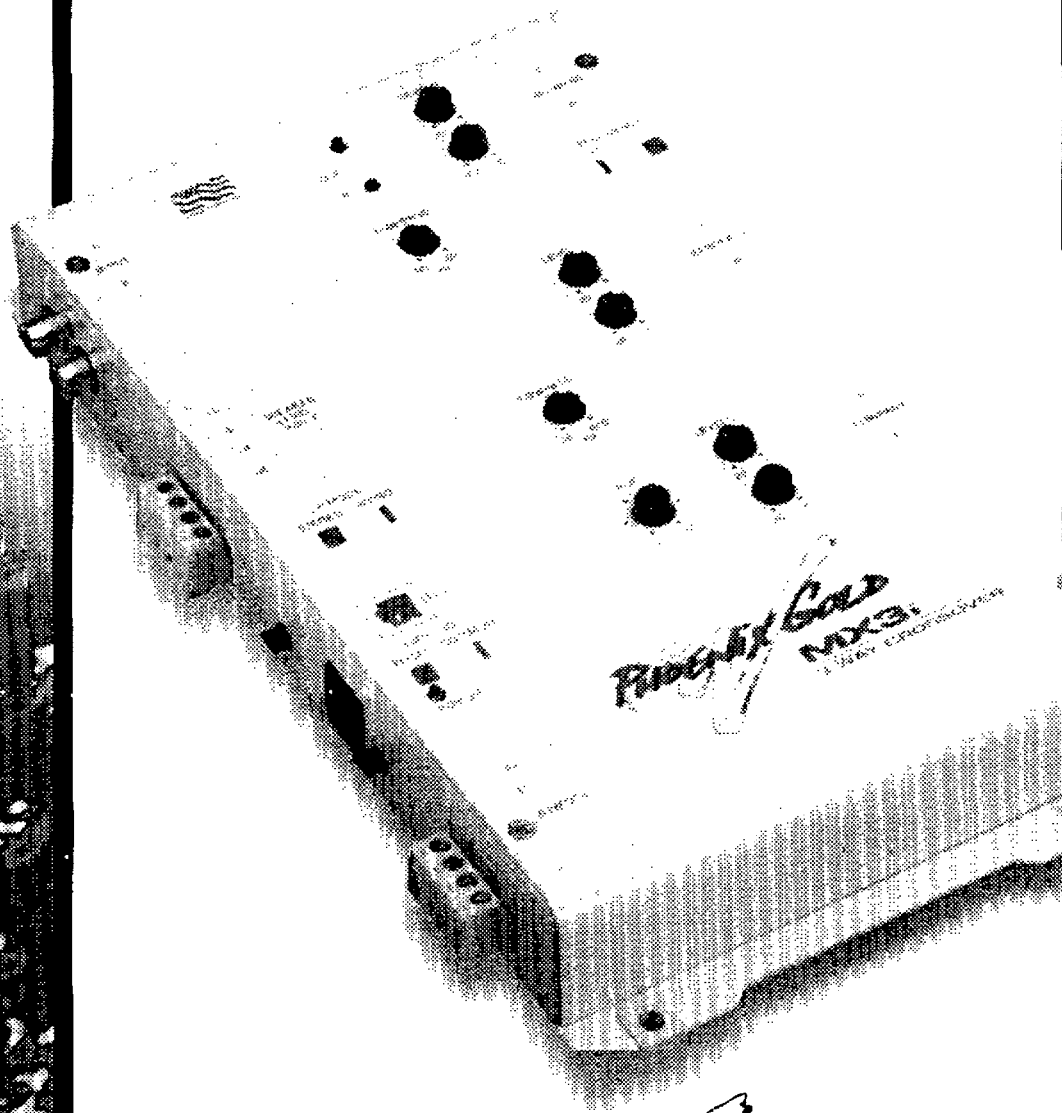


**OWNER'S  
MANUAL**

# MX3i

**THREE-WAY CROSSOVER**



*Phoenix Gold*

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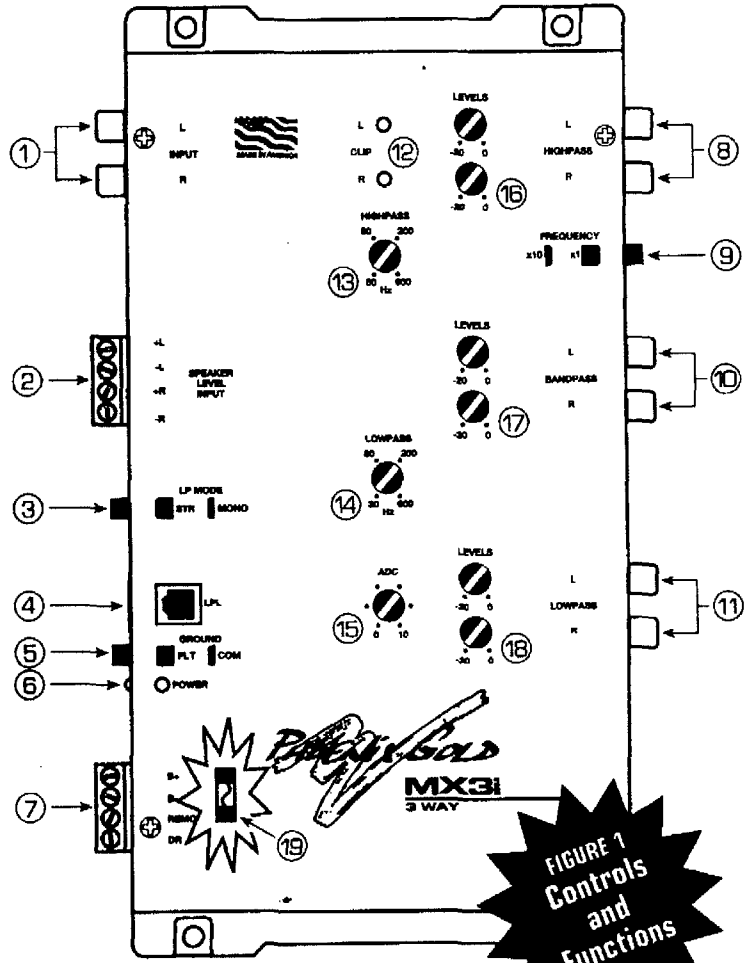
#### Features

- 3-Way Symmetrical Operation with Stereo 24dB per octave Crossover Slopes
- Continuously Variable Highpass and Lowpass Crossover Points
- 24kt Gold Plated Input and Output Jacks
- Optional Speaker Level Inputs
- Separate Left and Right Highpass Output Level Controls
- Separate Left and Right Bandpass Output Level Controls
- Separate Left and Right Lowpass Output Level Controls
- Adjustable Accustical Delay Circuit (ADC) for Lowpass Output
- LPL44 Jack Provides Optional Remote Low Pass Level Control
- Separate Left and Right LED Input Clipping Indicators
- Power-On LED Indicator
- Quick Disconnect Power Plug
- Pulse Width Modulated Power Supply
- 3 Second Delayed Remote Turn-On Output
- 24kt Gold Plated, 2 layer Copper G10 Glass-Epoxy Printed Circuit Boards
- Audiophile Grade 1% Metal Film Resistors
- Precision Laser Cut 16 Gauge White or Black Powder Coated Steel Chassis

**Specifications**

- Frequency Response.....±1dB, 20Hz to 30kHz
- Signal to Noise Ratio.....>100dB ref. to 8V<sub>RMS</sub>
- THD plus Noise @ 1kHz, 1V<sub>RMS</sub>.....<0.02%
- Crossover Freq. Adj. Range, Lowpass.....30Hz to 600Hz
- Crossover Freq. Adj. Range, Highpass.....30Hz to 6kHz
- Crossover Freq. Adj. Range, Bandpass.....30Hz to 6kHz
- Crossover Slopes, All Outputs.....24dB per octave
- Acoustical Delay Circuit (ADC) range.....0 to 10ms
- Input Impedance, Line Level.....10kΩ
- Input Impedance, Speaker Level.....91Ω
- Output Impedance, all Outputs.....51Ω
- Max. Input Signal Voltage, RMS/peak.....8/11
- Max. Output Signal Voltage, RMS/peak.....8/11
- DC Operating Range.....10 to 15.5VDC
- Typical DC Current Draw.....1A
- Internal DC Power Fuse.....GMC 2A
- Dimensions, chassis.....5.13"L x 8.69"W x 1.38"H
- Dimensions, overall.....5.13"L x 9.63"W x 1.38"H

Due to continuous product development, features, specifications, and availability are subject to change without notice.



**FIGURE 1**  
Controls  
and  
Functions

1. **Line Level Input Jacks:** These inputs are for standard RCA style signal cables from the headunit, line driver or other signal processor. Set the Signal Ground Switch #5 to (FLT) for most installations using this input.
2. **Optional Quick Disconnect Speaker Level Input Plug:** Your local authorized Phoenix Gold dealer stocks this plug. The part number is PDPHL4. The plug is easily removed for servicing

wiring connections and provides a convenient way to integrate the MX3i with a headunit that does not have line level RCA style outputs. Set the Signal Ground Switch #5 to (COM) for most installations using this input.

3. **LP Mode Switch:** This switch determines if the lowpass output Jacks #11 provide a stereo or mono lowpass signal.  
Stereo - The lowpass output is stereo. Left and right channels are separate.  
Mono - The lowpass output is mono. The left and right channels are summed together providing two output jacks with identical signals.
4. **Remote Lowpass Level Control Jack:** This jack is for connecting the optional LPL44 Remote Lowpass Level Control. This control will allow the driver to adjust the level of the Lowpass Output Jacks #11 from the driver's seat. The level may be attenuated as much as 20dB.
5. **Signal Ground Switch:** This switch determines how signal ground is referenced inside the MX3i. Set this switch to (FLT) for most installations using the Line Level Input Jacks #1. Set this switch to (COM) for most installations using the Speaker Level Input Jack #2. Setting this switch to the (COM) position connects signal ground to chassis ground inside the MX3i. These settings provide the best noise rejection for the majority of installations. There is no absolute best setting for all installations. Use the setting that results in the lowest amount of system noise.
6. **Power-On LED Indicator:** This LED turns on whenever the MX3i is turned on. The unit cannot turn on unless it is grounded through the B- terminal and is receiving 12 volts at both the B+ and Remote Turn-On terminals of the Quick Disconnect Power Plug #7.
7. **Quick Disconnect Power Plug:** This Plug is easily removed for servicing wiring connections and contains the following four terminals:  
**B+ Terminal (Battery Positive):** Connect to the power distribution system that is connected directly to the positive battery terminal. DO NOT connect to the vehicle's factory fuse box. Use a 16 gauge cable.  
**B- Terminal (Chassis Ground):** Connect to a clean, solid chassis ground of the vehicle. Use a 16 gauge cable. Keep

the cable as short as possible. DO NOT connect directly to the negative battery terminal.

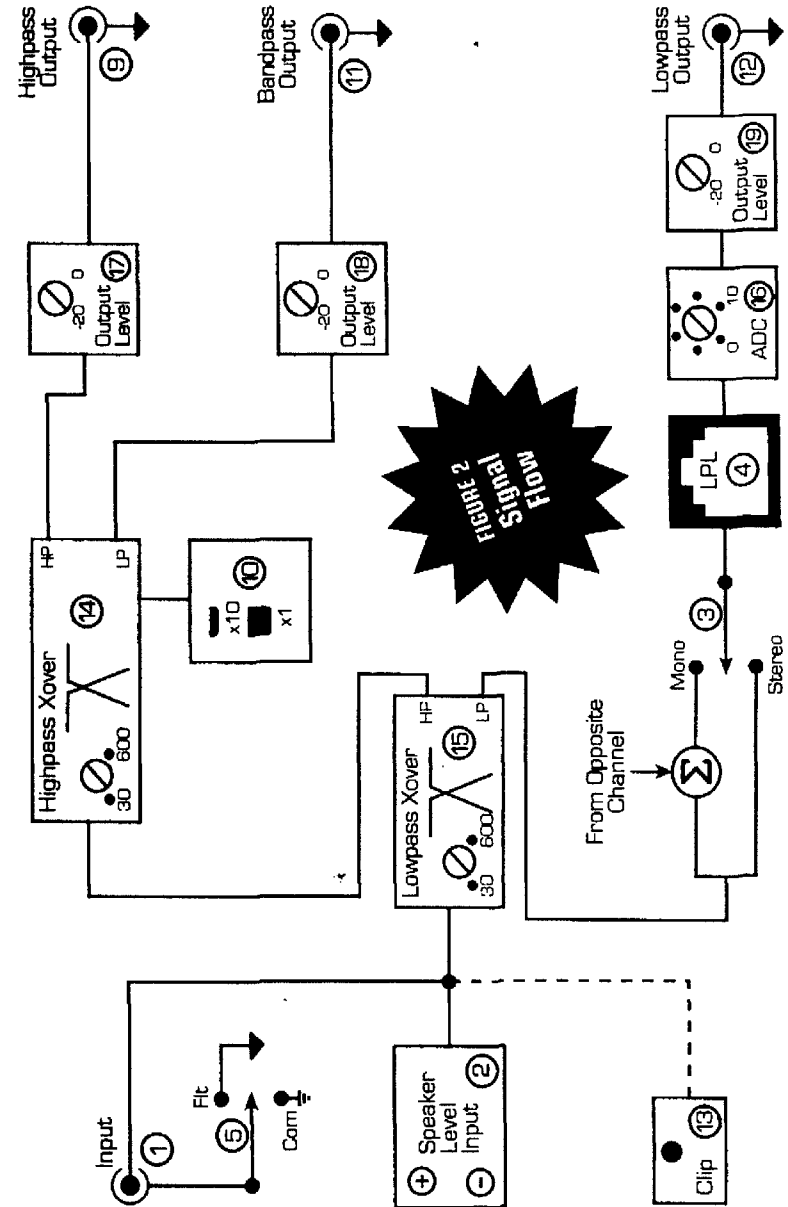
**R Terminal (Remote Turn-On):** This connection allows the MX3i to be turned on and off remotely. Connect to a switched 12 volt source such as the "remote out" or "power antenna" wire from the headunit. **Note:** Test the power antenna wire with a volt meter to insure it has 12 volts when both the tuner AND tape/CD are playing. DO NOT connect this to the B+ cable.

**DR Terminal (Delayed Remote Turn-On Output):** This output is used to delay the turn-on of amplifiers if they reproduce noises (turn-on pop) generated by preamp components as the system is first powered up. DO NOT connect this output to other signal processors. **Note:** There is an inherent voltage drop of about 1 volt when using the DR output. It may be necessary to use a standard automotive relay controlled by the DR output when turning on multiple amplifiers.

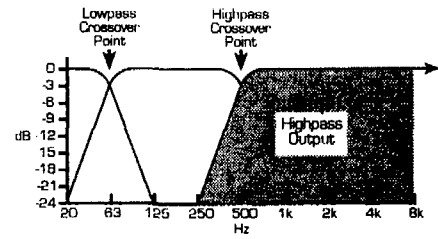
8. **Highpass Output Jacks:** These outputs are for standard RCA style signal cables that connect to an amplifier or another signal processor. Driving an amplifier for mid range and high frequency speakers is the primary use of this output.
9. **Frequency Multiplier Switch:** This switch can multiply the highpass crossover frequency by a factor of 10. With the switch in the x1 position, the crossover frequency is adjustable from 30Hz to 600Hz. In the x10 position the crossover frequency is adjustable from 300Hz to 6kHz.
10. **Bandpass Output Jacks:** These outputs are for standard RCA style signal cables that connect to an amplifier or another signal processor. Driving an amplifier for mid bass or mid range speakers is the primary use of this output.
11. **Lowpass Output Jacks:** These outputs are for standard RCA style signal cables that connect to an amplifier or another signal processor. Driving an amplifier for low frequency speakers is the primary use of this output.
12. **Input Clip LED Indicators:** These separate left and right LEDs light when peaks in the musical signal are approaching the 11 volt level. They sense the signal level passing through the Input Jacks #1.
13. **Highpass Crossover Frequency Control:** This control adjusts the crossover frequency for the Highpass Outputs #8. The frequency is adjustable from 30Hz to 600Hz with the

Frequency Multiplier Switch #9 set to x1. The frequency is adjustable from 300Hz to 6kHz with the Frequency Multiplier Switch #9 set to x10. This control also sets the upper limit of the Bandpass Outputs #10.

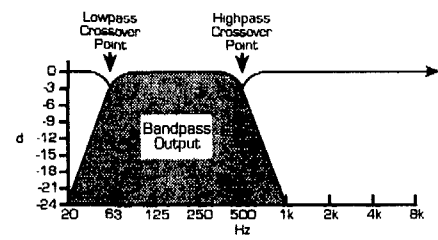
14. **Lowpass Crossover Frequency Control:** This control adjusts the crossover frequency for the Lowpass Outputs #11. The frequency is adjustable from 30Hz to 600Hz. This control also sets the lower limit of the Bandpass Outputs #10.
15. **Acoustical Delay Circuit (ADC):** This control adjust the amount of delay for the Lowpass Output Jacks #11. The signal may be delayed as much as 10 milliseconds. The primary use for this control is to insure that bass speakers and midrange/midbass speakers are acoustically in phase.
16. **Highpass Output Level Controls:** These controls allow independent adjustment of the left and right Highpass Outputs #8. The level may be cut as much as 20dB. With these controls set to maximum, the MX3i may pass 11 volts peak to the next component. The next component in the system will determine the amount of output signal desired. Consult the component's specifications to determine proper input signal level.
17. **Bandpass Output Level Controls:** These controls allow independent adjustment of the left and right Bandpass Outputs #10. The level may be cut as much as 20dB. With these controls set to maximum, the MX3i may pass 11 volts peak to the next component. The next component in the system will determine the amount of output signal desired. Consult the component's specifications to determine the proper input signal level.
18. **Lowpass Output Level Controls:** These controls allow independent adjustment of the left and right Lowpass Outputs #11. The level may be cut as much as 20dB. With these controls set to maximum, the MX3i may pass 11 volts peak to the next component. The next component in the system will determine the amount of output signal desired. Consult the manufacturer's specifications to determine the proper input signal level.
19. **Internal Power Fuse:** This fuse is installed inside the MX3i to protect the power supply from improper connection (reverse polarity) or a short in the B+ cable. It should never blow from normal operation. If replacement is necessary, use a fuse of the same size and type (GMC 2A). NEVER USE A FUSE WITH A HIGHER RATING.



**FIGURE 3**  
Operational  
Details



Highpass output is continuously variable from the lowpass crossover point up to 6 kHz.



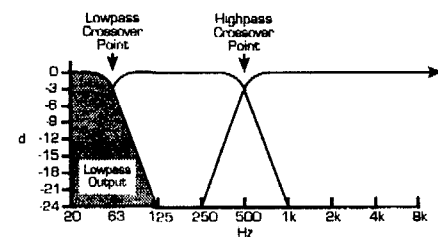
The highpass crossover point must be set to a higher frequency than the lowpass crossover point for the bandpass output to function.

Bandpass output frequency range is defined by the frequencies between the lowpass and highpass crossover points.

The widest possible bandpass output frequency range is 30 Hz to 600 Hz with the highpass frequency multiplier switch set to x1.

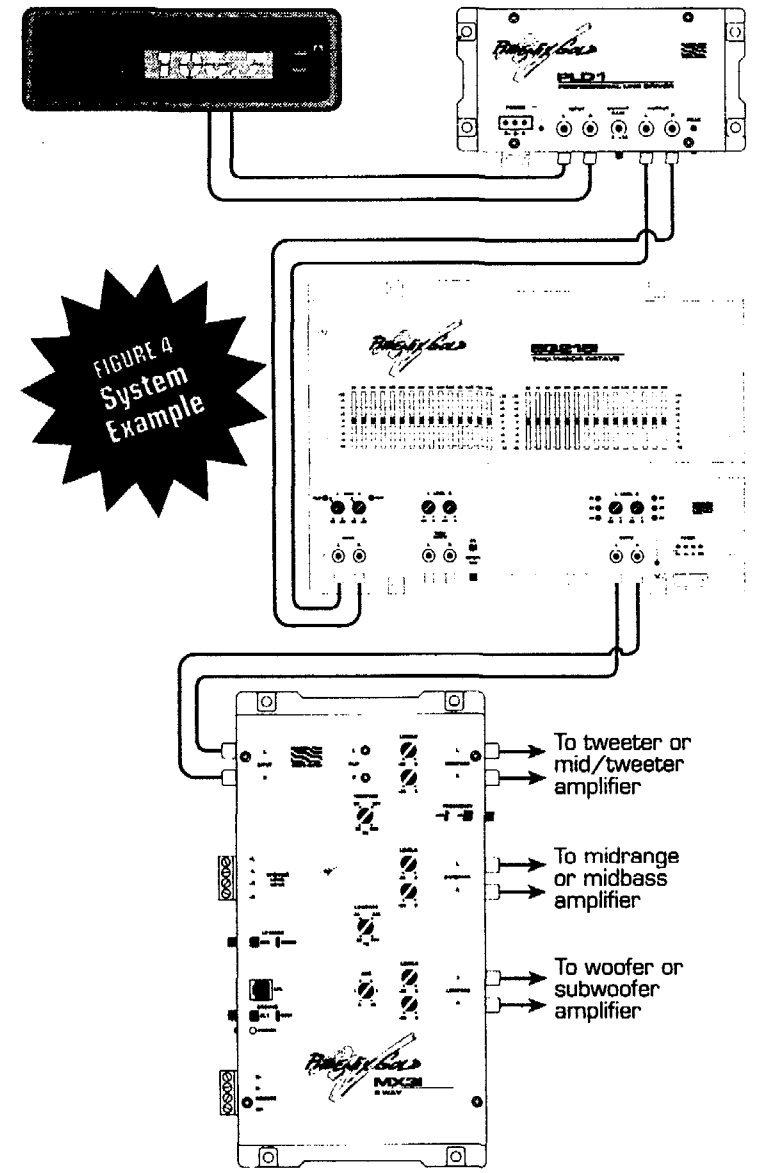
With the highpass frequency multiplier switch set to x10, the widest possible frequency range is 30 Hz to 6 kHz.

Lowpass output is continuously variable from 30 Hz to 600 Hz.



The lowpass output is stereo when the mode switch is set to STR. For summed mono lowpass output, set the mode switch to MONO.

**FIGURE 4**  
System  
Example



A successful installation must begin with planning. Before beginning the installation there are several things to consider:

### 1. **Inspect the vehicle's electrical system:**

The vehicle's battery and charging system must be in excellent condition before the system is installed. If there is any doubt as to the condition of the electrical system, it should be inspected and repaired by a qualified technician.

### 2. **Plan the mounting locations for all components:**

Select a mounting location for each component based on the guidelines below. This is the only way to determine if custom work is needed. If custom work is required, consult with a qualified custom installer. Attempting to modify your vehicle without the proper tools and experience can lead to damaging the equipment or vehicle.

**Speaker placement** - This is the most important consideration for a great sounding system. Try to mount the left and right mid /high frequency speakers an equal distance from the listening position. The kick panel area is a good location. Low frequency speakers are less critical.

**Preamp components** - Mount preamp components where they can be easily adjusted and serviced but not where loose cargo or other items can damage them or accidentally alter their settings.

**Amplifiers** - The primary consideration for amplifier location is ventilation. Make sure your amplifiers will receive plenty of fresh air to avoid overheating.

### 3. **Plan all system cable routes:**

When choosing cable routes, make sure no cables are allowed to interfere with the mechanical operation of the vehicle controls such as steering wheel, gas, brake, clutch pedal, trunk hinges, etc.

All main power cables must be fused within 18 inches of the positive battery terminal. Do not route power cables near hot engine components such as exhaust manifolds. Power cables must be protected with grommets when they pass through any metal panels such as the firewall.

Signal cables should never be run alongside power cables and must be routed away from all other vehicle wiring and electrical components such as computers. Use Phoenix Gold GLX or TRX Signal Cables wherever possible to maximize noise rejection.

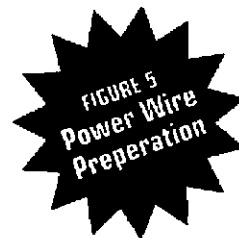
## **MOUNTING**

The MX3i can be mounted in a variety of positions. There are only a few precautions that must be observed.

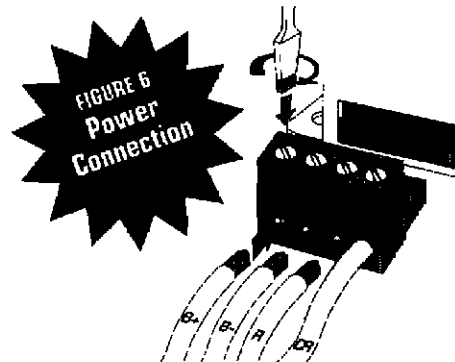
1. Never mount the MX3i where it can get wet. Water damage is not covered by the limited warranty.
2. Do not mount the MX3i where debris or cargo can damage it or change the settings. Physical damage is not covered by the limited warranty.
3. Mount the MX3i to a flat surface with screws. Make sure the base does not flex or distort.
4. Do not mount the MX3i where it may be exposed to excessive amounts of heat from other stereo components (amplifiers).

## **ELECTRICAL**

All power and speaker level input connections are made with the removable power plug or optional speaker level input plug (part # POPHL4). Strip 1/4" of insulation from the end of the wire and "tin" the tip with solder as shown in figure 5.



Insert each wire into the appropriate position and tighten the set screw with a flat blade screwdriver as shown in figure 6.



**Note:** Use 16 gauge cable for the B+ and B- connection. Use 18 gauge cable for the Remote and Delayed Remote connections.

Properly tuning the MX3i requires the following steps that must be taken in the correct order:

1. Setting system Input Gains and Output Levels.
2. Adjusting the Acoustical Delay Circuit (ADC).

### **LEVEL SETTING**

1. Install the system's power fuses after connecting all power, speaker, and signal cables.
2. Set all MX3i Output Level Controls to their minimum settings (full counterclockwise).
3. Set the HP Frequency Multiplier Switch and Mode Switch to their appropriate positions for your system configuration.
4. Make a preliminary adjustment to the Highpass and Lowpass Crossover Frequencies. Check the manufacturer's specifications for the proper frequency range of each speaker. It may be necessary to fine tune crossover frequencies later for the best overall sound quality.
5. Set the ADC Control to 0 (full counterclockwise).
6. Set all other signal processor input gain controls and output level controls to their minimum settings.
7. Set all amplifier input gain controls to their minimum settings.
8. Turn the head unit on with the volume set to *minimum*.
9. Visually check the MX3i's condition. The green Power-On LED should be on. The red Input Clip LED indicators should be off.
10. Visually check the power-on indicators (if equipped) of all other system components to verify that they are on.
11. Set the headunit's tone controls, balance and fader to the center (flat) position and turn off any loudness features or other processing effects.
12. Set the volume control of the head unit to approximately 7/8 of maximum (maximum undistorted output). Play a very clear and dynamic recording. Turn on the headunit's repeat track feature. **Note:** Do not be alarmed if you don't hear much sound coming from the speakers at this time.
13. Adjust all preamp components between the headunit and MX3i for maximum undistorted output as per the manufacturer's instructions. Start with the first component after the headunit and work your way towards the MX3i.
14. Turn up the output level controls for the last signal processor before the MX3i until the red LED Input Clip Indicators flicker on about once a second with the peaks in the music.
15. At this point approximately 1100 millivolts peak is being passed through the Highpass, Bandpass and Lowpass Outputs to the next component in the system. It is possible to send as much as 11 volts peak to each component by turning up the Output Level Controls. The input signal needs of the next component determine the settings for the Output Level Controls.

#### MX3i outputs going directly to an amplifier:

a - Turn up each Output Level Control separately until the speakers connected to the corresponding channel of the amplifier begin to distort. Turn the output level back down just enough to eliminate the distortion. If this adjustment cannot distort the speakers, then leave the output level at maximum and use the amplifier's input gain control to reach maximum undistorted output.

b - Repeat this step for each channel. Once the maximum undistorted output of a channel is determined, you may find it helpful to disconnect the signal input at the amplifier so it won't interfere with listening to other channels. The idea is to establish the maximum undistorted output of each amplifier channel and it's associated speakers independently of the others. When each output is properly adjusted, go to step 16.

#### MX3i outputs going to another signal processor:

a - Turn up each Output Level Control separately until the next signal processor is receiving the maximum amount of signal it can accept (consult the manufacturer's specifications).

b - Turn up the output level adjustments of the next signal processor according to the input needs of the following signal processor. Repeat this procedure for each processor until the correct input gain of the last signal processor before the amplifier is set.



c - Turn up the output level of the last processor until the speakers connected to the amplifier begin to distort. Turn the output level back down just enough to eliminate the distortion. If this adjustment cannot distort the speakers, then leave the output level at maximum and use the amplifier's input gain control to reach maximum undistorted output. Repeat this step for each channel in the system. Once the maximum undistorted output of a channel is determined, you may find it helpful to disconnect the signal input at the amplifier so it won't interfere with listening to other channels. The idea is to establish the maximum undistorted output of each amplifier channel and it's associated speakers independently of the others.

16. Once the maximum undistorted output for each amplified channel has been established it will be necessary to listen to the overall balance of the system and readjust the level controls for some channels. For example: If the right channel sounds louder than the left channel, the right channel's output should be lowered until it is equal to the left channel. Compare left to right highpass, midbass to subwoofer, etc. until the system is properly balanced. The idea is that all the channels in the system must be referenced to the weakest amplifier and speaker combination.
17. Listen to several musical selections and fine tune the Crossover Frequency Controls for the best overall sound quality.
18. When all input gains and output levels are set correctly, the system will reach maximum undistorted output at the volume level set in step 12. If more overall volume is desired, it will be necessary to increase amplifier power or speaker capability or both.

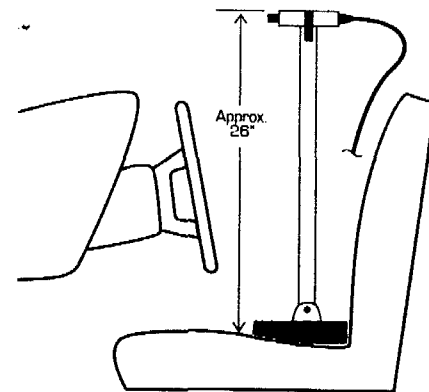
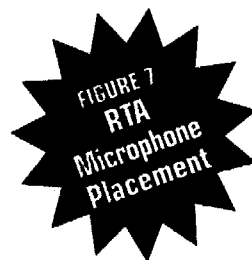
## ADJUSTING THE ACOUSTICAL DELAY CIRCUIT

The Acoustical Delay Circuit (ADC) corrects response problems caused by constructive or destructive interference around the lowpass crossover region. The frequency range around the lowpass crossover point includes frequencies that are being reproduced by both lowpass and bandpass/highpass speakers. The MX3i incorporates very steep 24dB per octave crossover slopes to minimize interaction between speakers at the crossover point. However, when the distance from the listening position to each speaker is different, the signals may arrive slightly out of phase with respect to each other. Constructive interference occurs when the two signals sum together and create a peak in the overall response at the crossover point. Destructive interference occurs when the two signals cancel each other and create a dip in the overall response.

The ADC can delay the lowpass signal as much as 10 milliseconds. This has the same effect as physically adjusting the placement of the lowpass speaker to allow the two signals to arrive in phase with each other.

A real time analyzer (RTA) capable of 1/3 octave resolution is required to adjust the ADC.

1. Set up the RTA so its display can be seen while adjusting the ADC. Set the response time of the RTA's display to its slowest setting. Attach the RTA's microphone to a stand and place it in the driver's seat as shown in figure 7. The microphone should



be horizontal and pointing forward towards the dash with a height of 26 inches from the seat cushion.

2. Play uncorrelated (stereo) pink noise with the headunit's repeat track function turned on and the bass and treble controls set to their flat positions. Turn off any loudness controls or other sound processing effects.
3. Set the volume level for approximately 90dB. Note: The level must be at least 10dB above any ambient noise that could interfere with RTA readings.
4. Observe the RTA and adjust the sensitivity to center the overall curve in the display area.
5. Turn the ADC Control from 0 to 10 while observing the response curve in the area of the crossover point between lowpass and bandpass/highpass. The idea is to smooth either a peak or dip in the response by delaying the lowpass output slightly and thus changing the phase relationship between the two signals.
6. Adjust any equalization controls used in the system for a smooth frequency curve.
7. Check the sound quality of the system with various music selections and fine tune the equalizer settings based on what you hear. Remember that the RTA is just a guide and should never be the final judge of the sound quality of the system. Use your ears.

SYMPTOM	PROBABLE CAUSE	SOLUTION
Power On LED not on	No battery, chassis ground, or remote connection Blown power fuse inside the MX3i	Connect B+, B-, & Remote Turn-On to the Quick Disconnect Power Plug (pages 7 & 14) Check for a short to chassis ground in the B+ cable. Install a new fuse (2 amp GMC style)
No output and Power On LED is on	No signal from the source Faulty input or output signal cables	Check the signal source for proper output Try substituting different signal cables
Distorted sound in all channels	Clipped input signal	Make sure the signal source is not producing a clipped signal (pages 15 - 17)
Distorted sound in individual channels	Output Level Control set too high for the next component	Set the Output Level Control to a lower setting (pages 15 - 17)
No sound coming from the bandpass outputs	Highpass crossover frequency is set lower than the lowpass crossover point.	Readjust the highpass crossover frequency to a higher setting than the lowpass crossover frequency (page 11)