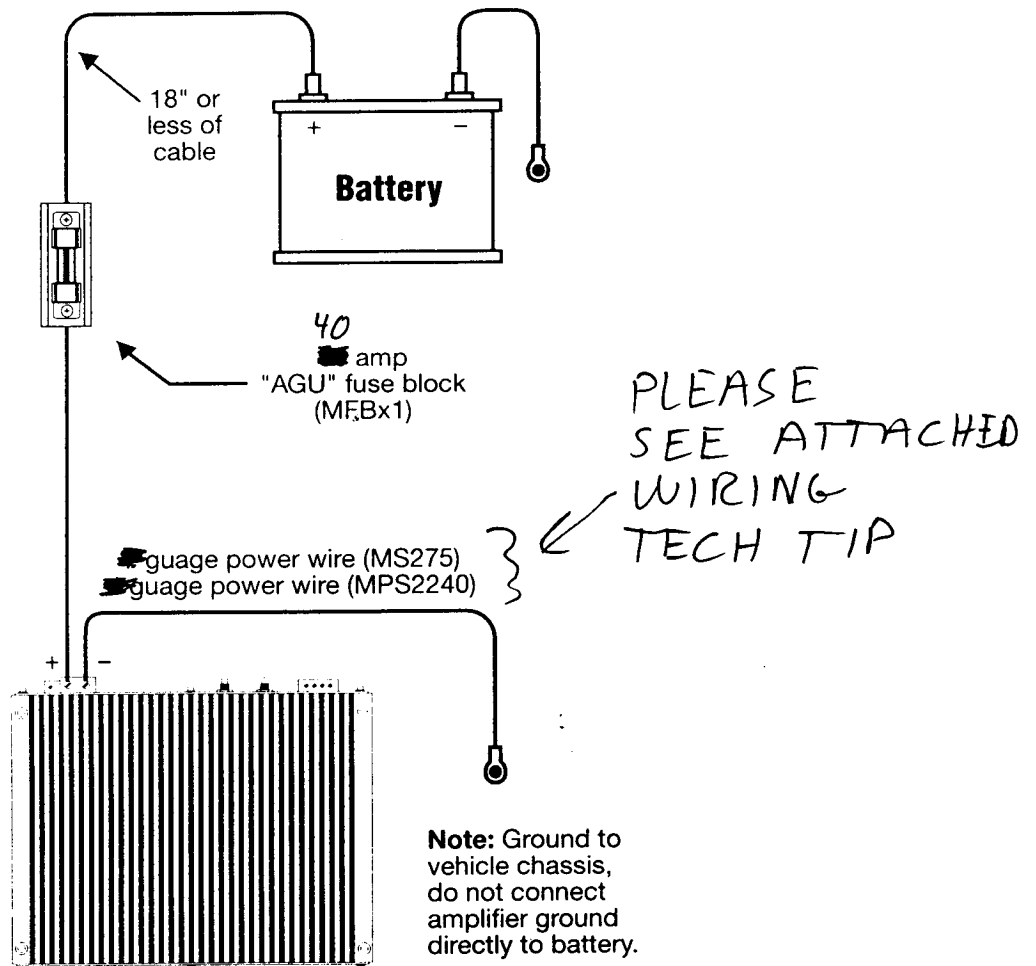


Figure 5: PowerFlow System

-- Phoenix Gold Tech Tips --

How to select the correct gauge power cable for single or multiple amplifier systems.

The maximum continuous amplifier power and the distance of the cable run determine the correct power cable size.

Use the chart below to find the correct cable size

1. Find the distance (feet) of the cable run along the top.
2. Find the total continuous power (watts) the cable must support on the left.
3. Where the two meet indicates the proper gauge cable.

If the distance or power falls between two columns or rows, always round up to the next higher gauge.

Distance of cable run

		4 ft	8 ft	12 ft	16 ft	20 ft	24 ft
M a x i m u m C o n t i n u o u s p o w e r	100 w	10	10	8	8	4	4
	200 w	10	8	8	4	4	2
	400 w	8	8	4	4	2	2
	600 w	8	4	4	2	2	2
	800 w	4	4	2	2	2	2
	1000 w	4	2	2	2	2	1/0
	1400 w	2	2	2	2	1/0	1/0
	1800 w	2	2	2	1/0	1/0	1/0
	2200 w	2	2	1/0	1/0	1/0	1/0 x 2
	2600 w	2	1/0	1/0	1/0	1/0 x 2	1/0 x 2
	3000 w	1/0	1/0	1/0	1/0 x 2	1/0 x 2	1/0 x 3

Examples:

1. A system with one ZX450. The amplifier is mounted in the trunk and the battery is 18 feet away in the engine compartment. The amplifier can produce up to 500 watts. The chart above shows the need for a 2 cable.

2. A system with a ZPA0.5 for bass and a . The amplifier is mounted in the trunk and the battery is 18 feet away in the engine compartment. The amplifier can produce up to 500 watts. The chart above shows the need for a 2 cable.



ELECTRICAL INSTALLATION (CONT.)

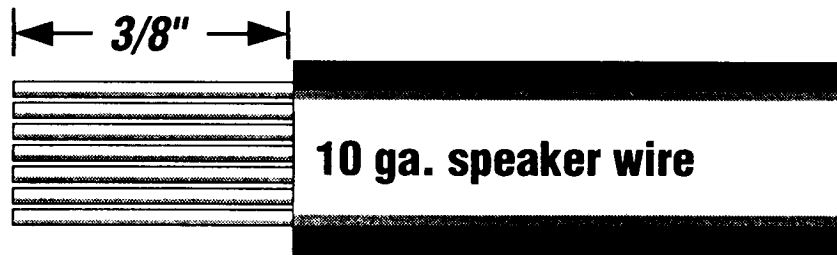


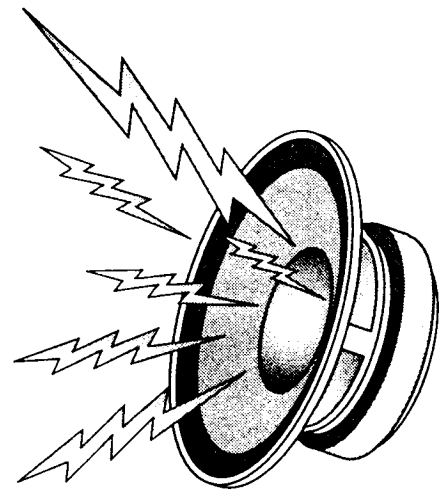
Figure 6: Wire Stripping

3. Always use the largest gauge speaker wire possible, to get the highest possible “damping factor” for the tightest, most accurate bass. The speaker terminal accepts up to 10 gauge cable.
4. Strip each cable approximately $\frac{3}{8}$ inches (see Figure 6) and twist the exposed wire together.
5. Insert the twisted wire end into the connector. Tighten the set screw firmly. Avoid loose connections, as they have high contact resistance.
Note: For **bridged mono** operation, connect the speaker to the **left+** and **right –** terminals.
6. Make sure to run your audio cables **AWAY** from your power wires. This reduces noise caused by the power wire radiating into the audio cables.
For audio connections, we **strongly** recommend using high-quality audio interconnects like our STS (Super Triple Shielded) or Compact STS cables. The Triple-Shielded cables are the ultimate in sound quality and for eliminating unwanted “radiated noise” from your system.
 - The Green LED lights when the amplifier is **on**.
 - The Yellow LED lights when the amplifier has “thermaled”: the heatsink has reached 200°F and the amplifier has shut off to protect itself.
 - The Red LED lights if the speaker impedance is too low to allow safe operation, or if there is a wiring fault.
 - When the protective circuitry engages, the green LED flashes for a second, then the red LED will stay lit. The lights may recycle several times. This is the result of a short in the system. Make sure that none of the speakers are shorted. Having a shorted output will not damage your MS275/MPS2240, but it will cause the protection circuitry to engage. This condition is indicated by the green Power LED and the red Protection LED alternately cycling on and off.

AUDIO SYSTEM DESIGN

The MS275/MPS2240 is extremely flexible: take great care designing the entire system before installing it. Use the following system diagrams for ideas to help design a truly awesome car audio system.

The following Crossover Slope charts are for your reference. When passive components (capacitors and inductors) are used in multi-speaker systems, the crossover's impedance **and** the speaker system combinations **must** be considered when determining the amplifier loading. These system diagrams do not consider crossover component values for the system you have chosen; those values will be determined by the frequency you select for your crossover point and the impedance of the speakers at the crossover point selected for your system.




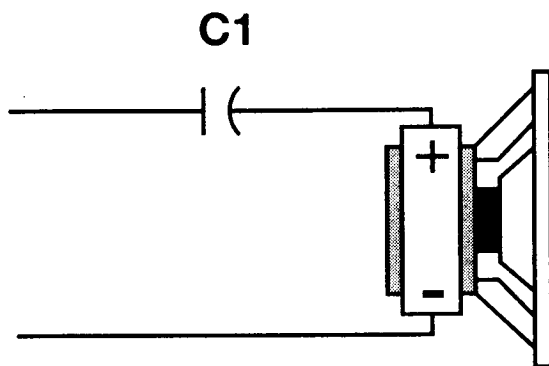
Phoenix Gold recommends that you use 12dB per octave crossovers in your systems. A 12dB per octave crossover (an inductor and capacitor for each speaker) forms a series resonant circuit to ground whose impedance at a particular resonance frequency is determined by the speaker's **dynamic** impedance at that frequency. If the speaker circuit, for whatever reason, becomes "open" or disconnected, the crossover impedance is theoretically zero (0)—a direct **short**. Most amplifiers **do not** like to see this condition, but Phoenix Gold amplifiers are designed to withstand this type of treatment and allow you to use an easy-to-control 12dB slope.

6dB and 18dB per octave crossover slopes don't short because they are "in phase." However, 6dB slopes don't filter the frequencies outside the passed band effectively, and 18dB slopes can be cumbersome if not ineffective because the slope varies according to the speaker's impedance. No speaker's impedance is a flat 4Ω across its frequency range, which means your crossover will not have the slope you expect it to have at a given frequency. In real-world terms that means you have no way of predicting what your crossover slopes will actually look like.

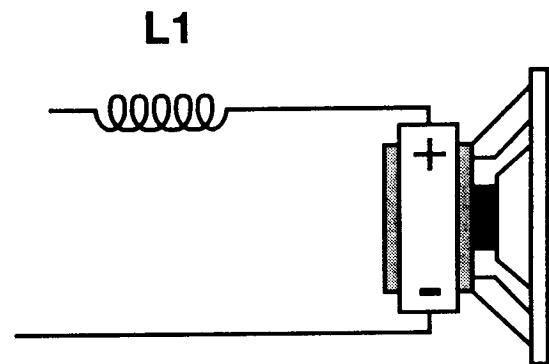
AUDIO SYSTEM DESIGN

FREQUENCY HERTZ	SPEAKER IMPEDANCE					
	2 Ohm		4 Ohm		8 Ohm	
	L1	C1	L1	C1	L1	C1
80	4.1 μ H	1000 μ F	8.2 μ H	500 μ F	16 μ H	250 μ F
100	3.1 μ H	800 μ F	6.2 μ H	400 μ F	12 μ H	200 μ F
130	2.4 μ H	600 μ F	4.7 μ H	300 μ F	10 μ H	150 μ F
200	1.6 μ H	400 μ F	3.3 μ H	200 μ F	6.8 μ H	100 μ F
260	1.2 μ H	300 μ F	2.4 μ H	150 μ F	4.7 μ H	75 μ F
400	.8 μ H	200 μ F	1.6 μ H	100 μ F	3.3 μ H	50 μ F
600	.5 μ H	136 μ F	1.0 μ H	68 μ F	2.0 μ H	33 μ F
800	.41 μ H	100 μ F	.82 μ H	50 μ F	1.6 μ H	25 μ F
1000	.31 μ H	78 μ F	.62 μ H	38 μ F	1.2 μ H	20 μ F
1200	.25 μ H	66 μ F	.51 μ H	33 μ F	1.0 μ H	16 μ F
1800	.16 μ H	44 μ F	.33 μ H	22 μ F	.68 μ H	10 μ F
4000	80 μ H	20 μ F	.16 μ H	10 μ F	.33 μ H	5 μ F
6000	51 μ H	14 μ F	.10 μ H	6.8 μ F	.29 μ H	3.3 μ F
9000	34 μ H	9.4 μ F	68 μ H	4.7 μ F	.15 μ H	2.2 μ F
12000	25 μ H	6.6 μ F	51 μ H	3.3 μ F	.1 μ H	1.6 μ F

 USE BI-POLAR CAPACITORS



6dB Per Octave High-Pass Filter

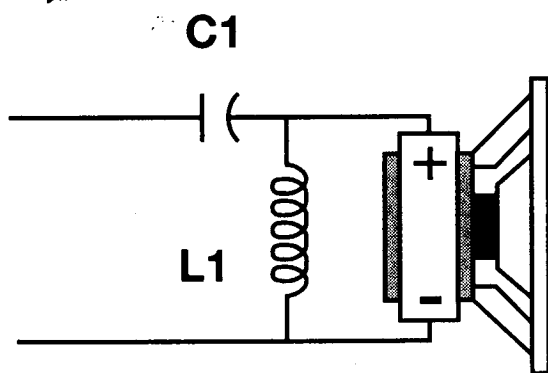


6dB Per Octave Low-Pass Filter

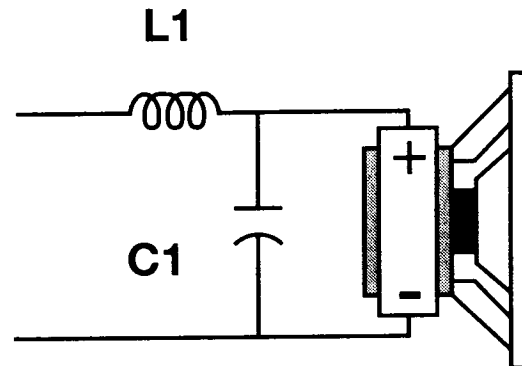
CROSSOVER SLOPES/COMPONENT VALUES

FREQUENCY HERTZ	SPEAKER IMPEDANCE					
	2 Ohm		4 Ohm		8 Ohm	
	L1	C1	L1	C1	L1	C1
80	5.5 μ H	680 μ F	11 μ H	330 μ F	22 μ H	180 μ F
100	4.7 μ H	560 μ F	9.1 μ H	270 μ F	18 μ H	150 μ F
130	3.3 μ H	400 μ F	6.8 μ H	200 μ F	15 μ H	100 μ F
200	2.2 μ H	300 μ F	4.7 μ H	150 μ F	9.1 μ H	75 μ F
260	1.8 μ H	200 μ F	3.6 μ H	100 μ F	6.8 μ H	50 μ F
400	1.1 μ H	150 μ F	2.2 μ H	68 μ F	4.7 μ H	33 μ F
600	.75 μ H	100 μ F	1.5 μ H	47 μ F	3.0 μ H	27 μ F
800	.50 μ H	68 μ F	1.0 μ H	33 μ F	2.0 μ H	15 μ F
1000	.47 μ H	50 μ F	.91 μ H	27 μ F	1.8 μ H	13 μ F
1200	.33 μ H	44 μ F	.75 μ H	22 μ F	1.5 μ H	11 μ F
1800	.27 μ H	30 μ F	.50 μ H	15 μ F	1.0 μ H	6.8 μ F
4000	.10 μ H	15 μ F	.22 μ H	6.8 μ F	.47 μ H	3.3 μ F
6000	75 μ H	10 μ F	.15 μ H	4.7 μ F	.33 μ H	2.2 μ F
9000	50 v	6.8 μ F	.10 μ H	3.3 μ F	.23 μ H	1.5 μ F
12000	39 μ H	4.7 μ F	75 μ H	2.2 μ F	.15 μ H	1.0 μ F

USE BI-POLAR CAPACITORS



12dB Per Octave High-Pass Filter

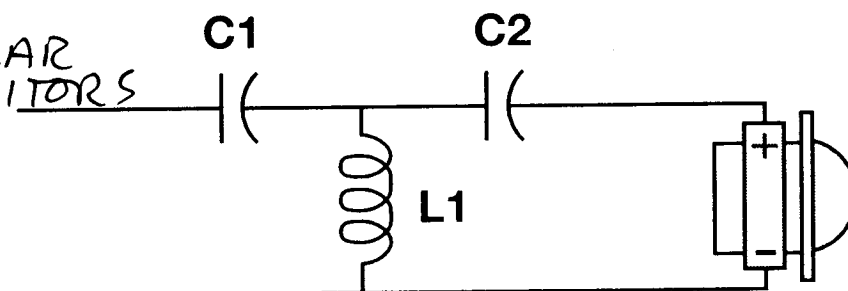


12dB Per Octave Low-Pass Filter

CROSSOVER SLOPES/COMPONENT VALUES

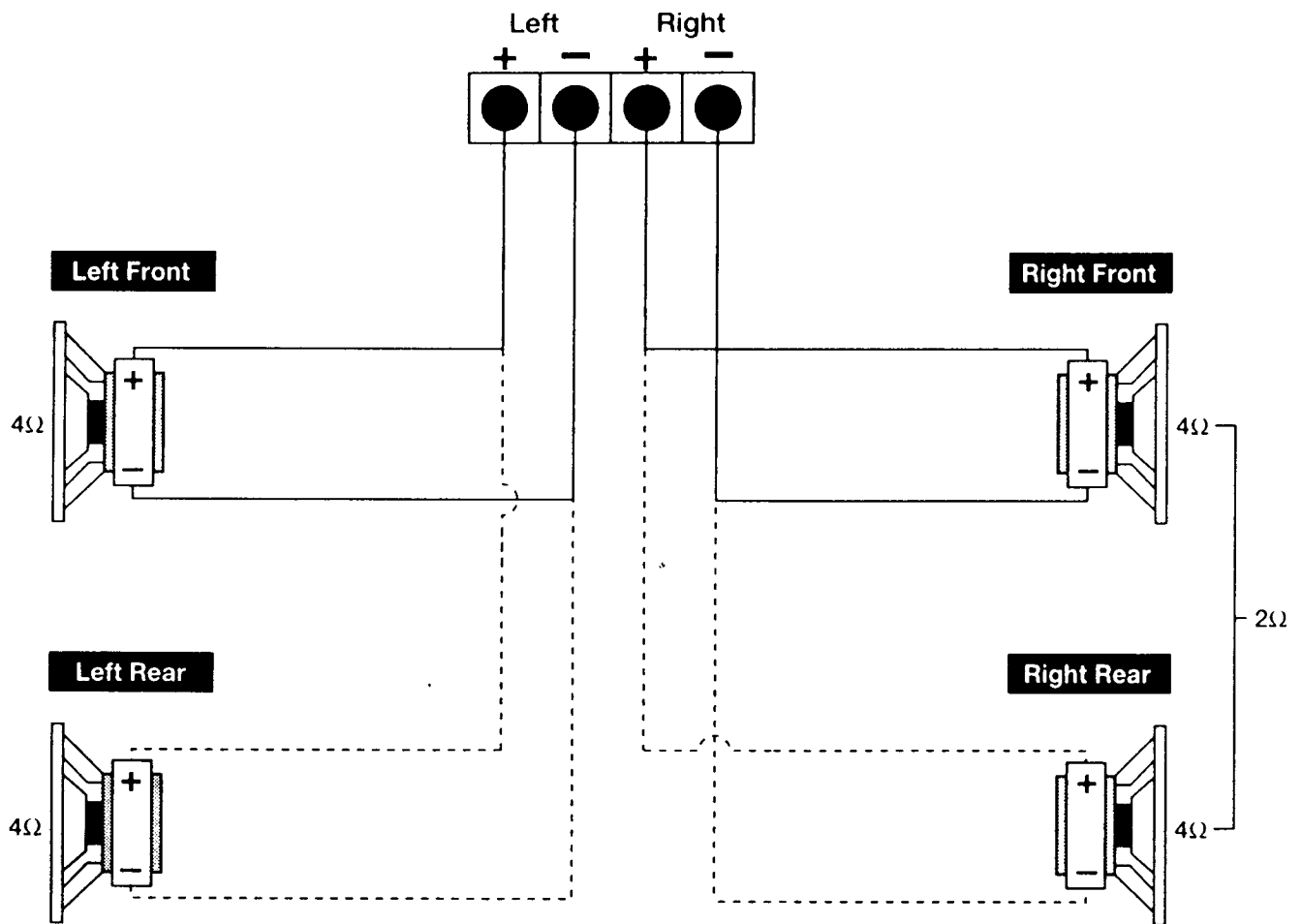
FREQUENCY HERTZ	SPEAKER IMPEDANCE					
	4 Ohm			8 Ohm		
	C1	L1	C2	C1	L1	C2
80	330 μ F	6.0 μ H	1000 μ F	160 μ F	12 μ H	500 μ F
100	270 μ F	4.7 μ H	800 μ F	150 μ F	10 μ H	400 μ F
130	200 μ F	3.3 μ H	600 μ F	100 μ F	7.5 μ H	300 μ F
200	150 μ F	2.2 μ H	400 μ F	68 μ F	5.4 μ H	200 μ F
260	100 μ F	1.8 μ H	300 μ F	50 μ F	3.3 μ H	150 μ F
400	68 μ F	1.1 μ H	200 μ F	33 μ F	2.4 μ H	100 μ F
600	47 μ F	.80 μ H	130 μ F	21 μ F	1.6 μ H	68 μ F
800	33 μ F	.60 μ H	100 μ F	16 μ F	1.2 μ H	50 μ F
1000	27 μ F	.47 μ H	75 μ F	13 μ F	.90 μ H	39 μ F
1200	22 μ F	.39 μ H	68 μ F	11 μ F	.80 μ H	33 μ F
1800	15 μ F	.27 μ H	47 μ F	7.5 μ F	.50 μ H	22 μ F
2000	13 μ F	.24 μ H	40 μ F	6.8 μ F	.47 μ H	20 μ F
3000	8.8 μ F	.16 μ H	27 μ F	4.7 μ F	.33 μ H	14 μ F
4000	6.8 μ F	.12 μ H	20 μ F	3.3 μ F	.24 μ H	10 μ F
6000	4.7 μ F	.82 μ H	13 μ F	2.2 μ F	.21 μ H	6.8 μ F
8000	3.3 μ F	.60 μ H	10 μ F	1.5 μ F	.12 μ H	5.0 μ F
10000	2.7 μ F	.47 μ H	8.2 μ F	1.3 μ F	.10 μ H	3.9 μ F
12000	2.2 μ F	.38 μ H	6.8 μ F	1.1 μ F	.82 μ H	3.3 μ F

* USE
BI-POLAR
CAPACITORS



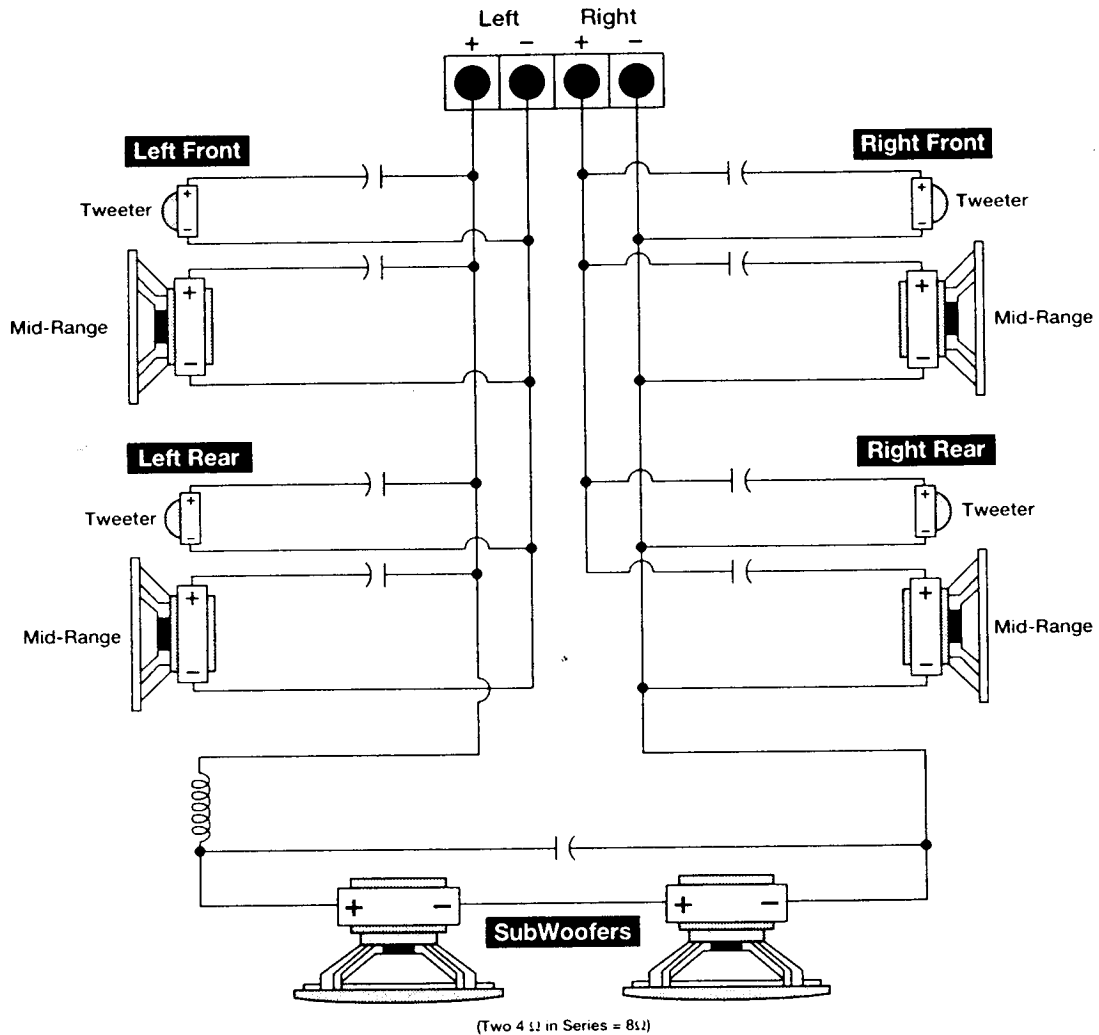
18dB Per Octave High-Pass Filter

PHOENIX GOLD SYSTEM 1



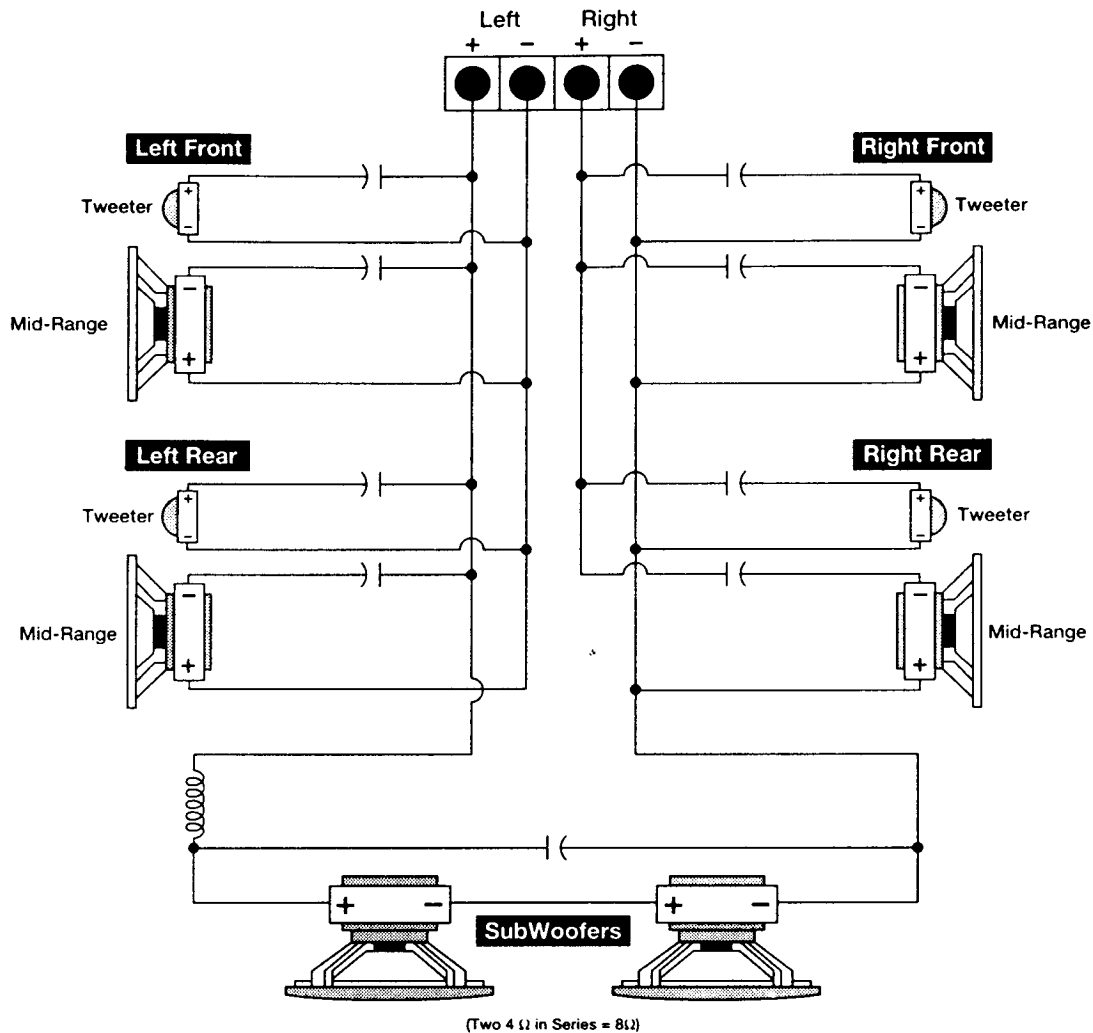
System 1 uses only stereo output into 2 (or 4) speakers.

PHOENIX GOLD SYSTEM 2



TRI-LINEAR™ Output: Front and rear speakers in parallel with 6dB per octave passive crossovers. The subwoofer is connected across the bridged output of MS275/MPS2240 amplifier with 12dB per octave passive crossover.

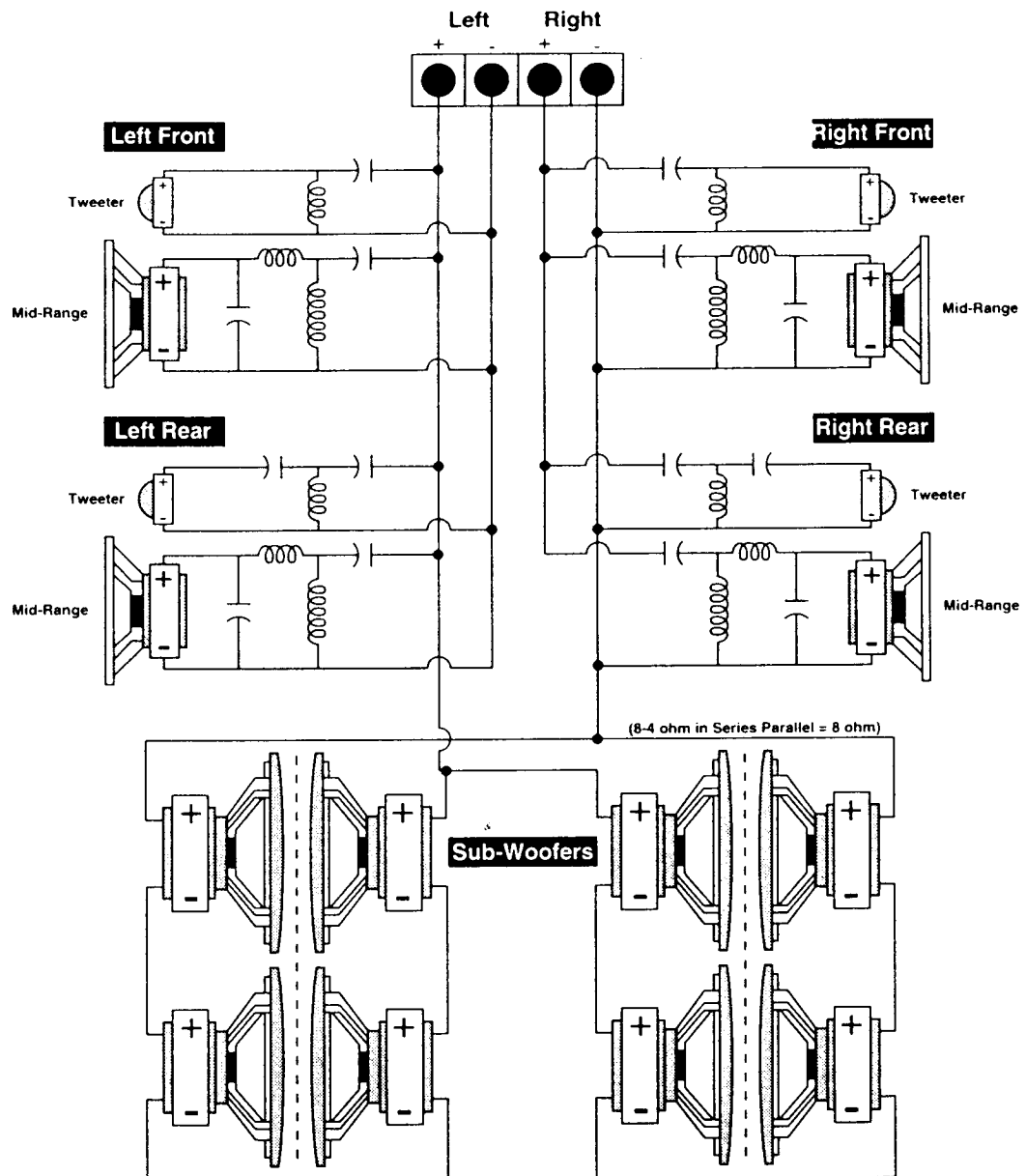
PHOENIX GOLD SYSTEM 3



TRI-LINEAR™ Output: Front and rear speakers are parallel with 12dB per octave passive crossovers. The subwoofer is connected across the bridged output of MS275/MPS2240 amplifier with 12dB per octave passive crossover.

NOTE: Midrange is “out of phase” to the woofer and tweeter so that the entire speaker system will be acoustically “in phase.” This is very typical of 3-way 12dB per octave networks.

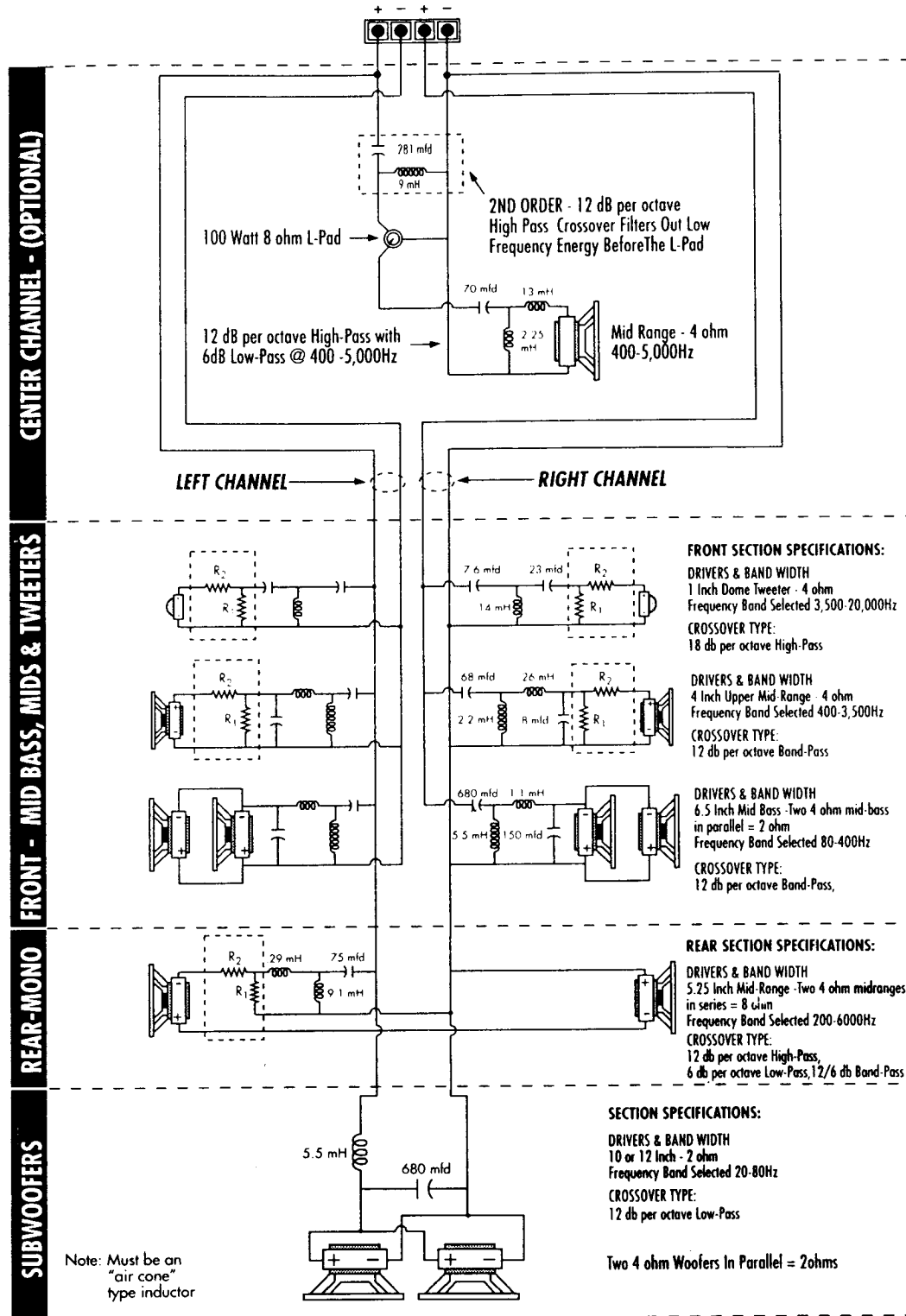
PHOENIX GOLD SYSTEM 4



TRI-LINEAR™ Output: Front and rear speakers in parallel with 12dB bandpass passive crossovers and 18dB per octave high-pass tweeter crossover. The subwoofer is connected across the bridged output of the MS275/MPS2240 amplifier.

NOTE: The woofers are connected series parallel with outside woofers out of phase to inside woofers. This is an "Isobaric" 7th order enclosure which needs no crossover as it rolls the high frequency off at 36dB per octave.

PHOENIX GOLD SYSTEM 5



This system uses 4 mid-bass drivers to create the illusion that bass is coming from the front of the vehicle, not the rear! Note that the rear channel is MONO! Also check out the optional center channel. This is an IASCA (International Auto Sound Challenge Association) type system. When your going for best sound quality, use this system!