

# *Owner's Manual*

# M100



**Triple Darlington High-Definition Amplifier**

*PHOENIX GOLD*

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# M100

Triple Darlington  
High Definition Amplifier

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## BEFORE YOU BEGIN YOUR INSTALLATION

Thank you for choosing a Phoenix Gold product. In doing so you've demonstrated a desire to own the finest in audio reproduction. Phoenix Gold strives to provide you, the customer, with the finest products possible.

Properly installed, your Phoenix Gold amplifier will provide years of high quality sonic reproduction. Before installing the M100 in your vehicle, please read the entire manual carefully. It is required reading for the protection of your vehicle and for the maximum performance of your car audio system.

The M100 utilizes the fastest output devices in the industry. Where most manufacturers use 3 to 5 MHz output devices, Phoenix Gold utilizes 25 MHz high temperature devices. These devices are not only faster, but more costly... and much more reliable. At Phoenix Gold, we don't just use run-of-the-mill capacitors in our circuitry, but rather low ESL/ESR type capacitors, and we use them extensively in our amplifier. This helps reduce one of the major failure modes of all car audio amplifiers—heat. The M100 amplifier has been extensively tested and burned in for maximum reliability.

### Phoenix Gold Warranty

If you, the consumer, install this amplifier we provide a limited warranty for 30 days. If your authorized Phoenix Gold dealer professionally installs your M100 power amplifier the warranty period extends to 18 months from the date of purchase. See your warranty card for more details on the extended warranty of this power amplifier.

Remember, at Phoenix Gold, we don't just manufacture mobile electronics, we also manufacture cables, PowerFlow distribution systems, alternators and accessories for the professional.



## M100 POWER AMPLIFIER FEATURES

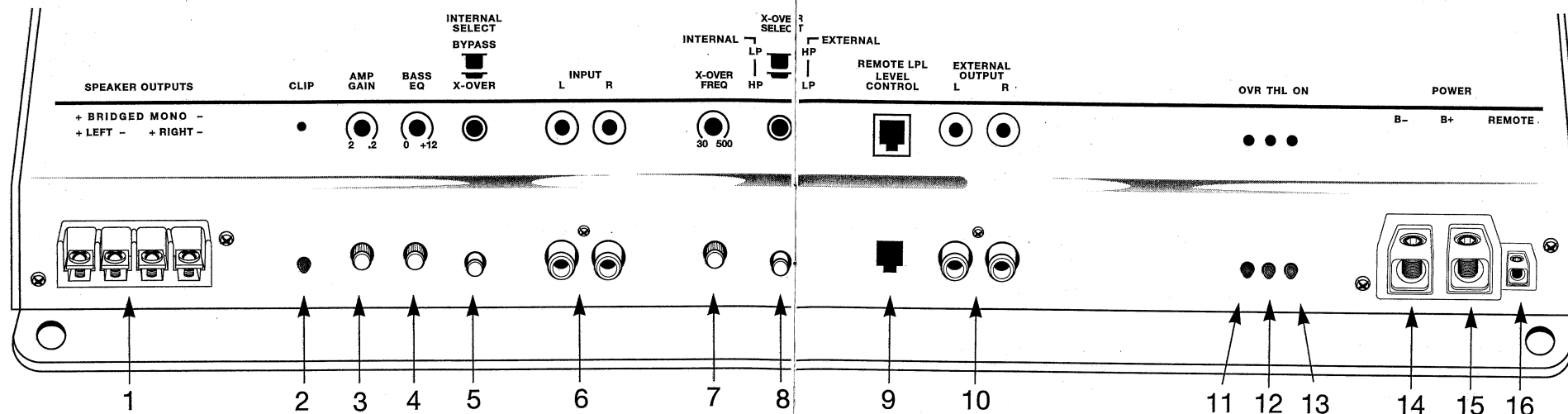
- 2 x 100 watts Per Channel
- Bridgeable Outputs
- Tri-Linear™ output capacity (simultaneous stereo & bridged mono configuration)
- Stereo 12dB per octave, continuously variable crossover from 30 to 500Hz. Selectable HP, LP or Full Range for the internal amplifier and HP or LP for the external output.
- Adjustable High-Q Bass EQ (0 to +12dB) @ 45Hz
- Pulse Width Modulated (PWM) MOSFET Switching Power Supply
- Stable into 1 ohm stereo loads
- High-Current / High-Voltage Triple-Darlington Output Design
- 2 layer, 2 ounce Gold Plated Copper G10 Glass-Epoxy Printed Circuit Board
- Variable input sensitivity (200mV to 2V)
- Thermal Overload Protection
- Superior muting circuitry assures no turn on / turn off noise.
- Optically isolated input design
- VI limiting circuitry with overcurrent LED
- Extensive burn-in and QC testing for the ultimate in reliability
- Low RFI / EMI design
- Optional LPL44 input, a Dash Mount Subwoofer Level Control
- Made in the good ol' USA

## M100 POWER AMPLIFIER SPECIFICATIONS

- Output Power per Channel- Both Channels Driven
  - Into 4 ohms @ 12/13.8V DC.....100/160 WRMS
  - Into 2 ohms @ 12/13.8V DC.....200/250 WRMS
  - Bridged Power into 4 ohms @ 12/13.8V DC .....335/455 WRMS
- Total Dynamic Output Power.....1001 watts
- THD at rated power 4 ohms .....0.02%
- SMPTE at rated power 4 ohms.....0.05%
- DIM at rated power 4 ohms .....0.01%
- Frequency response .....10Hz to 30KHz +/-1dB
- Signal to Noise Ratio ..... > 100dB (20 to 20kHz)
- Input Sensitivity.....200mV to 2V
- Minimum Output Load Impedance.....1 ohm Stereo
- Input Impedance.....10K ohms
- Idle Current.....2A
  - Current Consumption
    - @ 4 ohms stereo ..... 40 Amps
    - @ 2 ohms stereo .....70 Amps
    - @ 2 ohms stereo, 4 ohms mono .....70 Amps
- Efficiency..... > 80% (Power Supply)
- Damping Factor (20 to 10Khz) .....250 to 1
- Min to Max Voltage requirements.....10.2 to 15.5V DC
- Dimensions .....18" L X 10.625" W X 2.0" H



## AMPLIFIER CONTROLS AND FUNCTIONS



### 1. Speaker Output

This specially tooled 24kt Gold barrier connector allows the use of any gauge speaker wire. We suggest termination with a Phoenix Gold PRO80/81 Gold spade terminal. Be careful to observe polarity when connecting speakers!

### 2. Clip (Red LED Indicator)

When this LED lights up it is an indication that the amplifier output is clipping.

### 3. Gain Adjustment

Allows for the correct matching of any signal source (CD player, AM/FM cassette deck, etc.) from its preamp output into the M100. Adjustments range from 200 mV (.2 volts) to 2 Volts (AC/Audio).

### 4. Bass EQ

This control adjusts the level of the 45 Hz High-Q bass equalization from 0 to greater than 12dB. The equalization affects the output of the power amp *only*; the crossover low pass channels are not affected.

### 5. Internal Select Switch

This switch selects the power amp's input signal source. The X-Over position routes the internal crossover's output to the amp, while the Bypass position connects the RCA input signals directly to the amp.

### 6. RCA Inputs

The M100 is configured for preamp inputs. Almost all CD players and AM/FM cassette decks with RCA outputs will connect to these inputs.

### 7. Crossover Frequency Adjustment

Adjusts crossover corner frequency from 30 to 500Hz.

### 8. Crossover Select Switch

This switch selects the routing of the crossover's high- and low- pass signal paths. With the pushbutton **out** (and the Internal Select pushbutton **in**), the crossover's low-pass signals are routed to the M100's power amp section and the high-pass signals are routed to the External Output jacks (see #10.) With the pushbutton **in**, the signal path routings are reversed.

### 9. Remote LPL44 Level Control Input

This optional dash mount potentiometer enables the user to control the gain of the crossover's low-pass signal paths.

### 10. External Output

This output connects to an optional separate amplifier used to drive satellite speakers or subwoofers depending on the position of the crossover select switch.

### 11. Overload (Red LED Indicator)

When this LED lights up it is an indication that the amplifier has:  
A. Passed more than 16 amps of current in the *output* stage, or  
B. Passed more than 440 total watts total RMS! Obviously a bit more power than the amplifier is rated for.

### 12. THL (Amber LED Indicator)

When this LED lights up it is an indication that the amplifier has shut down as the temperature of the heatsink has reached 90° C or approximately 200° F. In simple terms, the amplifier is **extremely hot** and has protected itself.

### 13. Power On (Green LED Indicator)

Indicates 12 volts at B+ and remote wires. Amplifier is **on**.

### 14. Power Ground (B- Chassis Ground)

We recommend using our Pro Onyx 4 gauge Phoenix Gold ground cable.

### 15. Power Input (B+ Positive 12VDC)

This 24kt Gold three position barrier type connector is designed to accommodate up to 4 gauge power cable. We recommend using our Pro Ruby Red 4 gauge Phoenix Gold power cable. We recommend that you PowerFlow and properly fuse (40 Amp maximum) your M100. See page 8.

### 16. Remote Turn-on

Connect the automatic antenna lead or remote switched 12V DC lead from CD player (or radio) to this terminal. This connection allows the M100 to be turned **on** and **off** by the Volume-On/Off control on your head unit.

## AMPLIFIER LOCATION / MOUNTING

### AMPLIFIER LOCATION:

The M100 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 M100 make sure that there is at least a 2 inch 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)—a position which allows the rising heat to feed back into the amplifier, causing a premature system shut down.

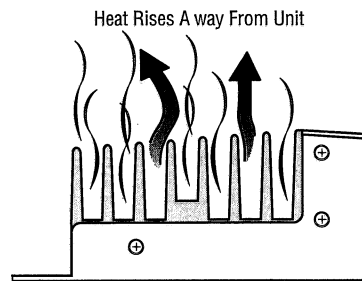


Figure 1 - Upright Mount

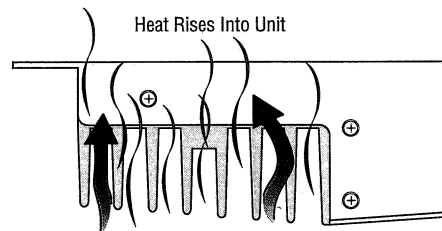


Figure 3 - Inverted Mount

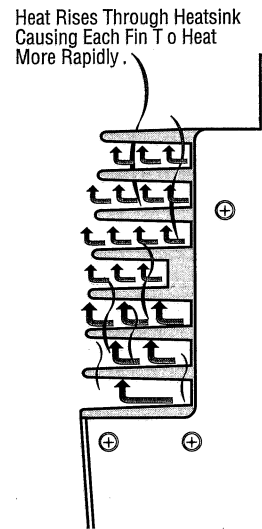


Figure 2 - Horizontal Mount

The M100 should be protected from exposure to moisture and it is best to mount the amplifier on:

1. The back wall or floor of the trunk.
2. The side of the sub-woofer enclosure.

Place amplifier in the position that you wish to use and check for clearances around the amplifier.

## AMPLIFIER LOCATION / MOUNTING CONT.

### AMPLIFIER MOUNTING:

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

1. Use the M100 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 1/8 inch pilot holes.
3. Mount the amplifier with four (4) #10 by 3/4 inch panhead phillips screws.

The optimum mounting configuration is shown below in Figure 4. This mount allows the heat sink fins to act as a chimney thus keeping the amplifier cool over longer periods of time.

**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.**

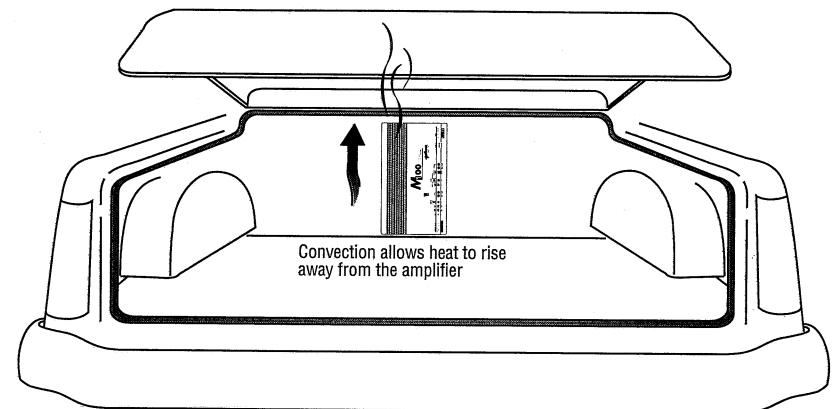


Figure 4 - Trunk Mount

# ELECTRICAL INSTALLATION

## REMEMBER TO ALWAYS DISCONNECT BATTERY GROUND BEFORE WORKING ON A VEHICLE'S ELECTRICAL SYSTEM

1. Always use the largest gauge power/ground cable available. We recommend using Phoenix Gold Pro4 Ruby and Pro4 Onyx wire for Power and Ground.
2. Always place a fuse or circuit breaker no more than 12 inches from the battery. This protection is only for the vehicle, not the stereo and should be no greater than 40 amps per amplifier. (See Figure 5)

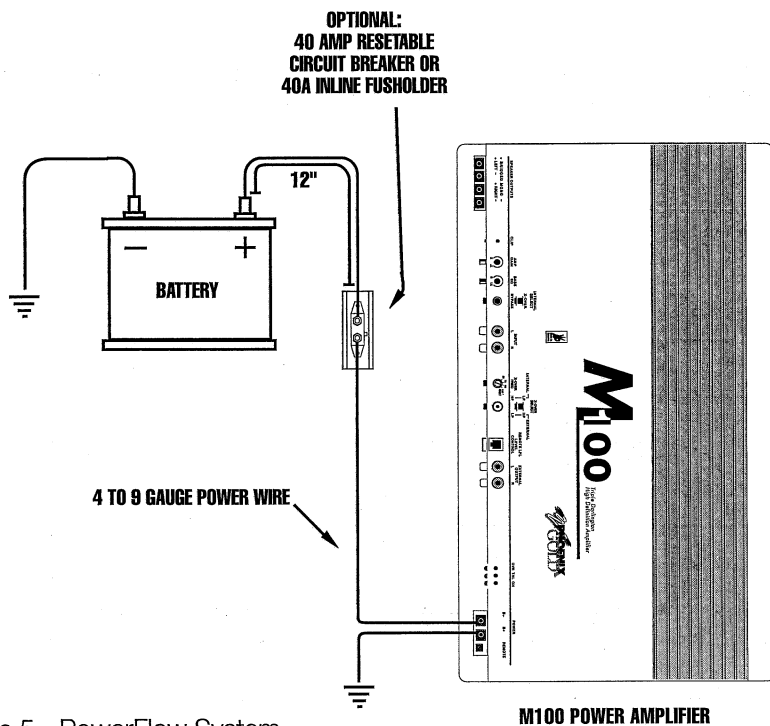
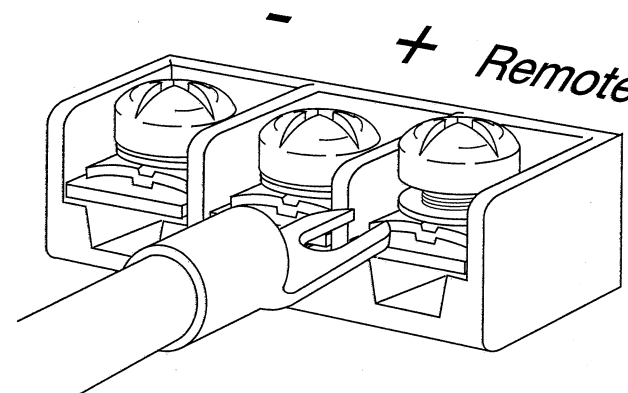


Figure 5 - PowerFlow System

3. For audio connections, we recommend using high-quality audio interconnects like the Phoenix Gold A540 Trans-Balanced or our compact CSI cables. The Phoenix Gold cables are the ultimate in sound quality and reducing or eliminating unwanted radiated noise from your system. Make sure that you run your audio cables **away** from your power wires. This will help reduce any noise caused by the power wire radiating into the audio cables.
4. Based on the current draw of your system, always use the largest gauge power and ground wire possible. The M100 power terminal can handle up to 2 gauge wire (see Figure 6.) Utilizing the largest gauge power and ground wire will give you the highest damping factor, and thereby the tightest and most accurate bass.

Figure 6 - Remote/Power/Ground Terminal connections



5. If the green LED is on the amplifier is **on**. If the amber LED is on the amplifier has thermalled, meaning that the heatsink has reached 200°F and the amplifier has protected itself. The red LED will only light if the amp reaches full power at 3/4 of an ohm or less.

Make sure that none of the speakers are shorted. A shorted output will not damage your Phoenix Gold M100, but it will cause the protection circuitry to engage. This situation will be apparent when observing the three LEDs on the front panel. The green LED will flash on for a second and then the red LED will flash. This pattern will repeat several times.

## AUDIO SYSTEM DESIGN

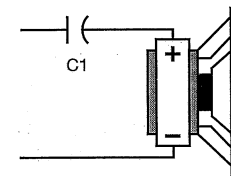
With the extreme flexibility of the Phoenix Gold M100, we highly recommend that you carefully design the entire system before its installation. The following system diagrams should be used as ideas towards designing a truly awesome car audio system. Remember that this amplifier likes to be driven hard. Whenever possible choose the Tri-Linear™ mode (i.e., stereo & bridged mono simultaneously). Passive crossover networks must be utilized in order to protect drivers. When passive components (capacitors and inductors) are used in multiple speaker systems, the crossover's impedance **and** the speaker system combinations must be considered especially when determining the amplifier loading. 12dB per octave crossovers are good, but tend to create sonic problems if not utilized correctly. A 12dB per octave crossover (an inductor and capacitor for each speaker) forms a series resonant circuit to ground whose impedance at that resonance frequency is determined by the speakers **dynamic** impedance. If the speaker circuit, for whatever reason, becomes open or disconnected the crossover input impedance is theoretically zero (0). In other words, a **direct short**.

Fortunately, Phoenix Gold amplifiers are designed to withstand this type of treatment. Generally, most amplifiers do not like to see this condition. We recommend 6 dB or 18 dB per octave type crossovers, especially in automobiles. These crossover slopes are in phase and tend to sound better.

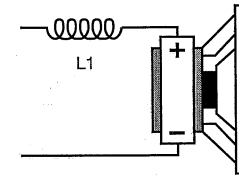
The following crossover slope charts are for your reference. Remember, we cannot take into account crossover component values for the system you have chosen since those values will be determined by the frequency you select for your crossover point and the impedance of the speakers at the crossover point selected for your system.

## CROSSOVER SLOPES / COMPONENT VALUES

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



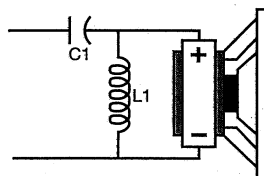
6 dB per Octave High-Pass Filter



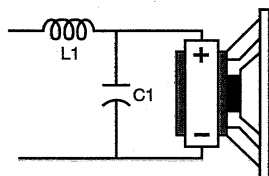
6 dB per Octave Low-Pass Filter

# CROSSOVER SLOPES / COMPONENT VALUES

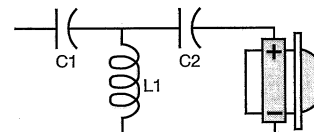
FREQUENCY HERTZ	SPEAKER IMPEDANCE					
	2 Ohm		4 Ohm		8 Ohm	
	L1	C1	L1	C1	L1	C1
80	5.5 mH	680 $\mu$ F	11 mH	330 $\mu$ F	22 mH	180 $\mu$ F
100	4.7 mH	560 $\mu$ F	9.1 mH	270 $\mu$ F	18 mH	150 $\mu$ F
130	3.3 mH	400 $\mu$ F	6.8 mH	200 $\mu$ F	15 mH	100 $\mu$ F
200	2.2 mH	300 $\mu$ F	4.7 mH	150 $\mu$ F	9.1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



12 dB per Octave High-Pass Filter



12 dB per Octave Low-Pass Filter



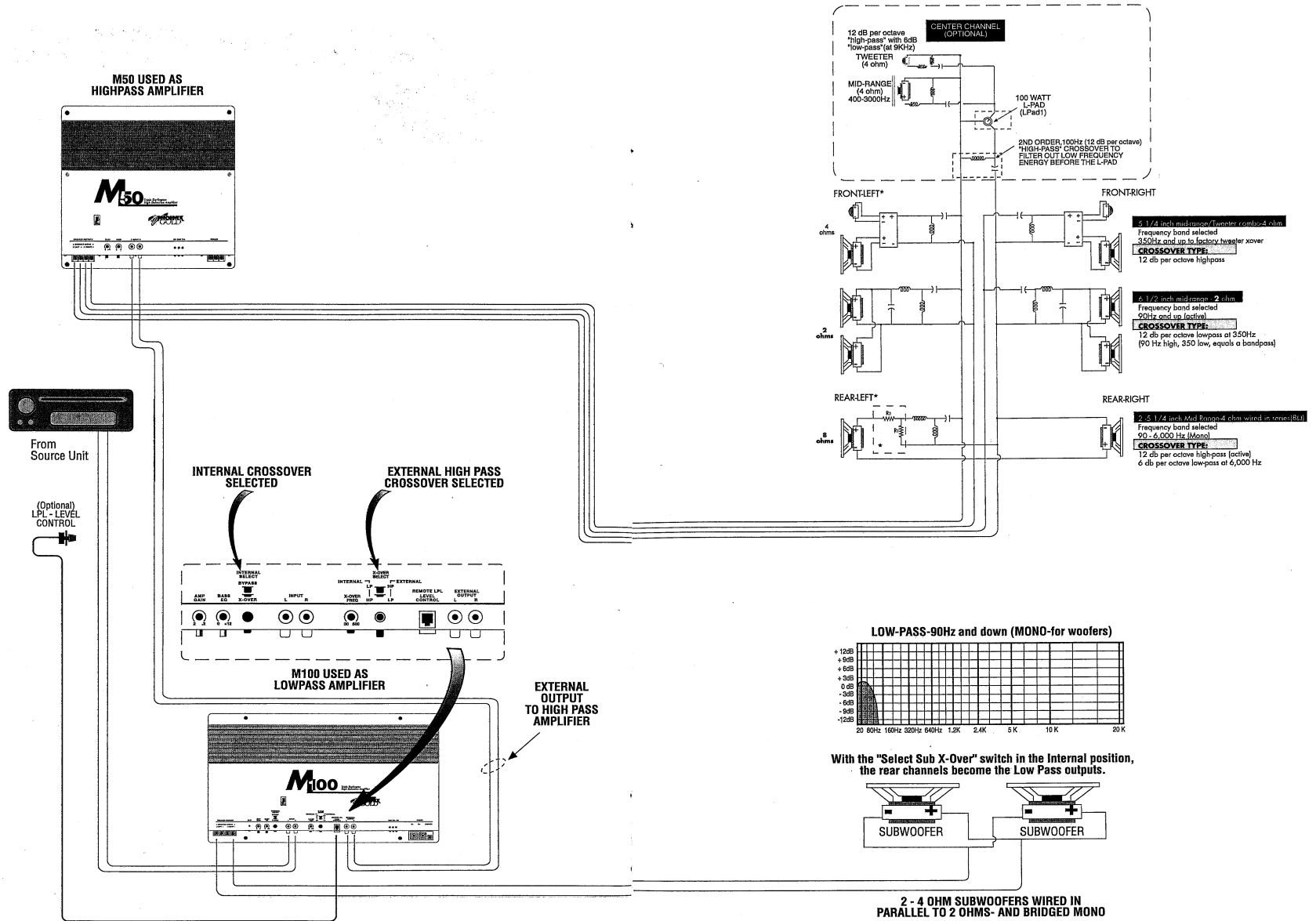
18 dB per Octave High-Pass Filter

# CROSSOVER SLOPES / COMPONENT VALUES

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

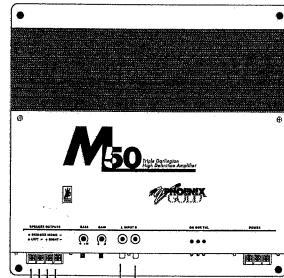


# PHOENIX GOLD SYSTEM 1



# PHOENIX GOLD SYSTEM 2

M50 USED AS  
HIGHPASS AMPLIFIER



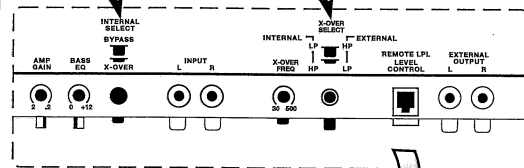
INTERNAL CROSSOVER  
SELECTED

EXTERNAL HIGH PASS  
CROSSOVER SELECTED



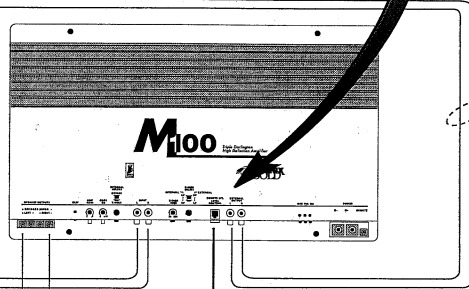
From  
Source Unit

(Optional)  
LPL - LEVEL  
CONTROL

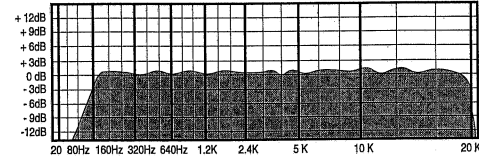


M100 USED AS  
LOWPASS AMPLIFIER

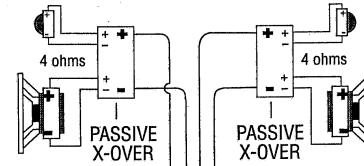
EXTERNAL  
OUTPUT  
TO HIGH PASS  
AMPLIFIER



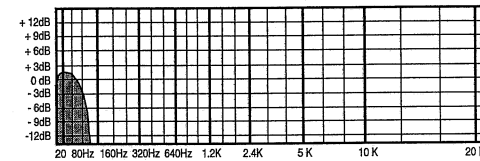
FRONT HIGH-PASS-90Hz and up (STEREO-for mid-tweeter)



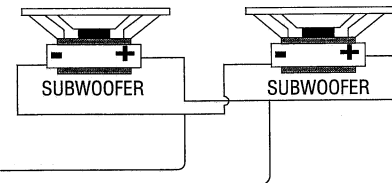
FRONT HIGH PASS CROSSOVER  
SELECTED AT 90Hz



LOW-PASS-90Hz and down (MONO-for woofers)

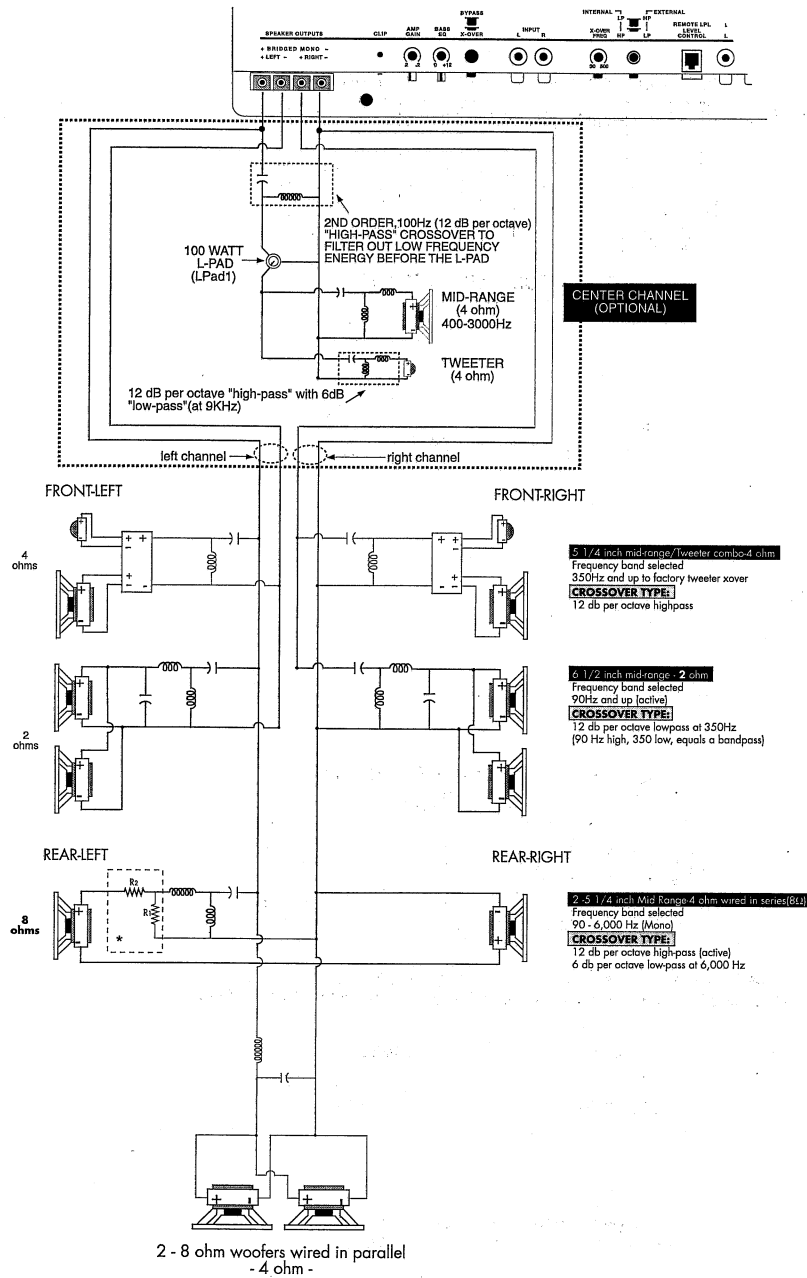


With the "Select X-Over" switch in, and the "XOVER SELECT" switch set to "HP" Internal and "LP" external position, the M100 becomes the Low Pass outputs.



2 - 4 OHM SUBWOOFERS WIRED IN  
PARALLEL TO 2 OHMS- AND BRIDGED MONO

# PHOENIX GOLD SYSTEM 3



# AMPLIFIER ADJUSTMENTS

The M100 has both an input sensitivity adjustment and a Bass EQ adjustment. Care should be taken to adjust these properly as they affect each other.

1. Start both adjustments at "0" or at minimum sensitivity, a counter-clockwise setting for Bass EQ and Gain (See Figure 8).

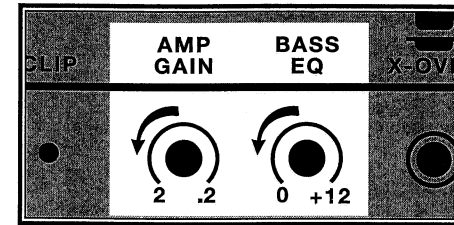


Figure 8 - Bass & Gain Controls

2. Adjust the volume control on your head unit (C/D, Cassette, etc.) to approximately 3 o'clock or 3/4 volume setting. (See Figure 9).

Approximately 3 o'clock or 3/4 volume setting



Figure 9 - Head Unit

3. Turn the Gain setting adjustment on the M100 clock-wise (i.e. to the right) until you hear the amplifier distort. The M100 clips very softly so this can sometimes be a difficult adjustment. Please listen carefully! (see Figure 10)

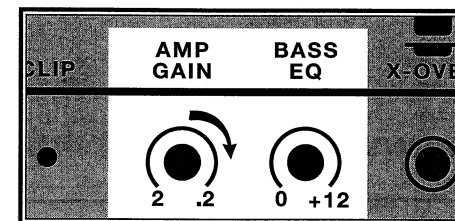


Figure 10 - Gain Control

4. If, after adjusting the input gain the bass sound quality is to your liking, it would be best to not adjust the Bass EQ level control. Adding any EQ into the system either through an external equalizer or the built-in one provided with the M100 can cause the amplifier to:

- A. Distort easier, or...
- B. Overheat at a much more rapid rate than is normal.

5. If you desire more Bass output, adjust the Bass EQ level clockwise. The adjustment range is from "0" to "+12 dB". We recommend using as little Bass EQ as possible. Remember, boosting +12 dB at 45Hz means the amplifier will clip a 45Hz signal 4 times faster.

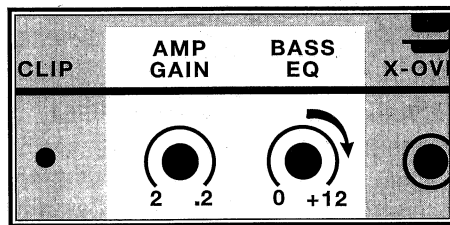


Figure 11 - Bass Control

6. If you need to boost the Bass EQ to the maximum level (+12 dB) to obtain the desired bass output, **something is very wrong**. Check the design notes for your subwoofer enclosure. More than likely the woofer and the enclosure are not working together correctly.

## ***Your Installation Is Now Complete! Relax and Enjoy...***

If you experience any problems with your M100 amplifier, do not hesitate to contact us at (503) 288-2008. We are here to help.

Phoenix Gold is a proud member of IASCA (International Autosound Challenge Association). If you would like to know more about sound off competitions in your area contact IASCA at (602) 437-4678.

# PHOENIX FACTS

## **Heat Kills**

All amplifiers can get hot. If an amplifier is loaded down from an impedance standpoint and makes a lot of power it needs to dissipate that energy as heat. Heat will kill an amplifier. If you keep your amplifier cool, it will perform better with no annoying shut down problems. If you are going to play your amplifier hard, consider attaching a fan shroud. It will make a big difference.

## **Double Power at Half the Impedance**

Phoenix amplifiers will work into virtually any impedance load. Our amplifiers are physically the largest in their respective power class. PG amplifiers will double output power as impedance is halved. This is usually considered a good thing, but the bad part is that as big as our amplifiers are, they are not big enough for 3 to 6 times their rated power! They won't blow-up, but they will thermally shut down. This is not a design flaw, it's called "The Laws of Physics". No magic over here! Just plain Ol' Fashioned good engineering. Heatsink material is the single most expensive part in any automotive amplifier today, and our amps aren't big enough already?

## **Voltage Drops Vs Amplifier Construction**

Another reason an amplifier would get hot is because of voltage drops, specifically at the power input terminal. This is very important! That's why we ask that you use 4 gauge wire on the M100 amplifier. If there is any impedance in the power wire or ground wire there will be a voltage drop, which means that when voltage drops, current rises (again Ohms law; aka Physics). Again, if there is heavy current draw, excessive heat is soon to follow, which creates performance problems.

Follow the Laws Of Physics and your audio system will sing. If you don't follow the laws, your system and vehicle will suffer the consequences. If you would like detailed information, give us a call at (503) 288-2008 to talk to a technician.



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