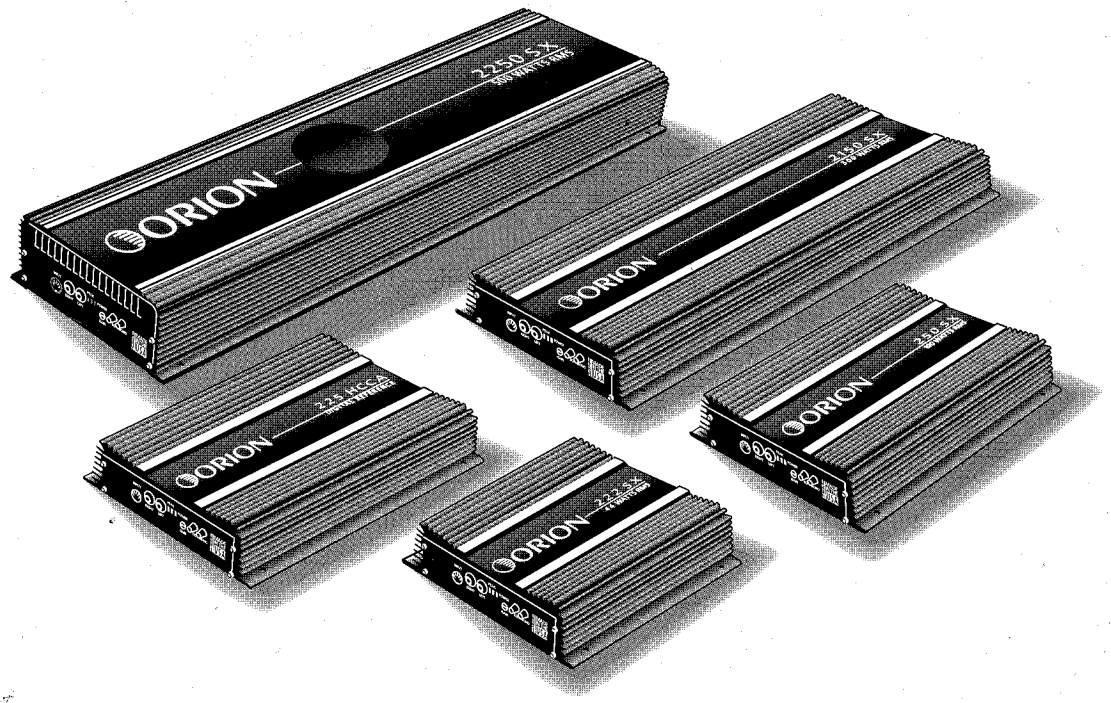
INSTALLATION MANUAL

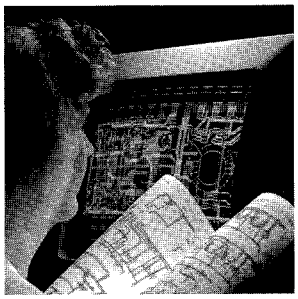
Orion SX Series

POWER AMPLIFIERS



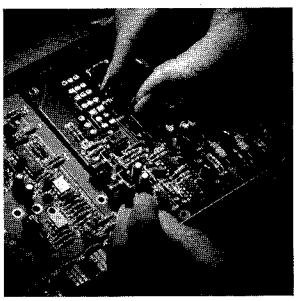
ORION™

CONTENTS



DESIGN

All Orion amplifiers are designed on our sophisticated CAD system, utilizing the latest technology available.



PRODUCTION

All Orion amplifiers are Made In The USA, with high-quality double-sided PC boards containing superior-grade components.

PRODUCT USE

The Orion SX Series sets new standards for performance and reliability.

They can attain Sound Pressure Levels well in excess of 110 dB. Use common sense and wear hearing protection when appropriate.

INTRODUCTION

Congratulations! You have purchased the finest car audio power amplifier available on the market today. Orion power amplifiers are superbly crafted and precision calibrated, and offer the utmost in ease of installation. Be assured, before you bought this superbly-built amplifier, it has been thoroughly tested and is ready for the most demanding of situations. This amplifier has passed an extensive five-step quality control inspection, culminating in a two-hour "burn-in" under actual operating conditions. If it had failed, it wouldn't be in the box!

To aid you in enjoying this premium product, please take a few moments to read through this manual before installing the amplifier in your new or existing system. Once the amplifier is carefully installed and you listen to it for the first time, you will be astonished at its sound quality and power.

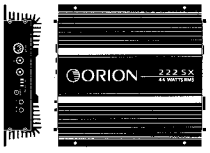
All SX Series amplifiers contain the following built-in features:

- Full frequency, Bi-Polar, Class AB output for full, clean reproduction at all frequencies without any compromise.
- Localized Feedback Design for extremely fast transient response and reduction of harmonic and intermodulation distortion.
- Parallel RCA and DIN inputs provide considerable versatility for interconnections.
- Each amplifier contains a ±15 volt power supply which provides phantom power for Orion accessories. This ensures maximum dynamic performance from all accessories. Power supplies are protected against low voltage or excessive current.
- Bridging capabilities for mono and mixed mono installations.
- A single variable input sensitivity control with left and right channel peak indicators for precise level matching of head unit outputs to amplifier inputs.
- 6 Hz rumble filter to eliminate any inaudible DC offset.
- FET switched 40 dB audio attenuator to reduce turn-on/turn-off "thump".
- Optically isolated remote turn on circuit.
- Massive aluminum heat sink for efficient dissipation of heat.
- A wide variety of accessories are available for flexibility in designing overall audio systems.
- A built-in equalization circuit that can be switched in for an interior-optimized frequency response The frequency contour is designed to accommodate most car interiors. The bass is boosted at 40 Hz by 15 dB, mid-bass boom is cut at 200 Hz by 4 dB, and high frequencies are boosted by 6 dB at 10 Khz to compensate for the car's sound-deadening upholstery, to produce a brighter sound.
- Left and right peak indicators. Used in conjunction with the input sensitivity control to match the amplifier's peak output to the peak coming from the head unit.

am-pli-fier (n.) An electronic device or circuit that increases the current or voltage applied to it.

DESCRIPTIONS

ORION 222 SX
STEREO POWER AMPLIFIER
44 WATTS RMS



The Orion 222 SX is a stereo power amplifier that provides 22 watts per channel. It is ideal for use in a basic single amplifier system shown on page 16. In this system it delivers 88 watts total output. In customized systems, the 222 SX can be used to drive tweeters, mid-range or midbass speakers in multiple amplifier applications.

ORION 250 SX
STEREO POWER AMPLIFIER
100 WATTS RMS

The Orion 250 SX is a stereo power amplifier that provides 50 watts per channel. It is an excellent choice for moderate listening systems where you want full range with smooth highs and rich, tight bass. This amplifier is also capable of operating in the three channel mode described on page 15. In this configuration the amplifier delivers 200 watts total output. In larger high-end or competition systems, it can be used to run mono on a single 4 ohm subwoofer, or used in stereo for midbass, midrange or tweeters.

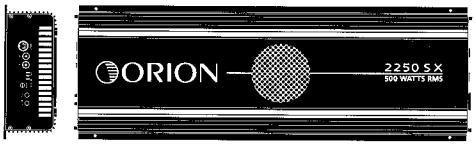
ORION 275 SX
STEREO POWER AMPLIFIER
150 WATTS RMS

The Orion 275 SX is a stereo power amplifier that provides 75 watts per channel, and a powerful 300 watts at 4 ohms in mono mode. On page 19, Figure 4 shows this configuration. In high-end or competition systems it is ideal in mono for subs, or in stereo for midbass, midrange, and tweeters.

ORION 2150 SX
STEREO POWER AMPLIFIER
300 WATTS RMS

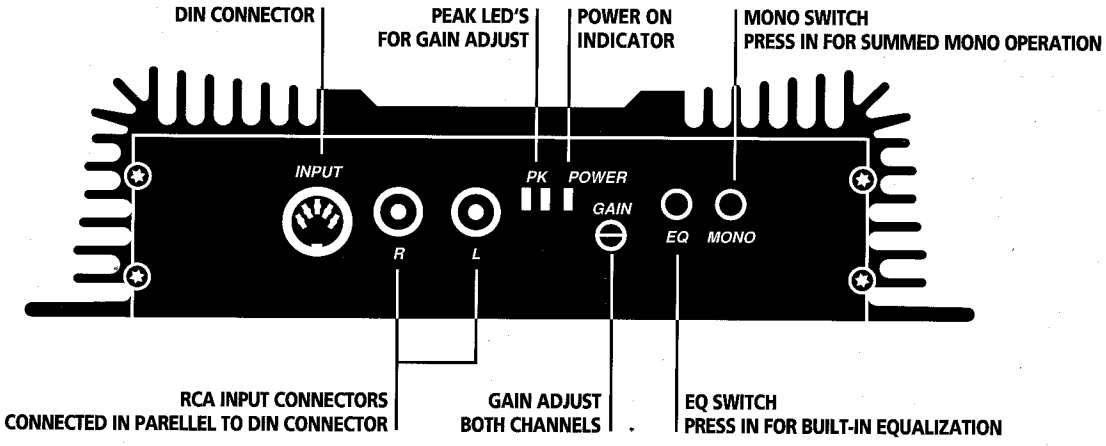
The Orion 2150 SX is a stereo power amplifier that provides 150 watts per channel. It has been designed for use in serious competition systems. In the bridged mode, this amplifier will deliver 600 watts at 4 ohms. This amp is also capable of three channel operation described on page 15. It's most common application is for subwoofers, due to it's very high output.

ORION 2250 SX
STEREO POWER AMPLIFIER
500 WATTS RMS



The Orion 2250 SX is a stereo power amplifier that provides 250 watts per channel. It has been designed for only the most serious of audiophiles or competitors. This amplifier delivers an incredible 1000 watts into 4 ohms in mono mode.

INPUT PLATE



INSTALLATION

This section details the mechanical and electrical procedures you'll need to perform to install your Orion amplifier. Take a moment to look over the list of precautions, tools and additional parts needed to successfully complete the job.

GENERAL PRECAUTIONS

Before installation, make sure you pick a location that will provide adequate ventilation around the amplifier. The Orion amplifier has massive heat sink fins to couple generated heat to surrounding air space via thermal conduction. However, if the amplifier is mounted in a tight space without any air movement, over time, the amplifier can damage itself, in spite of its thermal protection circuits.

Therefore, we recommend that you mount the amplifier flat on the floor under the front seat or in the front of the car trunk (under the rear deck plate). Remember, heat travels up away from the heat sink fins. In addition, please observe these precautions:

CAUTION: THE EXTERIOR OF THE AMPLIFIER GETS HOT AND MAY BURN YOUR SKIN.

- Do not touch the amplifier during operation.
- Do not mount the amplifier on a plastic surface or other low-combustion-point material. The heat generated by the amplifier during operation will melt plastic and may scorch or even burn some materials.
- Do not place a glass or metal cover over the top of the amplifier unless you have a cooling fan at one end.
- Direct cool air along the length of the fins, rather than across them, for the most efficient cooling. Remember, any moving air will dissipate heat.

REQUIRED TOOLS

- Electric drill/drill bits
- Utility knife
- Phillips and flathead screwdrivers
- Pliers (standard and needle nose)
- Wire cutters/strippers
- Wire crimping tool
- Wire brush and emery sandpaper (for metal)
- Rubber grommets
- Heat shrink tubing
- Soldering iron and solder
- Nylon tie wraps
- Volt/Ohm meter (VOM or DVM)
- Felt-tip pen or spring loaded center punch tool

REQUIRED PARTS

The following parts are packed with 222 SX, 250 SX, 275 SX, and 2150 SX:

- Female speaker plug pigtail harness
- External fuse pigtail assembly
- Fast blow fuse
- Butt splice
- 20 feet of Orion Connection 12 Gauge Power Cable (red jacket) *NOTE: The 2150 SX gets 8 gauge*
- 20 feet of 18 Gauge (blue jacket) stranded copper wire
- Four metal self tapping Phillips screws

The following parts are packed with the 2250 SX:

- Fused female speaker plug pigtail harness
- One 50 Amp circuit breaker
- Two 2 ft. sections of Orion Connection 4 Gauge Power Cable (red jacket)
- 2 feet of Orion Connection Ground Cable
- 4 metal self-tapping Phillips screws

OPTIONAL PARTS

The Orion Connection carries everything you need to complete your car audio system. Visit your Orion dealer and check out genuine Orion Connection Installation Accessories.

- MBR 70 Multiple Battery Regulator
- Modular Power Distribution (POWER BLOCKS)
- Modular Fuse Holders (POWER BLOCKS)
- XTREME Speaker Cable
- Power Cable, Ground Cable
- Battery Terminals
- Audio Interlink Cables (RCA & DIN)
- Passive Crossovers
- Raw Crossover Components
- Automotive Carpet, Vinyl & Grill Cloth
- Damping Material
- Cosmetic Integration Accessories

1. Disconnect the battery positive (+) lead before making any power connections.
2. Reinforce The Ground: Ground the battery negative terminal to a metal member to ensure an adequate ground. (see Detailed Power Connections)
3. Connect the power cable assembly directly to the positive (+) terminal on the battery. CAUTION: DO NOT connect amplifier to fuse box. Do not use a smaller gauge wire for the hot lead than coming out of your amplifier.
4. Use the supplied fuse within 18 inches of the battery.
5. Make sure that all connections are clean and properly secured. Failure to do so may result in damage to the components in the system.
6. Make sure wire enters the vehicle safely. Always use a grommet when penetrating metal.
7. Run wire through the vehicle in appropriate areas, try to avoid going near the fuse-box (it can radiate noise into your power wire). Never get power from the fuse-box, this will at best cause a noise problem and may in some cases cause electrical problems.
8. Once you have selected the mounting location, mount the amplifier using the four self-tapping screws provided. Tighten screws securely.

Note: The 2250 SX contains a cooling fan and air exhaust vents at each end. Do not block the vents or the fan inlet or the amplifier will not receive adequate ventilation.

CAUTION: DO NOT DRILL INTO THE FUEL TANK, FUEL LINES OR THROUGH ELECTRICAL WIRING!

9. Connect power wire to the second fuse holder supplied with the amp (except 2250, it is internally fused).
10. Ground the amplifier, this is easily done with a #10 self-tapping screw, but only for 222, 250, and 275. (read section, titled Detailed Power Connections on the next page).
11. Make speaker connections. Do not to allow the speaker leads to come in contact with each other, or to ground when the amplifier is on. This will at best cause a noise problem, and may cause internal damage to the amplifier over time.
12. Connect the signal cables to the amplifier.
13. Connect turn-on lead. This wire needs to see 12 volts input to turn on the amplifier.
14. Make necessary gain adjustments. (see section System Adjustments on page 10).
15. Make sure the car's electrical system can withstand the new demands you have just placed on it by following directions in the Power Section on page 12.

222 SX, 250 SX, AND 275 SX

Battery Connections: Always connect the power cable assembly directly to the positive terminal on the battery. Do Not connect to the car fuse panel. The 222 SX and 250 SX amplifiers provided with two fuses. The fuse at the battery is designed to prevent fire or damage to your car should there be a ground short. The second fuse protects the amplifier itself. Do not substitute fuses.

CAUTION: ALWAYS REPLACE WITH FUSES OF THE SAME FAST BLOW CURRENT RATING AS THOSE SUPPLIED WITH YOUR AMPLIFIER.

Amplifier Remote Control Lead: Connect the remote blue lead to the power antenna or the amp turn-on connection. Do not connect the remote blue lead directly to 12 volts as this will not allow the amplifier to turn off.

2150 SX

Battery Connections: For most cars, the existing battery and charging system will handle a single 2150 SX amplifier. If two or more amplifiers are used (or if the headlights dim when the amplifier is cranked up to full power), use two batteries connected with a MBR 70, as shown in figure 5 on page 20. A heavy duty fuse-holder and fast blow 40 ampere fuse is provided with the amplifier. Install the fuse-holder at the battery positive terminal. Always connect the power cable assembly directly to the battery. Do not connect to the car fuse panel. If the batteries are not installed side-by-side as shown in the figure, install a heavy duty fuse at the positive post of both batteries.

Always replace the fuse with the same fast blow current rating as the one supplied with the amplifier.

Reinforce The Ground: Ground the battery negative terminal to a metal member to ensure an adequate ground. Install a separate grounding kit for the second battery.

Amplifier Ground Connection: The large black wire must be connected to a welded chassis member. Do not lengthen the ground wire. If more than one amplifier is used, do not use the same ground screw, but always connect both amplifiers to the same metal member as close together as possible. Failure to do this will introduce ground loops and result in a noisy system. It is a good idea to use a large carriage bolt, instead of the #10 self-tapping screw. The carriage bolt will assure adequate grounding.

CAUTION: DO NOT EXTEND GROUND WIRE, OR RUN GROUND TO THE BATTERY IN A SINGLE BATTERY SYSTEM.

NOTE: The ground connection is one of the most important parts of the installation. The better the ground, the better the amplifier will perform. You can obtain an Orion Connection Grounding Kit from your dealer.

2250 SX

Battery Connections: Install a separate heavy duty premium battery to service the amplifier. Refer to the 2250 SX wiring diagram of on the opposite page. Make battery connections as follows:

1. Refer to Detail "A" on this diagram and turn the amplifier upside down.
2. Remove the plastic caps from the setscrew access holes. You may have to rotate the plastic cap so that the notch in the cap permits removal.
3. Using the Allen wrench supplied with the mounting hardware package to loosen booth setscrews enough to permit insertion to the stripped and tinned ends of the black ground cable and red power cable. Insert the black ground cable into the "Battery – " hole and the red power cable into the "Battery +" as far as it will go. Tighten the setscrews just enough to hold the cables firmly.

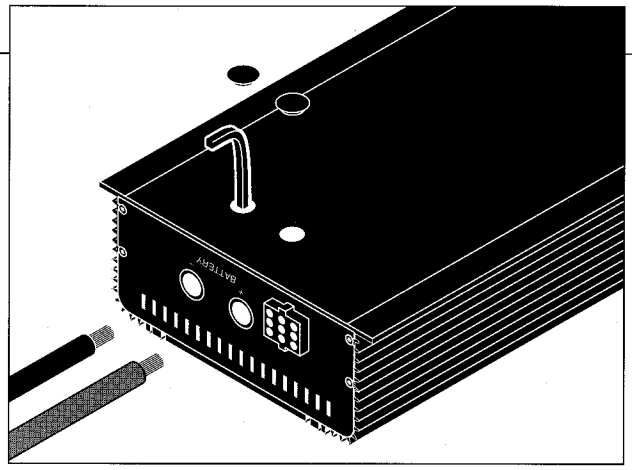
⚠ **CAUTION: DO NOT OVER-TIGHTEN THE SCREWS. OVER-TIGHTENING MAY STRIP THE THREADS ON THE SCREWS.**

4. Replace the plastic caps and turn the amplifier upright.
5. Mount the amplifier and connect the black ground cable to a metal member of the car frame.
6. Install the circuit breaker (supplied) so that the red power cable can be attached with a slight loop in the cable to prevent straining the connections. Connect the red power cable to the circuit breaker and tighten the attaching screw securely.
7. Connect the small lug on the red battery cable to the circuit breaker and the large lug end to the positive battery terminal.
8. Connect the positive terminal of the rear battery to the engine compartment battery positive terminal. Install a 150 ampere fuse or circuit breaker in this line as shown in this diagram.

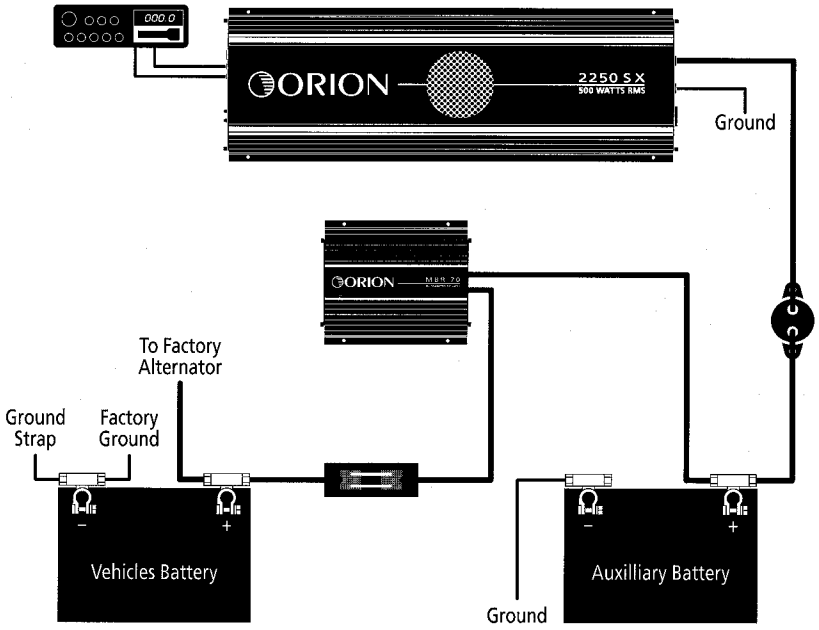
NOTE: Orion Connection compression lugs and flag clamps are designed for this type of installation. Heavy-Duty fuseholders (called POWER BLOCKS) are also available from the Orion Connection.

9. At both batteries, connect the battery negative terminal to a metal member of the frame to ensure a good ground.
10. Connect the blue remote turn on-off wire in the speaker cable assembly to the source unit's power antenna trigger wire.

NOTE: Amplifier On-Off Control: You may connect the remote blue lead to the power antenna or the remote turn-on connections, or install an on-off switch. Hooking the blue lead to 12 volts will not allow the amplifier to turn off.


BATTERY

DETAIL A


000.0
ORION
2250 SX
500 WATTS RMS
Ground
ORION
To Factory
Alternator
Ground
Strap
Factory
Ground
Vehicles Battery
Auxilliary Battery
Ground

SYSTEM ADJUSTMENTS

You will get less system noise if you keep the amplifier gain as low as possible. This can be accomplished best with a preamp, such as the 300 PRQ or the 500 PMQ.

If there are no accessories (equalizers, crossovers, etc.) used in the system:

1. Turn off all power.
2. If the Bridging Mode is being used, press the Mono switch to the In position. If the Bridging Mode is Not being used, make sure the Mono switch is in the Out position.
3. Set the Gain controls on all amplifiers to their minimum position.
4. Turn on the power to the amplifiers. Turn on the radio and set the Volume control to approximately 3/4 volume.
5. Adjust the Gain control on each amplifier until the PEAK indicators just flash on (clipping).
6. Set the Volume control on the radio for desired listening level.
7. If desired, press the EQ switch to the IN position and re-adjust the Gain control.

If Orion accessories are being used:

1. Turn all power off.
2. Set the gain controls on all amplifiers to their minimum positions.
3. If an Orion 200 DAB Dual Amp Balancer is installed in the system, set both fader controls to maximum (fully clockwise).
4. Set all frequency controls on the 300 PRQ or 600 EQM Equalizers to flat response (dots in top center position). If a 500 PMQ Parametric Equalizer is being used, set the frequency controls to the center position and set the boost/cut controls to the center position.
5. If a 600 EQM is being used, set the input gain control to minimum (fully counterclockwise). If a 300 PRQ or 500 PMQ is being used, set both input controls to minimum (fully counterclockwise) and the Volume control for maximum (fully clockwise).
6. Turn on power to amplifiers. Turn on the radio and set the Volume control for approximately 3/4 volume.
7. If a 300 PRQ or 500 PMQ is being used, adjust each input gain control until the PEAK indicators on the amplifiers just start to flash (clipping). If the input gain controls on the 300 PRQ or 500 PMQ do not produce full volume, increase the gain setting of each amplifier as required to cause the PEAK indicators to flash. Decrease the setting of the Volume control on the 300 PRQ or 500 PMQ to desired listening level. If a 600 EQM is being used, adjust the input gain control clockwise until the PEAK indicators on the amplifiers just start to flash (clipping). If the gain control on the 600 EQM does not provide full volume, increase the gain setting of each amplifier just enough to cause the PEAK indicators to flash.

CAUTION: BE SURE TO TURN OFF THE POWER WHEN DISCONNECTING AND RE-CONNECTING CABLES.

8. If a 200 CRX Active Crossover is installed in the system, unplug the cable from the low output and adjust the HIGH FREQ. control to where the mid-range and highs sound best. Then plug in the low output cable and unplug the high output cable. Using the Low Frequency control, adjust the lows until it sounds good to you. Now plug in the high output and make minor adjustments to suit your taste.

If a 300 CRX 3-way Active Crossover is installed in the system, proceed as follows:

a. Unplug the cables from the Mid Out and High Out connectors an adjust the Low Pass control until the lows from the subwoofers sound good to you.

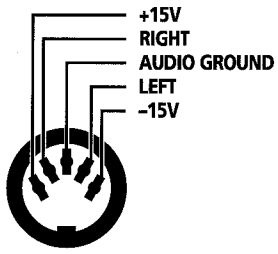
b. Unplug the cable from the Low Out connector and plug in the High Out cable. Adjust the High Pass control to where the highs from the tweeters sound best.

c. Unplug the cable from the High Out connector and plug in the Mid Out cable. Adjust Mid Pass controls until the instruments and voice sounds delivered by the mid-range speakers sound the fullest. Use the left-hand Mid Pass control to adjust the low end and the right-hand Mid Pass control to adjust the high end.

d. Now plug in the High Out and Low Out cables and make minor adjustments to suit you taste.

Note: Ideally, the Low Out should be adjusted to permit the subwoofers to reproduce all frequencies of 100 to 150 Hz and below. The High Out should be adjusted to permit the tweeters to reproduce only frequencies of about 4 kHz and above. The Mid Out should be adjusted to pass a band of frequencies of about 100 Hz to 4500 Hz. The response of various speakers greatly affects these adjustments, therefore, it is generally always better to trust your ears and simply adjust the various frequency outputs to where they sound best to you.

PHANTOM POWER (±15V) IS SUPPLIED TO ALL ORION ACCESSORIES BY THE AMPLIFIER THROUGH THE DIN CABLE.



Before installing your audio system, a little common sense beforehand, can save you a lot of time. Make sure that your car has enough power to service all of the car electrical components (engine, headlights, windshield wipers, air conditioning, etc.) and still handle the power required to supply your audio system at full power.

If you are installing a system containing two or three 222 SX or two 250 SX amplifiers, your existing factory electrical system will probably handle your power requirements.

An existing system may handle a 2150 amplifier just fine, but if you install two of these amplifiers, you probably won't be able to run the system at full power very often, especially at night with the headlights on. The best way to handle this problem would be to install a MBR 70 and extra remote batteries.

2250 SX amplifiers should never be operated on a one battery system. There just is not enough reserve time in one battery.

A good way to test your existing electrical system to see if you have enough current to operate your new audio system, is to turn on the dome light and turn your system up to higher levels. If the dome light tends to flicker with the music you should add an extra battery or batteries.

CAUTION: IF YOU ATTEMPT TO OVERLOAD YOUR EXISTING SYSTEM, YOU WILL BURN OUT THE BRUSHES OR FIELD DIODES IN YOUR ALTERNATOR, OR CAUSE DAMAGE TO THE VOLTAGE REGULATOR AND GREATLY REDUCE THE LIFE OF YOUR BATTERY.

GROUNDING AMPLIFIERS

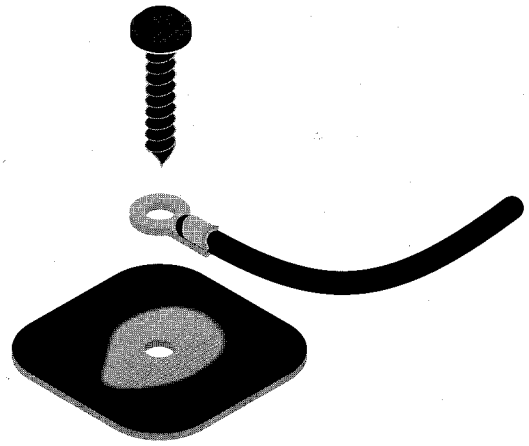
Ground is a term generally used to describe the common connections in an electrical or electronic circuit. The common connection is usually the same potential for all circuits in the system. In cars, the ground is almost always the metal chassis or body and originates at the negative (-) terminal of the battery.

Electromagnetic interference is a combination of electric and magnetic fields caused by alternating current (or frequencies) radiating from the wires and being picked up on the signal leads to and from your amplifier. This type of interference may show up a popping, bursts of static, or random noise.

A ground connection should have the least possible resistance which is why we emphasize that the ground wire for an amplifier should be as short as possible (18-inches long maximum). Longer wires add resistance and make the circuit susceptible to ground loops which can result in hum pickup and other electromagnetic interference.

For any audio system, you should install an additional ground from the battery negative terminal to the chassis. Leave the original ground strap connected to the engine. This is used to help eliminate ignition noise. The Orion Connection offers a Grounding Kit especially for this purpose.

Ground Connection: The large black wire with the terminal lug must be connected directly to the car chassis not more than 18 inches from the amplifier.



Scrape any paint from the grounding point and clean with sandpaper just before attaching the ground lug. After the ground lug has been securely tightened, cover the bare metal area with paint, under-coating, or grease to prevent rust. Do not lengthen the ground wire. If more than one amplifier is used, do not use the same grounding screw, but always connect both amplifiers to the same metal member as close together as possible. Failure to do this will introduce ground loops and result in a noisy system.

NOTE: The ground is every bit as important as the power lead. Many audio system troubles are the result of improper ground connections.

CAUTION: DO NOT GROUND THE AMPLIFIERS AT THE SAME POINT. USE A SEPARATE GROUNDING POINT FOR EACH AMPLIFIER.

SPEAKER CONNECTIONS

IMPEDANCE

The Orion SX Series Amplifiers are designed for operation with 2 to 16 ohm speakers. For best operation, we recommend using XTREME Series Loudspeakers.

SPEAKER CONNECTIONS

Never connect any speaker to the chassis ground. This will introduce ground loops that cause noise in the system.

Never use twisted wire connections. Always make connections using spade insulated butt connections or quick-disconnect connectors or solder connections. If quick-disconnect or solder connections are used, insulate the connections using shrink tubing. Do not use electrician's tape since the adhesive on such tape tends to deteriorate with time and will cause short circuits. Do not route the speaker wires next to any power wires.

Be sure to observe the speaker polarity shown in the figures on pages 18-25. Except as shown in those figures, the yellow wire is right positive and the yellow/black wire is right negative. Also, the orange wire is left positive and the orange/black is left negative.

SPEAKER WIRE

Use substantial wire for speaker connections. We recommend that the speaker wire be Orion Connection XTREME Speaker Cable, at least 16 AWG.

BRIDGING

All SX amplifiers bridge the same way. Each amplifier is capable of running 1, 2, or in 3 channel mode.

MONO MODE 1 CHANNEL

To run the amplifier into 1 channel to a subwoofer, push in the mono button. Wire the SOLID ORANGE wire to the positive side of the speaker, and the BLACK WITH A YELLOW STRIPE to the negative. You can refer to figure 4 on page 21.

CAUTION: USE 4 OHM OR HIGHER LOAD WHEN THE AMPLIFIER IS USED IN THIS CONFIGURATION!!

MIXED-MONO 3 CHANNELS

It is possible to run a mono subwoofer and stereo mids and highs with only one amplifier. The subwoofer will wire exactly the same as listed above. In 3 channel mode the mono button should be in the out position, or disengaged. The stereo mids and highs will be wired in the normal fashion, as illustrated on page 19.

When running the amplifier in 3 channel mode, do not go below a 4 ohm load on the sub woofer, and a 4 ohm load for the mids and highs. Also be sure to use appropriate passive crossovers. (see mixed-mono operation diagram on page 17)

CAUTION: IF INCORRECT, OR NO PASSIVE CROSSOVERS ARE USED, THE AMPLIFIER WILL SEE TOO LOW OF AN IMPEDANCE AND EVENTUALLY CAUSE INTERNAL DAMAGE.

SYSTEM LAYOUT

It's important that you decide what your trying to achieve. Car audio systems can vary from merely upgrading your existing factory installation to multi-amplifier systems that include external equalizers, crossover modules, and a variety of loudspeakers. By studying these diagrams, you will see that you can start with a relatively simple system that can gradually grow by adding additional components as your needs change.

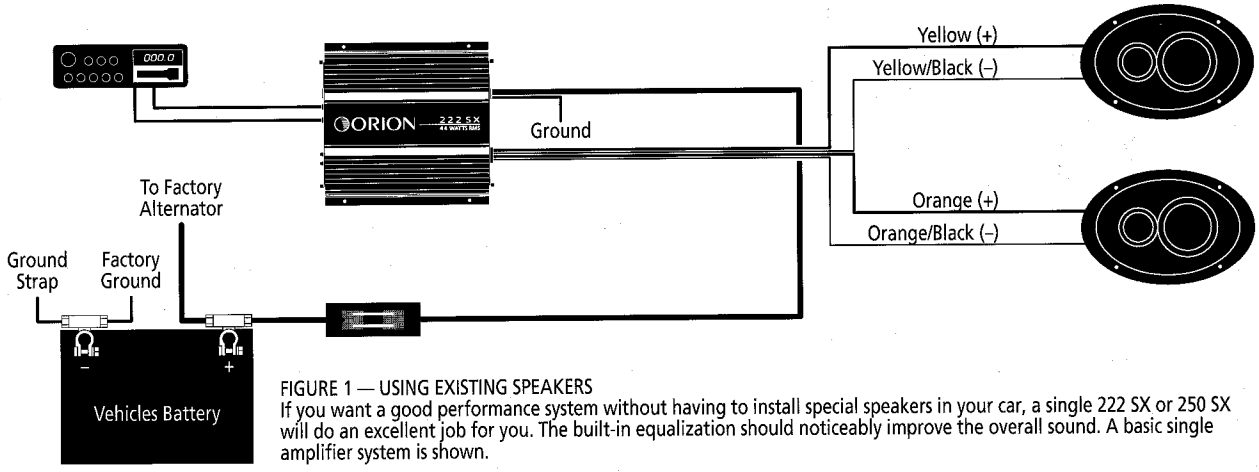


FIGURE 1 — USING EXISTING SPEAKERS
If you want a good performance system without having to install special speakers in your car, a single 222 SX or 250 SX will do an excellent job for you. The built-in equalization should noticeably improve the overall sound. A basic single amplifier system is shown.

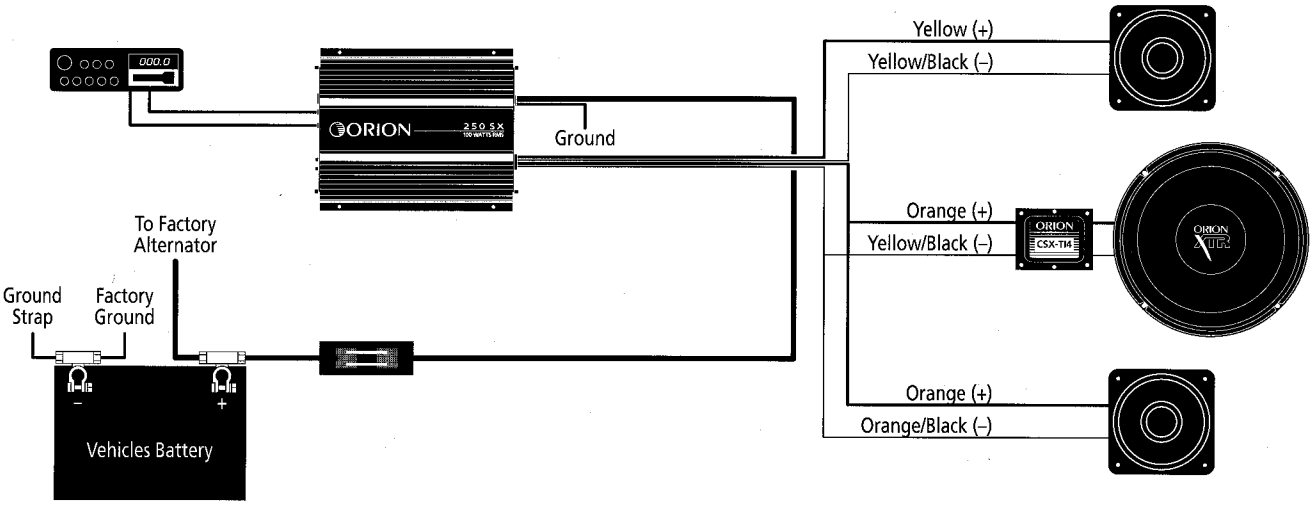


FIGURE 2 — ADDING A SUBWOOFER

For added punch, you could add a subwoofer to the system, perhaps using one of the portable subwoofers available for ease of installation. For this system, you would connect the speakers as shown, to take advantage of the mixed mono output of the amplifier. Refer to the discussion covering bridging on page 15.

Mixed mono operation is the approach to use when you want to add a subwoofer to the single amplifier system. This mode can be used to provide more power to the subwoofer while maintaining stereo left and right. The amplifier accepts the stereo inputs and turns one channel over 180 degrees (inverts the channel).

This system also works best with the built-in equalization because it provides +15 dB at 40 Hz to boost the bass and -4 dB attenuation at 200 Hz to take away the mid-bass boom.

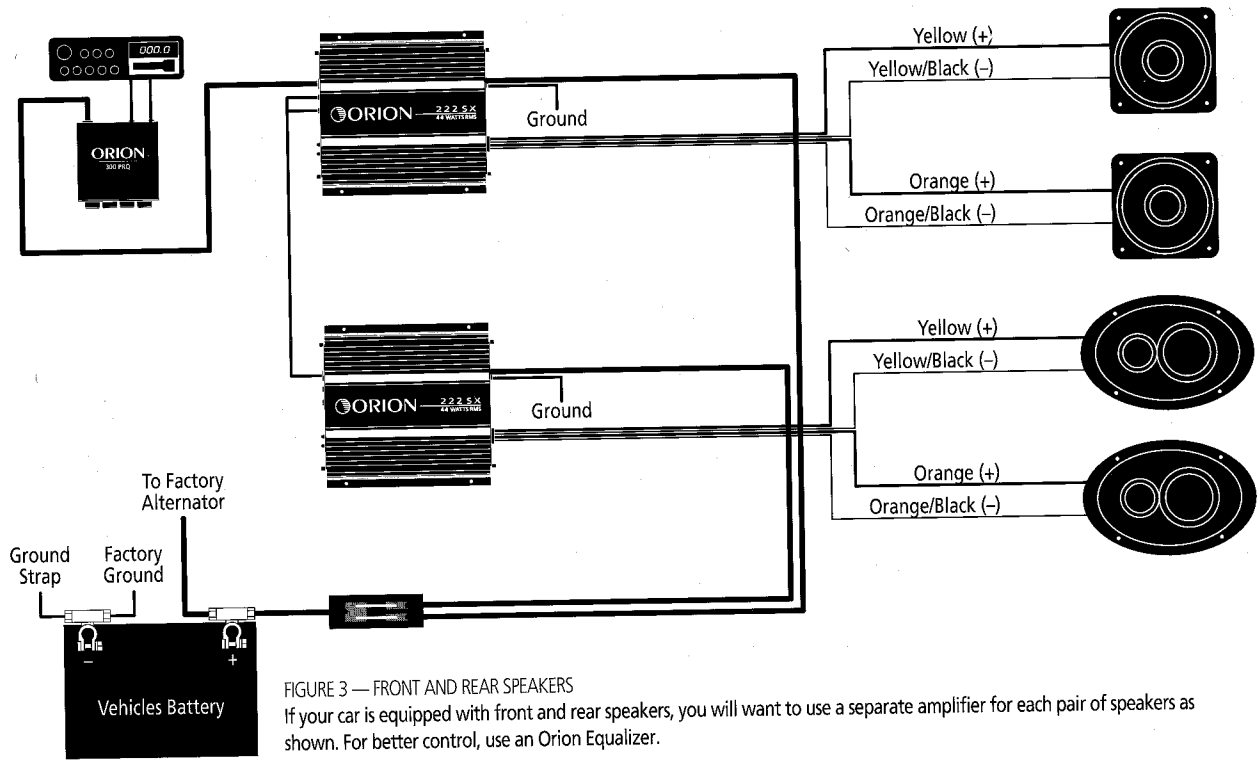


FIGURE 3 — FRONT AND REAR SPEAKERS
If your car is equipped with front and rear speakers, you will want to use a separate amplifier for each pair of speakers as shown. For better control, use an Orion Equalizer.

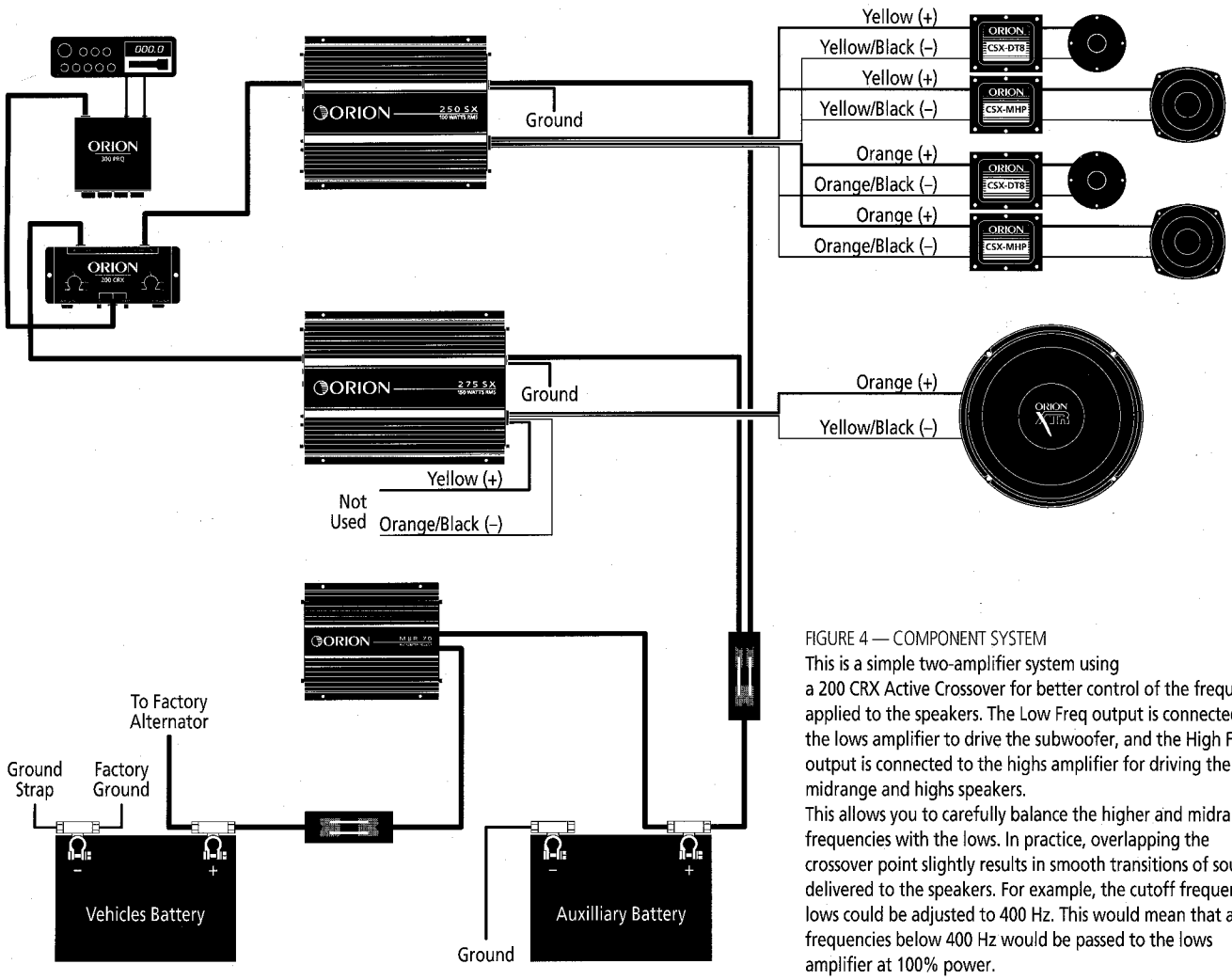


FIGURE 4 — COMPONENT SYSTEM

This is a simple two-amplifier system using a 200 CRX Active Crossover for better control of the frequencies applied to the speakers. The Low Freq output is connected to the lows amplifier to drive the subwoofer, and the High Freq output is connected to the highs amplifier for driving the midrange and highs speakers.

This allows you to carefully balance the higher and midrange frequencies with the lows. In practice, overlapping the crossover point slightly results in smooth transitions of sounds delivered to the speakers. For example, the cutoff frequency for lows could be adjusted to 400 Hz. This would mean that all frequencies below 400 Hz would be passed to the lows amplifier at 100% power.

The attenuation (reduction in power) is 12 dB which is a reduction in power of about 90%. An octave is a doubling of frequency so that a 800 Hz only about 10% of the power would go to the subwoofers. In this example, the high output would be adjusted to pass only frequencies above 300 Hz. This would give you about 100 Hz overlap. Then you could make slight adjustments to provide the sound that pleases you the most.

In a system utilizing a lows amplifier to drive the subwoofer, you would probably always want to use the summed mono mode as shown here. Use of the built-in equalization or an Orion accessory equalizer depends on personal taste. If the bass is "boomy" whether or not you use an accessory equalizer, the built-in equalization at the lows amplifier will improve overall performance.

This system could be designed using two 222 SX amplifiers (22 watts per channel). For added power, you could choose a 2150 SX for the mid/high speakers and a 2250 SX for the lows amplifier.

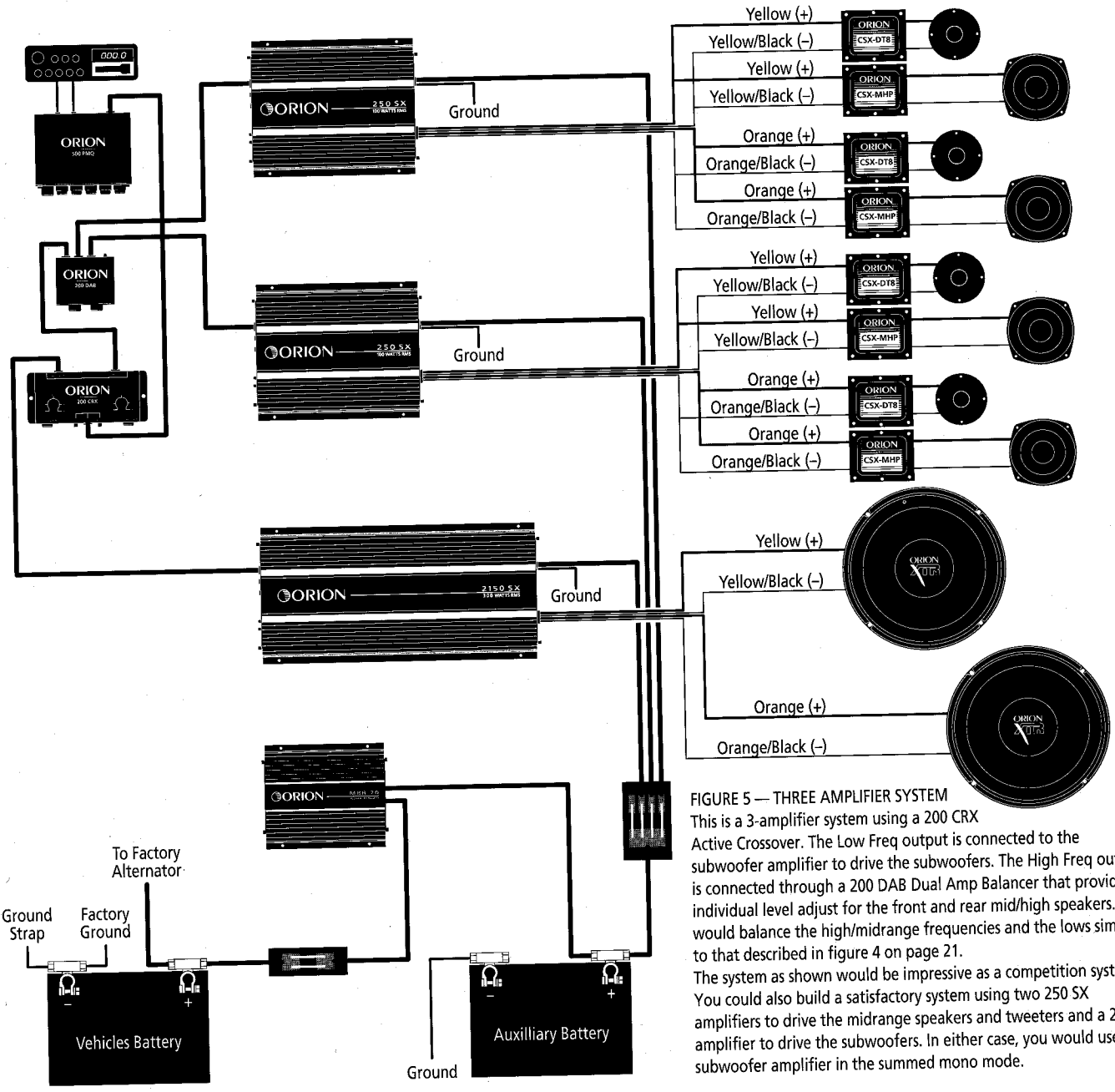


FIGURE 5 — THREE AMPLIFIER SYSTEM
This is a 3-amplifier system using a 200 CRX Active Crossover. The Low Freq output is connected to the subwoofer amplifier to drive the subwoofers. The High Freq output is connected through a 200 DAB Dual Amp Balancer that provides individual level adjust for the front and rear mid/high speakers. You would balance the high/midrange frequencies and the lows similar to that described in figure 4 on page 21.
The system as shown would be impressive as a competition system. You could also build a satisfactory system using two 250 SX amplifiers to drive the midrange speakers and tweeters and a 250 SX amplifier to drive the subwoofers. In either case, you would use the subwoofer amplifier in the summed mono mode.

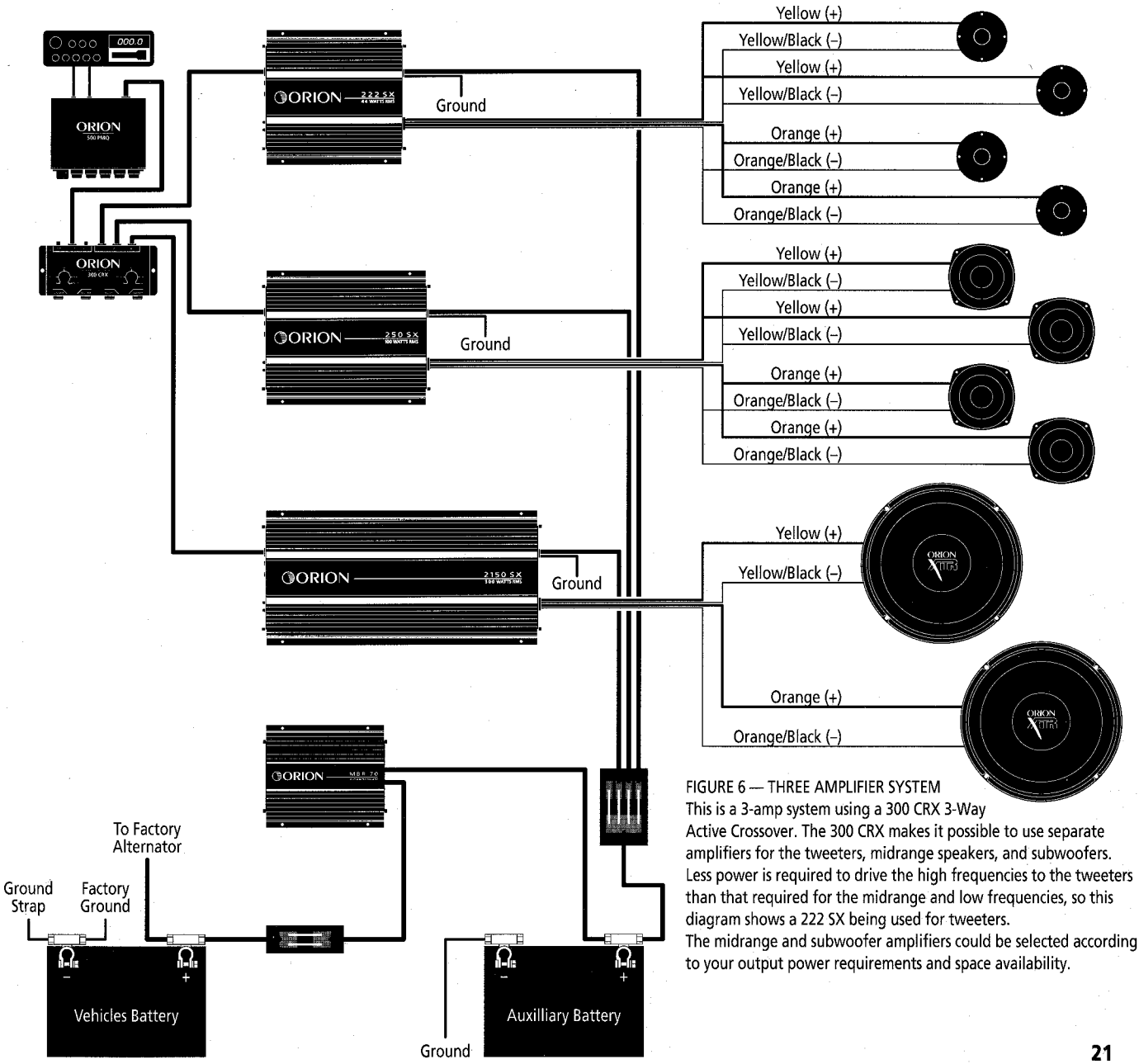


FIGURE 6 — THREE AMPLIFIER SYSTEM
This is a 3-amp system using a 300 CRX 3-Way Active Crossover. The 300 CRX makes it possible to use separate amplifiers for the tweeters, midrange speakers, and subwoofers. Less power is required to drive the high frequencies to the tweeters than that required for the midrange and low frequencies, so this diagram shows a 222 SX being used for tweeters.
The midrange and subwoofer amplifiers could be selected according to your output power requirements and space availability.

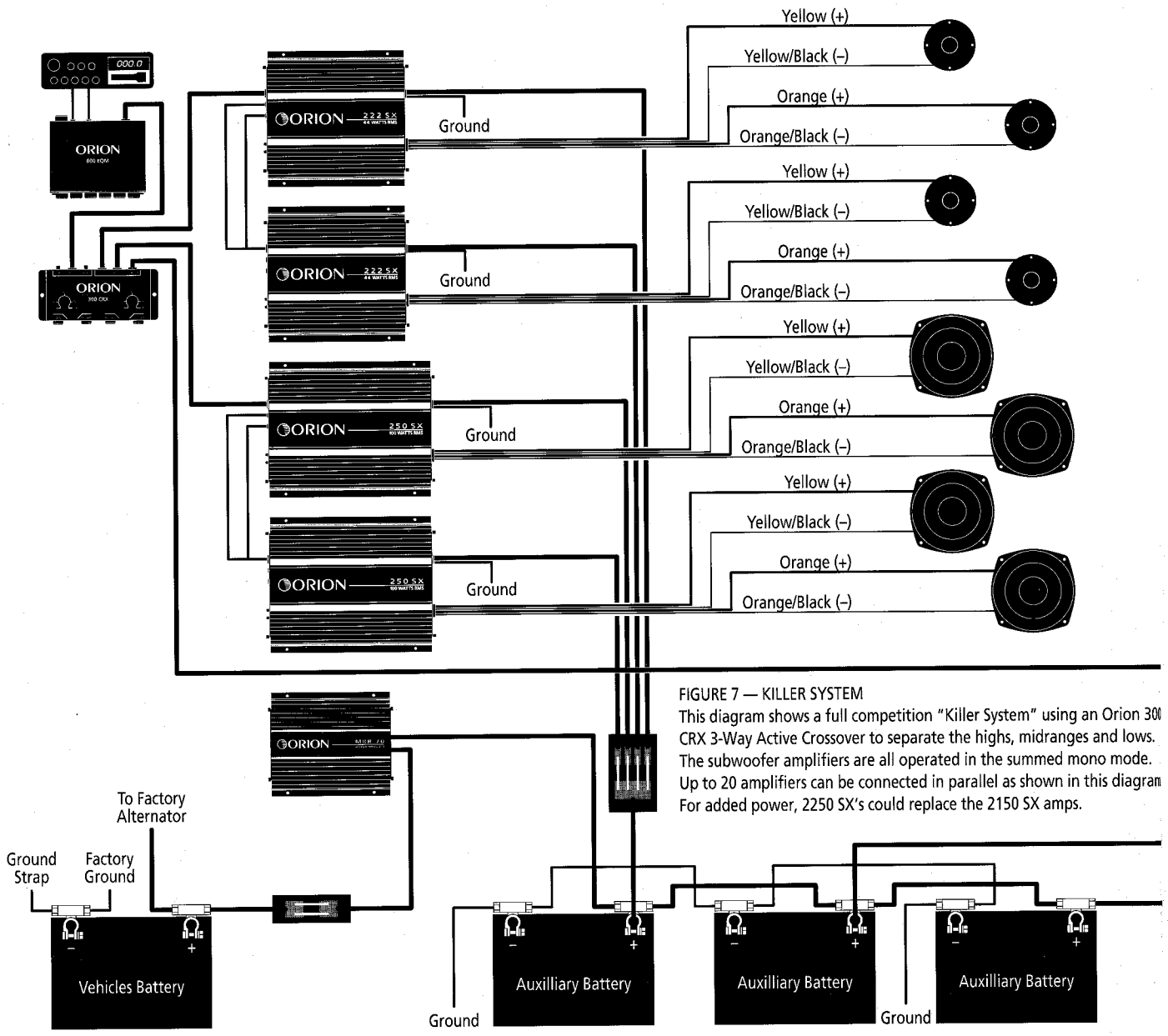
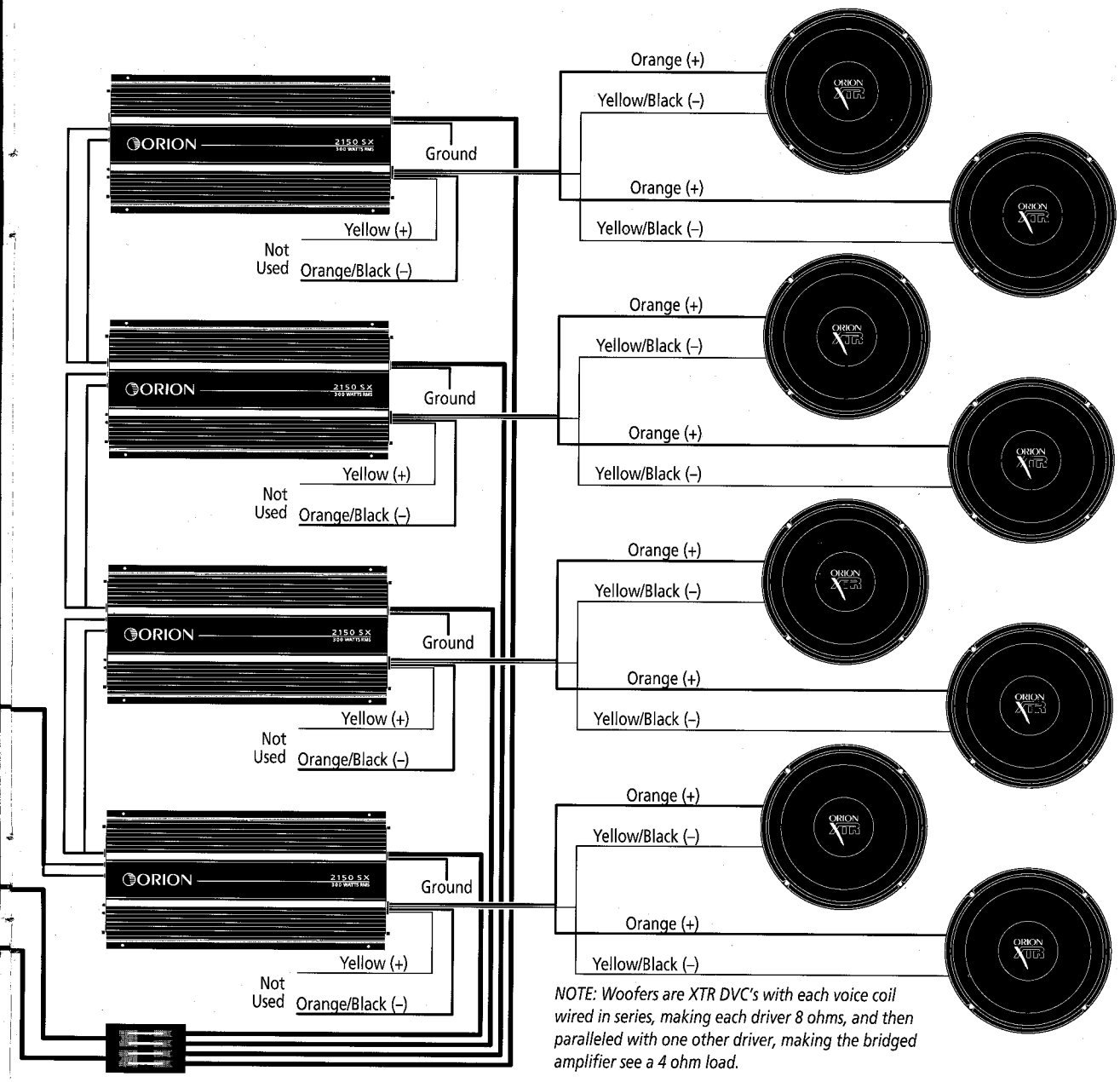


FIGURE 7 — KILLER SYSTEM
This diagram shows a full competition "Killer System" using an Orion 30
CRX 3-Way Active Crossover to separate the highs, midranges and lows.
The subwoofer amplifiers are all operated in the summed mono mode.
Up to 20 amplifiers can be connected in parallel as shown in this diagram
For added power, 2250 SX's could replace the 2150 SX amps.



NOTE: Woofers are XTR DVC's with each voice coil wired in series, making each driver 8 ohms, and then paralleled with one other driver, making the bridged amplifier see a 4 ohm load.

TROUBLESHOOTING GUIDE

This section provides you with a catalog of amplifier symptoms and their probable causes and solutions. Before you consult this listing, make sure the vehicle's electrical system is working properly by verifying that other electrical items (e.g. headlights, windows, etc.) still function correctly.

SYMPTOM	PROBABLE CAUSE	SOLUTION
No Audio	Low or No Remote Turn-On connections	Check remote turn-on voltage at amp and head unit
	Blown Fuse	Replace with new fast-blow fuse
	Power wires not connected	Check butt splices or solder joints; check Ground and Battery connections
	Blown speakers or not connected	Use VOM or DVM to measure speaker coil impedance; check speaker wiring connections
Audio cycles on and off	Thermal Protection Circuits are properly shutting amplifier off each time it gets too hot	Check location for for adequate ventilation; check speaker wiring for a short to chassis
Distorted Audio	Input Sensitivity not set properly or damaged speaker cones	See Calibrating Input Sensitivity procedure and check each step; inspect each speaker for damage and repair or replace suspected component
	Low turn-on voltage	Refer to head unit owner's manual
Audio level low	Mute circuit is on	Check electrical system for low voltage; check ground connection
Audio lacks	Speakers wired with wrong polarity, causing cancellation of bass frequencies	Check polarity of wires from amplifiers to each speaker as defined by the system design
External fuse blowing	Incorrect wiring or short circuit	Refer to Electrical Installation and check keeps each installation step
Whining noise on audio with engine running	Amplifier is picking up alternator noise	Install an in-line noise filter on the head unit's power wire; check alternator diodes or voltage regulator for proper operation
Ticking noise on audio with engine running	Amplifier is picking up radiated spark noise	Check RCA audio cables routes; install an in-line noise filter on the head unit's power wire

SPECIFICATIONS

Model	**222 SX**	**250 SX**	**275 SX**	**2150 SX**	**2250 SX**
Output Power per channel, all channels driven into 4 Ω @12 V	22 x 2	50 x 2	75 x 2	150 x 2	250 x 2
Distortion maximum at 4 Ω, 20 to 20kHz	0.03%	0.03%	0.03%	0.03%	0.03%
Frequency Response ±0.5 dB	6Hz to 30 kHz	6Hz to 30 kHz	6Hz to 30 kHz	6Hz to 30 kHz	6Hz to 30 kHz
Dynamic Headroom	3dB	3dB	3dB	3dB	3dB
Signal to Noise	110dB	110dB	110dB	110dB	110dB
Input Sensitivity	150mV to 5 Volts	150mV to 5 Volts	150mV to 5 Volts	150mV to 5 Volts	150mV to 5 Volts
Output Load	2Ω to 16Ω	2Ω to 16Ω	2Ω to 16Ω	2Ω to 16Ω	2Ω to 16Ω
Idle Current	500mA	500mA	500mA	500mA	1 Amp
Current Draw	8 Amps to 15 Amps	20 Amps to 30 Amps	25 Amps to 35 Amps	35 Amps to 45 Amps	120 Amps
Damping Factor	Greater than 200	Greater than 200	Greater than 200	Greater than 200	Greater than 200
Slew Rate	30 Volts per µsec	30 Volts per µsec	30 Volts per µsec	30 Volts per µsec	30 Volts per µsec
Stereo Separation	80dB	80dB	80dB	80dB	80dB
Bridgeable	Internal Mixed & Summed	Internal Mixed & Summed	Internal Mixed & Summed	Internal Mixed & Summed	Internal Mixed & Summed
Built in Equalization	Yes	Yes	Yes	Yes	Yes
Size	8½" x 8½" x 2¼"	10" x 8½" x 2¼"	11" x 8½" x 2¼"	17" x 8½" x 2¼"	23" x 8" x 3⅛"

Orion Industries, Inc., warrants to the original purchaser only that all new Orion products shall be free from defects in workmanship and materials for a period of 90 days from the date of purchase, as shown in the dealer's original Bill of Sale. All Orion products are thoroughly tested by experienced technicians, to insure that they meet or exceed our performance specifications.

Orion agrees that defective products will be repaired or replaced (at our option) at no charge for labor or materials, provided that our inspection discloses that the defective products have not been subjected to misuse, negligence, or accident; damaged by modification, improper installation, or incorrect voltage; altered or repaired by other than Orion factory personnel, had the serial number or any other part altered, defaced or removed; or used in any way that is contrary to Orion's written instructions.

In order to obtain warranty service send the defective product, by prepaid freight, to Orion, together with a copy of the Original Bill of Sale. The product will be repaired or replaced, at our option, and returned freight prepaid, providing the unit is under warranty.

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Orion amplifiers, crossovers, signal processors	2 years
Orion XTR woofers	Lifetime
Orion Midrange speakers	1 year

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