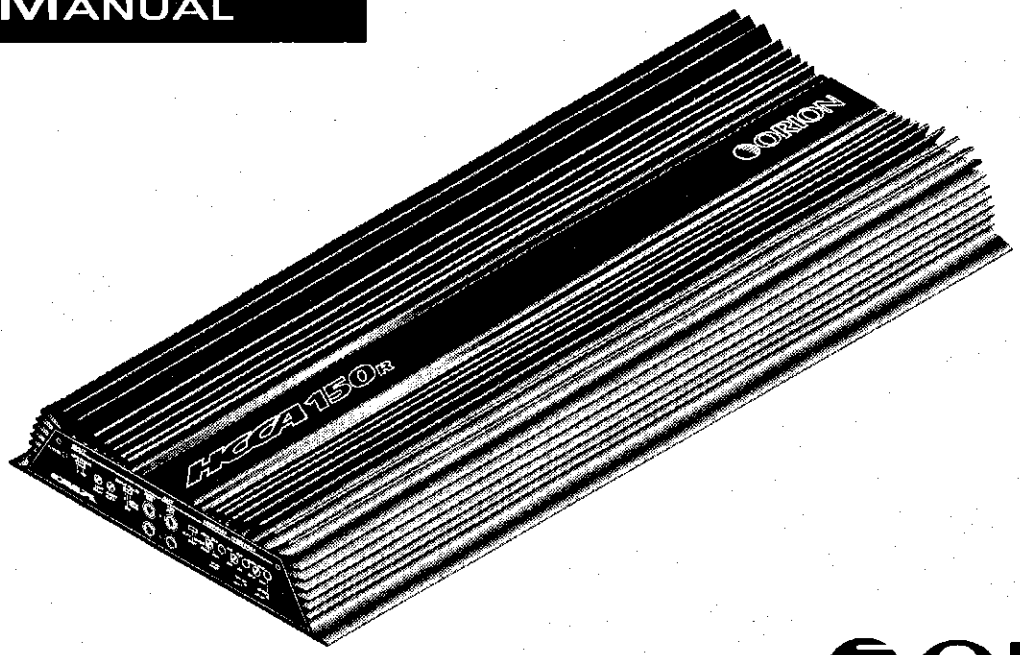
HCCA 150R
OWNER'S MANUAL



ORION

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INTRODUCTION

Thank you for your purchase of ORION's HCCA 150R power amplifier. Each HCCA amplifier is designed to be the leader in its class offering the most power, advanced features and ease of use. At home in high-end sound systems or high SPL systems, the HCCA 150R will give you years of trouble free performance.

- HCCA 150R – 150 watt, 4-channel staggered power competition amplifier. Channels 1 & 2 are designed for high-current subwoofer operation with 25 watts per channels into 4Ω. Channels 1 & 2 have built-in fully variable high-pass, low-pass or bandpass crossover with "Q" adjust on the high-pass for subsonic woofer control. Lowest rated impedance for channels 1 & 2 is 0.5Ω stereo or 1Ω bridged-mono for a total power of 400 watts. Channels 3 & 4 are designed for satellite operation with 50 watts per channel in a high-power configuration. Channels 3 & 4 have built-in fully variable high-pass or low-pass crossover. Lowest rated impedance for channels 3 & 4 is 1Ω stereo or 2Ω bridged-mono for a total power of 400 watts. The HCCA 150R also has an auxiliary output with three possible output configurations. Equipped with dual remote gain capability, the HCCA 150R is capable of 6, 5, 4, 3 or 2-channel operation with a maximum power capability of 800 watts.

NOTE: The installation of all ORION equipment will determine the overall performance result. Improper installation will not only limit the performance of your ORION system but also potentially damage either your ORION equipment or your vehicle. To ensure proper sonic results and component reliability, please refer to your Authorized ORION dealer for installation assistance or advice. If you decide to perform the installation yourself, please read the entire installation section of this manual before beginning the installation.

ABOUT THIS MANUAL

This manual is designed to answer your questions about this product. In the event you have questions not covered in this manual, please refer questions to your local Authorized ORION Dealer. Additionally, you can call ORION's Technical Support Hotline at 1-800 315-2052 or 602-705-5600 for assistance.

PRACTICE SAFE SOUND™

Continuous exposure to sound pressure levels over 100dB may cause permanent hearing loss. High powered automotive sound systems can generate sound pressure levels in excess of 130dB. When playing your system at high levels, please use hearing protection and avoid long term exposure.

HCCA 150R – WHAT'S IN THE BOX

(1) HCCA power amplifier

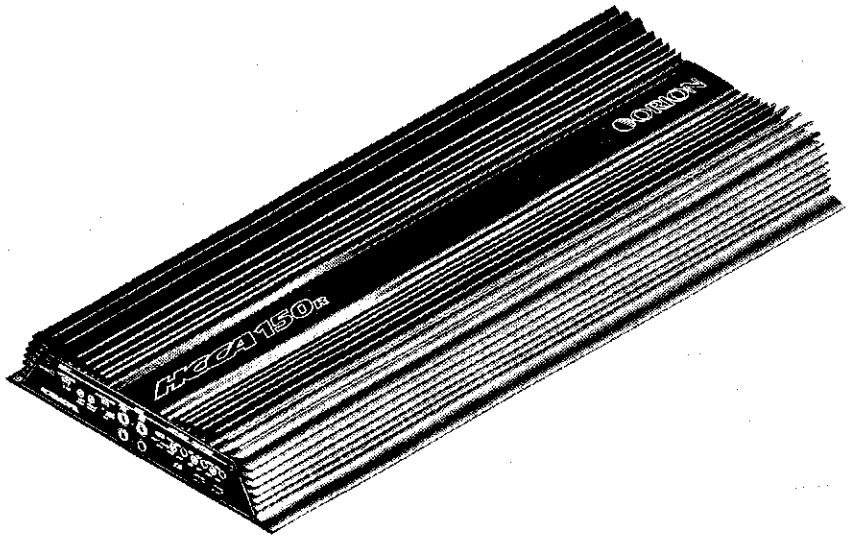
(1) 2 conductor 4 gauge power connector

(1) 5 conductor 12 gauge speaker connector

(1) 4 conductor 12 gauge speaker connector

(4) #8 Phillips pan head screws

(1) HCCA reference manual



WARRANTY

ORION Industries Inc. warrants this product to be free from defects in material and workmanship under the following terms:

Parts and Labor are warranted for a period of 3 years IF:

a. The product is purchased from an Authorized ORION Dealer
b. The product is installed by an Authorized ORION Dealer

Parts and Labor are warranted for a period of 1 year IF:

a. The product is purchased from an Authorized ORION Dealer
b. The product is NOT installed by an Authorized ORION Dealer

Parts and Labor are warranted for a period of 90 days IF:

a. The product is NOT purchased from an Authorized ORION Dealer

If you are uncertain as to whether your dealer is authorized, please contact ORION at 1-800-775-7150 or 602-705-5600. In countries other than the USA, each distributor warrants the ORION product it sells.

The following conditions and situations are **NOT** covered by this warranty:

Any product on which the serial number has been defaced, modified or removed. Damage or malfunction resulting from:

a. Accident, misuse, abuse, unauthorized modification or failure to follow the instructions provided with this product
b. Repair by anyone NOT authorized by ORION
c. Damage due to shipping (these claims must be presented to the freight carrier)
d. Removal or installation of this product
e. Any failure that has NOT been caused by a defect in material or workmanship

This warranty is in effect for the original purchaser only. ORION will pay for labor and material expense for covered items. ORION does not cover removal or installation charges, payment of shipping charges to ORION, payment of OUT-OF-WARRANTY shipping charges, or damage to other property caused by any defects in this product.

For IN-WARRANTY service, you must include a copy of the original, dated sales receipt, including serial number, from an Authorized ORION Dealer. Please also provide your name, return street address (No P.O. Boxes) and a detailed description of the problem.

For out-of-warranty products, please include ORION E-Z Repair Form. These are available by contacting ORION Repair at 1-888-362-5283 or 602-705-5600 and ask for the Repair Department.

Exclusion

1. This warranty is in lieu of all other warranties expressed or implied.

2. In no event will ORION be liable for any consequential damages resulting from the use of this product or any defect of this product.

This warranty gives you specific legal rights. You may also have other rights that vary from state to state.

SPECIFICATIONS

Amplifier Section	**HCCA 150M high current**	**HCCA 150R high voltage**
Power output 4Ω stereo (watts)[1]	25 watts	50 watts
Power output 2Ω stereo (watts)[1]	50 watts	100 watts
Power output 1Ω stereo (watts)[1]	100 watts	200 watts
Power output 0.5Ω stereo (watts)[1]	200 watts	n/a
Power output 4Ω mono (watts)[1]	100 watts	200 watts
Power output 2Ω mono (watts)[1]	200 watts	400 watts
Power output 1Ω mono (watts)[1]	400 watts	n/a
Distortion all channels driven (from 20Hz to 20kHz)	<0.1% THD	<0.1% THD
Frequency Response	20Hz to 20kHz ±0.25dB	20Hz to 20kHz ±0.25dB
Linear Bandwidth	6Hz to 50kHz ±3dB	6Hz to 50kHz ±3dB
Signal-to-noise ratio full bandwidth @ rated output power	>100dB	>100dB
Damping factor @ output connector full bandwidth	>500 at output connector	>500 at output connector
Slew Rate	>30V/ms	>30BV/ms
Input Sensitivity[2]	200mV to 5 Vrms	200mV to 5 Vrms
Input Impedance	20kΩ	20kΩ
Fuse Type	(4) 20 Amp ATC	(4) 20 Amp ATC

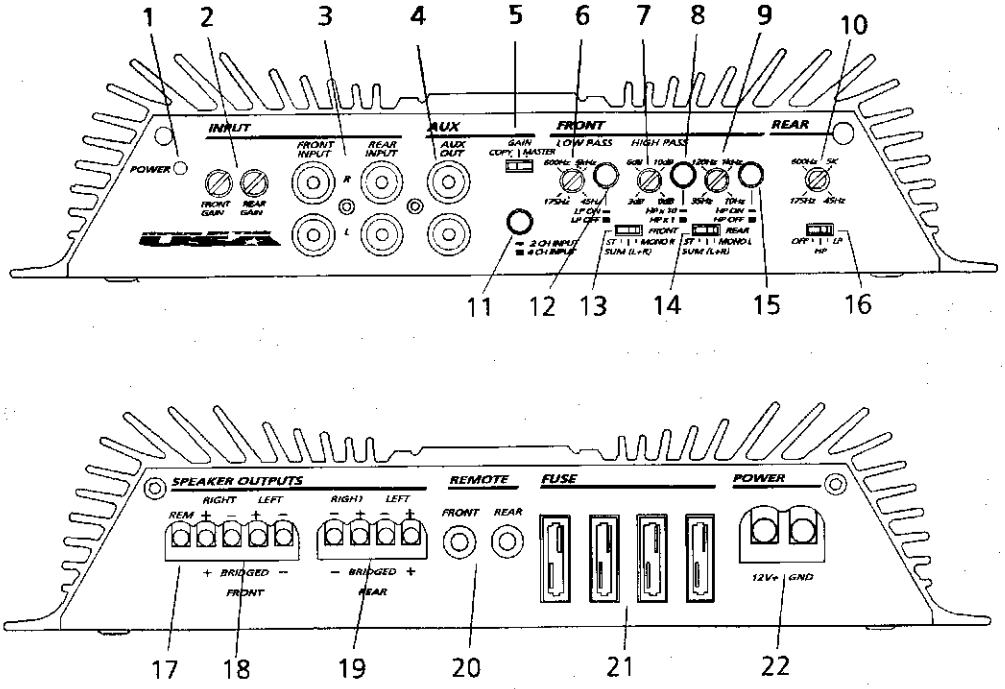
Crossover Section		
Low-Pass Crossover[3]	Continuously variable	Continuously variable
Low-Pass Frequency Range	45Hz to 5kHz	45Hz to 5kHz
High-Pass Crossover	Continuously variable	Continuously variable
High-Pass Frequency Range	10Hz to 1kHz, 100Hz to 10kHz	45Hz to 5kHz
High-Pass "Q" Range	Continuously variable from 0.707 to 3.5 (0dB to 10dB)	Fixed @ 0.707
General	**(L x W x H)**	**(L x W x H)**
Dimensions	22" x 10.25" x 2.25" 559mm x 260mm x 57mm	22" x 10.25" x 2.25" 559mm x 260mm x 57mm

[1] All channels driven, continuous rated load, 20Hz to 20,000Hz, >0.1% THD, per input voltage at 12.0 VDC.

[2] HCCA amplifiers are designed to accept full 9 Volts RMS input when set to the minimum gain position.

[3] Crossovers are with a slope rate of 12dB/octave and a "Q" of .0707 unless otherwise noted.

TECHNICAL DESIGN FEATURES



TECHNICAL DESIGN FEATURES

1. **Power LED** - when lit indicates that the amplifier is on
2. **Front and Rear Gain Controls** - continuously adjust from 200mV to 5Vrms for full power output
3. **RCA Inputs** - accept RCA input from a source unit, preamplifier or equalizer
4. **AUX OUT RCA Outputs** - provide easy connection to additional amplifiers
5. **AUX OUT Control** - determines the audio signal out the AUX RCAs
6. **Front Channel Low-Pass Frequency Control** - adjusts the frequency of the low-pass crossover
7. **Front Channel High-Pass INTELLi Q** - adjusts the "Q" of the high-pass crossover
8. **Front Channel High-Pass "x10" Frequency Range Switch** - selects the frequency range of the high-pass crossover
9. **Front Channel High-Pass Frequency Control** - adjusts the frequency of the high-pass crossover
10. **Rear Channel Crossover Frequency Control** - adjusts the frequency of the high-pass or low-pass crossover.
11. **4-Channel / 2-Channel Input Selector** - selects between 2-channel input (front) or 4-channel input (front and rear)
12. **Front Channel Low-Pass Crossover Activation Switch** - activates the low-pass crossover
13. **Front Output Configuration Switches** - determine the output configuration of the amplifier
14. **Rear Output Configuration Switches** - determine the output configuration of the amplifier
15. **Front High-Pass Crossover Activation Switch** - activates the high-pass crossover
16. **Rear Crossover Activation Switch** - activates the high-pass or low-pass crossover
17. **REM Remote turn-on input** - turns on the amplifier when fed 12V+
18. **Front Speaker Connections** - allow up to 12 gauge speaker wire
19. **Rear Speaker Connections** - allow up to 12 gauge speaker wire
20. **Remote Gain Control Port** - allows dashboard remote gain control
21. **Fuses** - Protect the amplifier from over current situations
22. **Power Connections** - allow up to 4 gauge power and ground cables

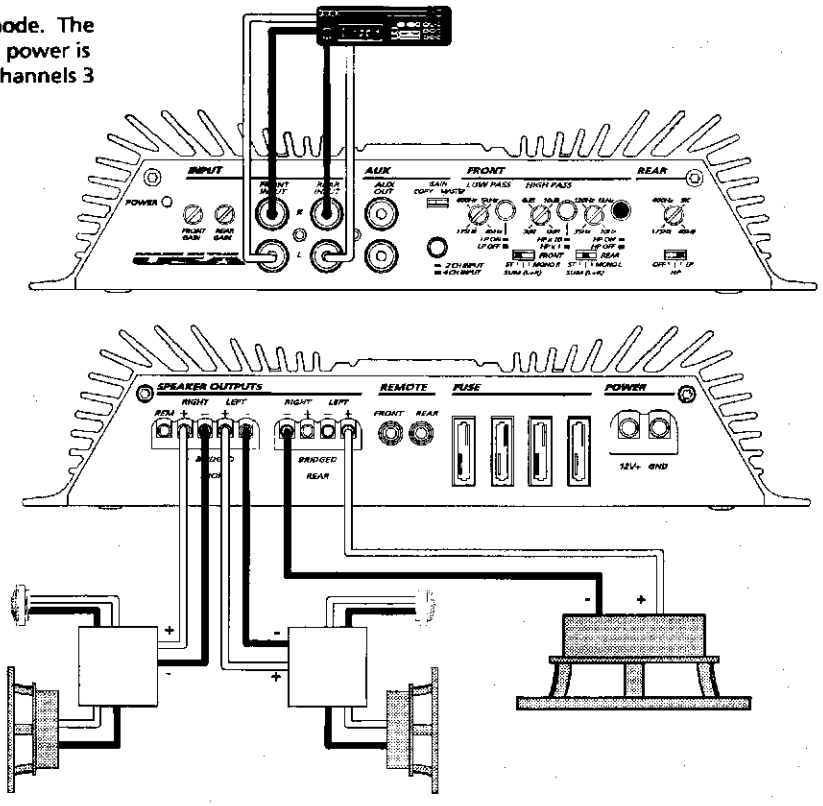
SYSTEM PLANNING

SYSTEM 1

System 1 uses a single HCCA 150x in three channel high-voltage mode. The competition rated power of this system is 150 watts. The dynamic power is 450 watts. Channels 1 & 2 operate a single pair of 4Ω satellites. Channels 3 & 4 are bridged summed mono for a single 4Ω subwoofer.

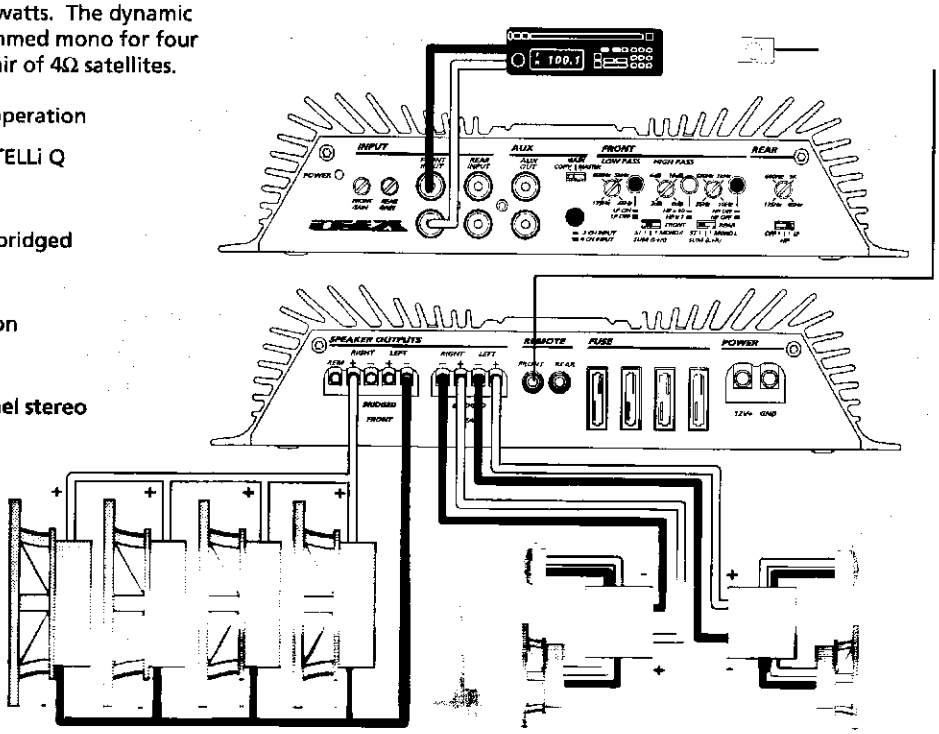
- Channels 1 & 2 configured for stereo operation
- Channels 1 & 2 crossover set to high-pass
- Channel 1 & 2 gain is set for desired output
- Lowest recommended impedance is 0.5Ω per channel stereo
- Channels 3 & 4 configured for summed-bridged operation
- Channels 3 & 4 crossover set to low-pass operation
- Channel 3 & 4 gain is set for desired output
- Lowest recommended impedance is 2Ω summed-bridged
- The 2CH/4CH switch can be configured for either 2 channel or 4 channel input.

Tuning Note: The subwoofer connected to channels 3 & 4 can have the level remote controlled through the Rear Remote gain control port located on the power connection side of the amplifier.

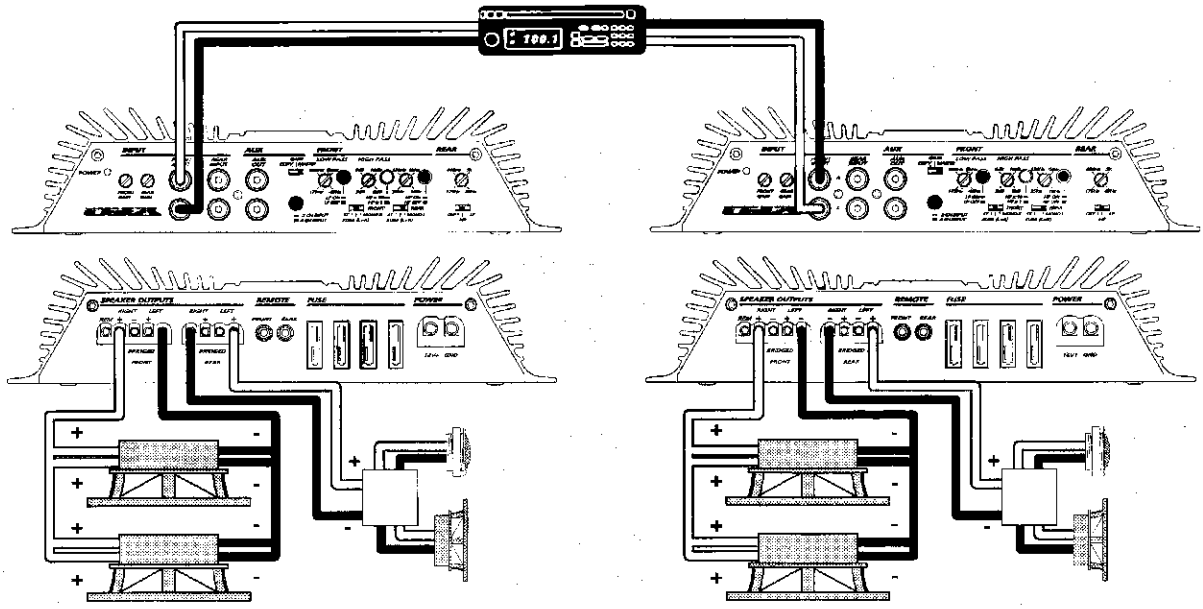


System 2 uses a single HCCA 150R in three channel high-current mode. The competition rated power of this system is 150 watts. The dynamic power is 500 watts. Channels 1 & 2 are bridged summed mono for four 4Ω subwoofers. Channels 3 & 4 operate a single pair of 4Ω satellites.

- Channels 1 & 2 configured for summed-bridged operation
- Channels 1 & 2 crossover set to bandpass with INTELLi Q
- Channel 1 & 2 gain is set for desired output
- Lowest recommended impedance is 1Ω summed-bridged
- Channels 3 & 4 configured for stereo operation
- Channels 3 & 4 crossover set to high-pass operation
- Channel 3 & 4 gain is set for desired output
- Lowest recommended impedance is 1Ω per channel stereo
- The 2CH/4CH switch can be configured for either 2 channel or 4 channel input.



Tuning Note: The subwoofer connected to channels 1 & 2 can have the level remote controlled through the Front Remote gain control port located on the power connection side of the amplifier. The INTELLi Q feature of this Orion amplifier can be used to maximize the performance of the subwoofers. Configure the high-pass crossover for "LOW" frequency range operation and set according to instructions explained in the ***High-Pass Crossover*** section in this manual.



System 3 has a competition rated power of 300 watts. The dynamic power of this system is 1200 watts. Amplifier 1 runs the left channel with channels 1 & 2 mono-bridged for two DVC subwoofers and channels 3 & 4 mono-bridged for the left 4Ω satellite. Amplifier 2 is configured identically to Amplifier 1 except it is configured for the right channel.

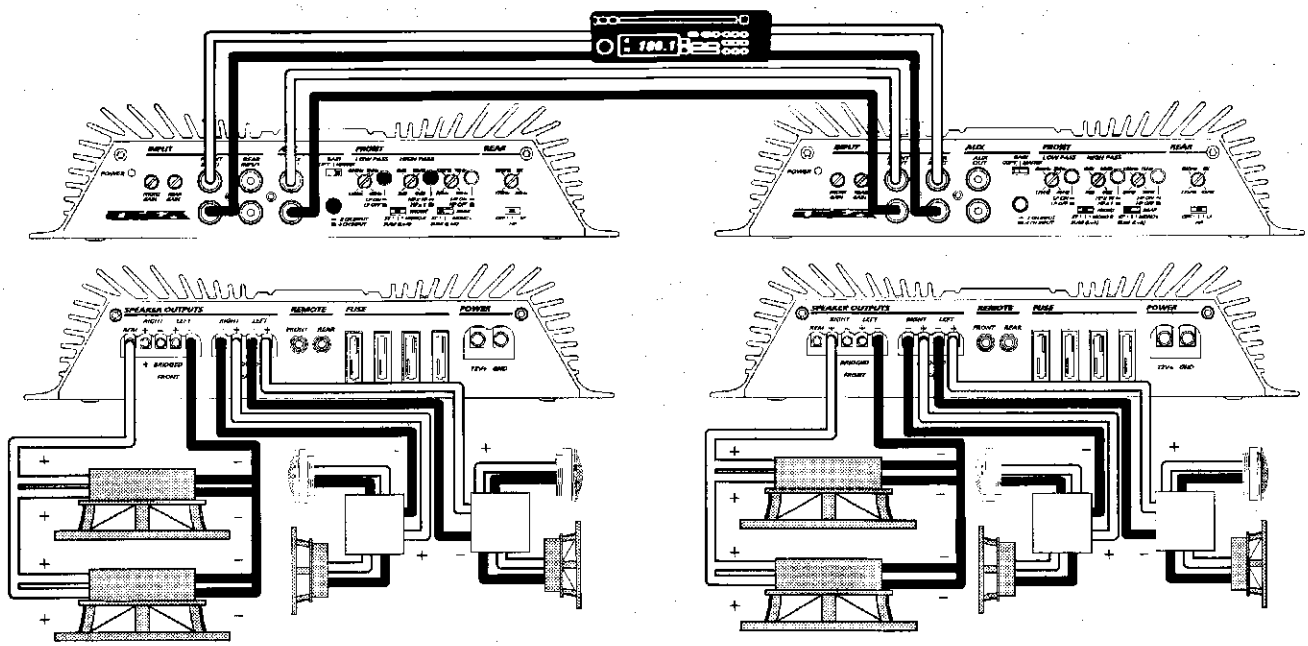
Amplifier 1

- Channels 1 & 2 configured for sum-bridged operation
- Channels 1 & 2 crossover is set to bandpass with INTELLi Q
- Channel 1 & 2 gain is set for desired output
- Lowest recommended impedance is 1Ω summed-bridged
- Channels 3 & 4 configured for mono-bridged operation
- Channels 3 & 4 crossover set to high-pass operation
- Channel 3 & 4 gain is set for desired output
- Lowest recommended impedance is 2Ω mono bridged
- The 2CH/4CH switch is configured for 2 channel input

Amplifier 2

- Channels 1 & 2 configured for sum-bridged operation
- Channels 1 & 2 crossover is set to bandpass with INTELLi Q
- Channel 1 & 2 gain is set for desired output
- Lowest recommended impedance is 1Ω summed-bridged
- Channels 3 & 4 configured for mono-bridged operation
- Channels 3 & 4 crossover set to high-pass operation
- Channel 3 & 4 gain is set for desired output
- Lowest recommended impedance is 2Ω mono bridged

Tuning Note: The subwoofer connected to channels 1 & 2 for both Amplifiers 1 & 2 can have the level remote controlled through the Front Remote gain control port located on the power connection side of the amplifier. The INTELLi Q feature of this Orion amplifier can be used to maximize the performance of the subwoofers. Configure the high-pass crossover for "LOW" frequency range operation and set according to instructions explained in the High-Pass Crossover Section in this manual.



System 4 uses two HCCA 150R in a 6-channel front rear and subwoofer bi-amplified system. The competition rated power of this system is 300 watts. The dynamic power is 1000 watts. Amplifier 1 runs the front channels with channels 1 & 2 mono-bridged for two DVC subwoofers and channels 3 & 4 run stereo for the front 4Ω satellites. Amplifier 1 AUX OUT is configured for "MASTER" for input into Channels 1 & 2 Amplifier 2. Amplifier 2 output configuration is the same as Amplifier 1.

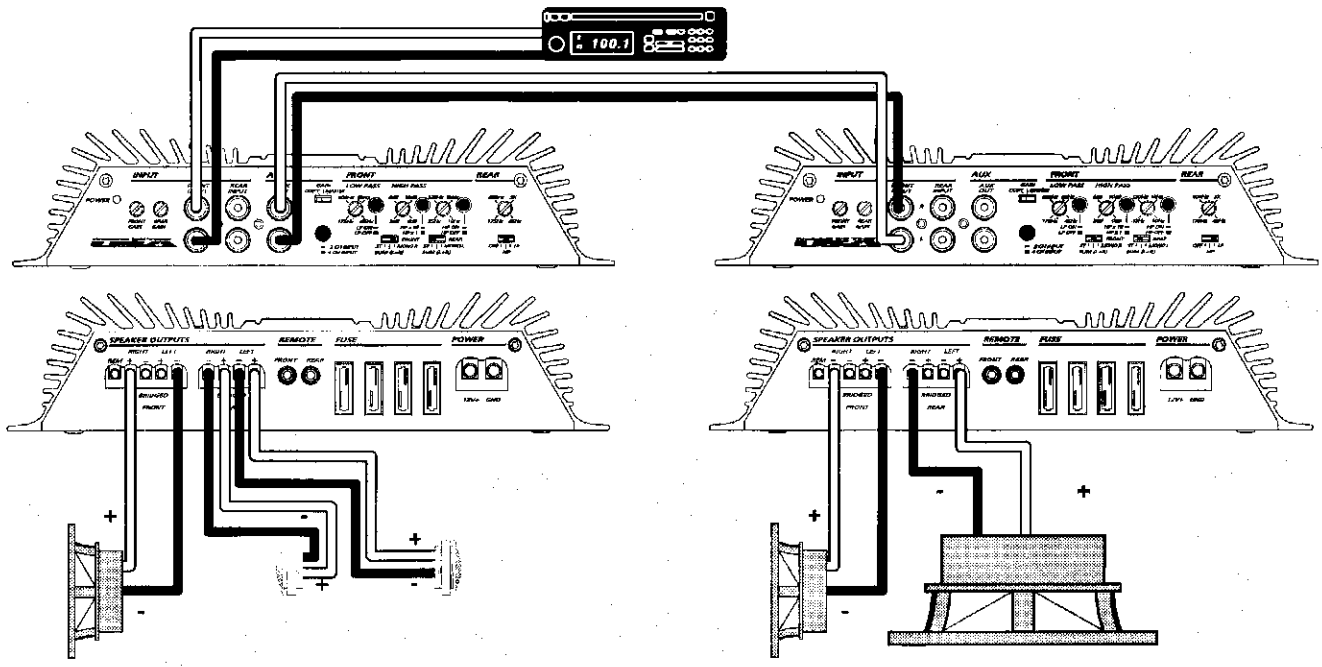
Amplifier 1

- Channels 1 & 2 configured for mono-bridged operation
- Channels 1 & 2 crossover is set to bandpass with INTELLi Q
- Channel 1 & 2 gain is set for desired output
- Lowest recommended impedance is 1Ω summed-bridged
- Channels 3 & 4 configured for mono-bridged operation
- Channels 3 & 4 crossover set to high-pass operation
- Channel 3 & 4 gain is set for desired output
- Lowest recommended impedance is 2Ω mono bridged
- The 2CH/4CH switch is configured for 2 channel input
- AUX OUT is configured in the "MASTER" position

Amplifier 2

- Channels 1 & 2 configured for mono-bridged operation
- Channels 1 & 2 crossover are turned off
- Channel 1 & 2 gain is set to the minimum position
- Lowest recommended impedance is 1Ω summed-bridged
- Channels 3 & 4 configured for mono-bridged operation
- Channels 3 & 4 crossover set to high-pass operation
- Channel 3 & 4 gain is set for desired output
- Lowest recommended impedance is 2Ω mono bridged
- The 2CH/4CH switch is configured for 4 channel input

Tuning Note: The subwoofer connected to channels 1 & 2 for both Amplifiers 1 & 2 can have the level remote controlled through the Front Remote gain control port located on the power connection side of the amplifier. The INTELLi Q feature of this Orion amplifier can be used to maximize the performance of the subwoofers. Configure the high-pass crossover for "LOW" frequency range operation and set according to instructions explained in the ***High-Pass Crossover*** section in this manual.



System 5 uses two HCCA 150R in a 5 channel tri-amplified system. The competition rated power of this system is 300 watts. The dynamic power is 700 watts. Channels 1 & 2 of Amplifier 1 are mono bridged for the right 4Ω midrange. Channels 3 & 4 of Amplifier 1 are configured for stereo operation for the left and the right 4Ω tweeters. Channels 1 & 2 of Amplifier 2 are mono-bridged for the 4Ω left midrange. Channels 3 & 4 of Amplifier 2 are summed-bridged for a single 4Ω subwoofer.

Amplifier 1

- Channels 1 & 2 configured for mono-bridged operation for the right midrange
- Channels 1 & 2 crossover is set to bandpass
- Channel 1 & 2 gain is set for desired output
- Lowest recommended impedance is 1Ω mono-bridged
- Channels 3 & 4 configured for stereo operation
- Channels 3 & 4 crossover set to high-pass operation
- Channel 3 & 4 gain is set for desired output
- Lowest recommended impedance is 1Ω stereo
- The 2CH/4CH switch is configured for 2 channel input
- The right and the left RCA inputs are wired correctly
- AUX OUT is configured in the "Copy" position

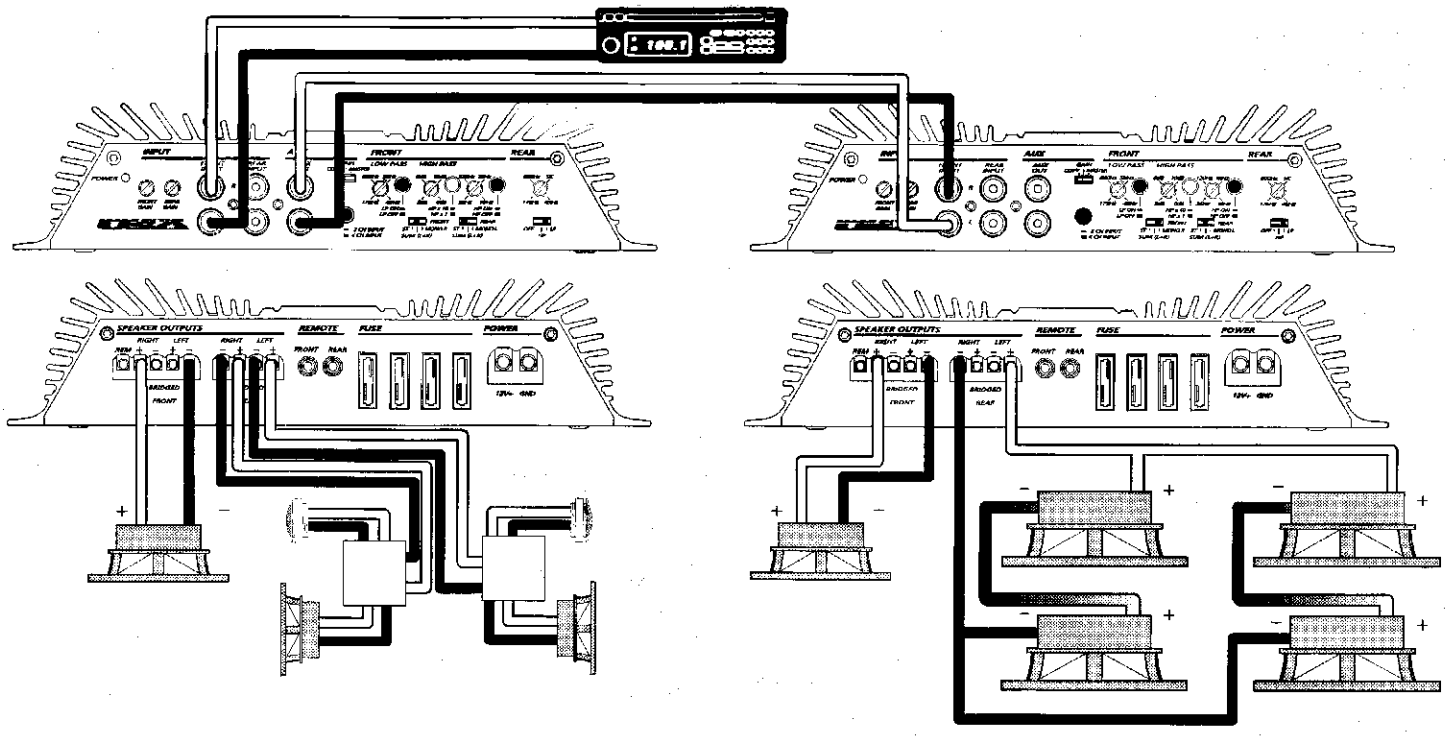
Amplifier 2

- Channels 1 & 2 configured for mono-bridged operation for the left midrange
- Channels 1 & 2 crossover is set to bandpass
- Channel 1 & 2 gain is set for desired output
- Lowest recommended impedance is 1Ω mono-bridged
- Channels 3 & 4 configured for summed-bridged operatior
- Channels 3 & 4 crossover set to low-pass operation
- Channel 3 & 4 gain is set for desired output
- Lowest recommended impedance is 2Ω mono bridged
- The 2CH/4CH switch is configured for 2 channel input
- Left and right RCA are wired BACKWARDS. Failure to due this will make the system play only the right channel on the midrange.

Tuning Note: The subwoofer connected to channels 3 & 4 on amplifier 2 can have the level remote c[illegible] the Rear Remote gain control port located on the power connection side of the amplifier.

SYSTEM PLANNING

SYSTEM 6



System 6 uses two HCCA 150R in a 6 channel tri-amplified system. The competition rated power of this system is 300 watts. The dynamic power is 700 watts. Channels 1 & 2 of Amplifier 1 are mono bridged for the right 4Ω midbass. Channels 3 & 4 of Amplifier 1 are configured for stereo operation for the left and the right 4Ω satellites. Channels 1 & 2 of Amplifier 2 are mono-bridged for the 4Ω left midbass. Channels 3 & 4 of Amplifier 2 are summed-stereo for four 4Ω subwoofers.

Amplifier 1

- Channels 1 & 2 configured for mono-bridged operation for the right midrange
- Channels 1 & 2 crossover is set to bandpass
- Channel 1 & 2 gain is set for desired output
- Lowest recommended impedance is 1Ω mono-bridged
- Channels 3 & 4 configured for stereo operation
- Channels 3 & 4 crossover set to high-pass operation
- Channel 3 & 4 gain is set for desired output
- Lowest recommended impedance is 1Ω stereo
- The 2CH/4CH switch is configured for 2 channel input
- The right and the left RCA inputs are wired correctly
- AUX OUT is configured in the "Copy" position

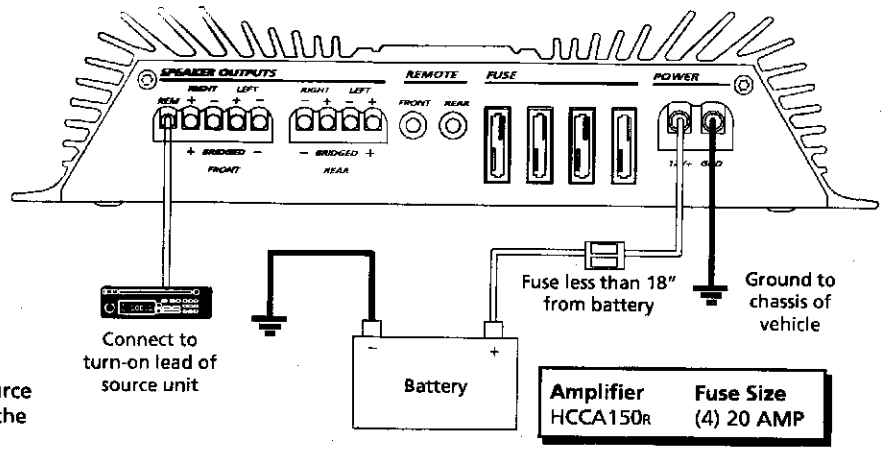
Amplifier 2

- Channels 1 & 2 configured for mono-bridged operation for the left midrange
- Channels 1 & 2 crossover is set to bandpass
- Channel 1 & 2 gain is set for desired output
- Lowest recommended impedance is 1Ω mono-bridged
- Channels 3 & 4 configured for summed-bridged operation
- Channels 3 & 4 crossover set to low-pass operation
- Channel 3 & 4 gain is set for desired output
- Lowest recommended impedance is 2Ω mono bridged
- The 2CH/4CH switch is configured for 2 channel input
- Left and right RCA are wired BACKWARDS. Failure to due this will make the system play only the right channel on the midrange.

Tuning Note: The subwoofer connected to channels 3 & 4 on amplifier 2 can have the level remote controlled through the Rear Remote gain control port located on the power connection side of the amplifier.

POWER CONNECTIONS

- Power connections made through a large 4 gauge removable terminal connector
- 4 gauge power and ground wire recommended for optimal performance
- Minimum 8 gauge power and ground cable is recommended for acceptable performance
- Connect 12V+ to the battery through fuse holder. This connection provides +12V main power to the amplifier
- Power wire must be fused less than 18" from battery
- Ground amplifier to a good chassis ground as close as possible to the amplifier
- Connect REM terminal to remote turn-on lead from source unit. This connection provides +12V power to turn-on the amplifier



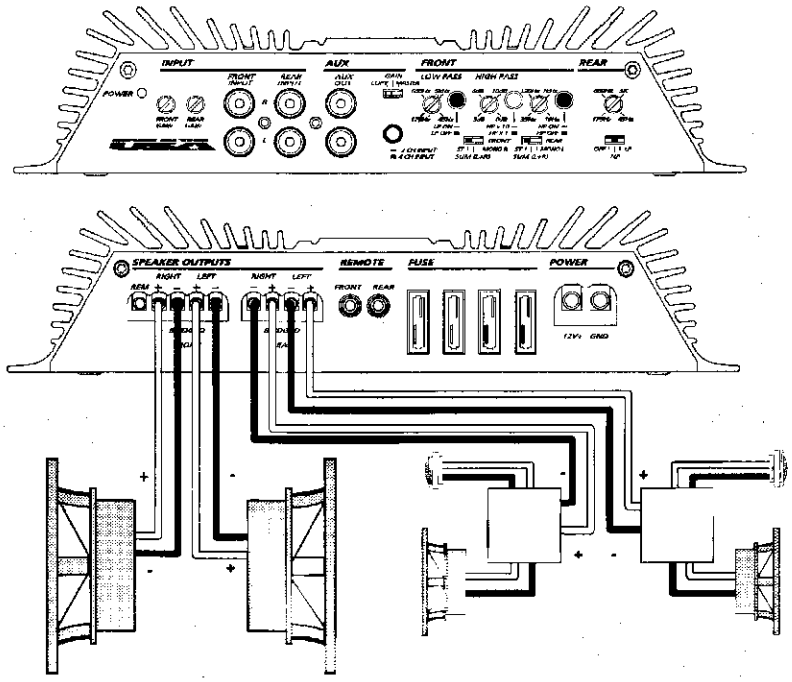
- Add extra ground wire between the negative terminal of the battery and the chassis

TUNING NOTE: The addition of a ground wire from the battery to the chassis of the vehicle improves the ability of the battery to supply power to the amplifier. This helps especially in newer vehicles, where the current delivery of the factory electrical system was designed only to accommodate electronics supplied by the auto manufacturer.

SPEAKER CONNECTIONS

FOUR CHANNEL STEREO CONFIGURATION

- Front channels lowest recommended impedance is 0.5Ω per channel stereo
- Rear channels lowest recommended impedance 1Ω per channel stereo
- RCA inputs are connected to both left and right channels
- 2 Ch/4Ch configured for either setting
- Front channels configured for summed stereo operation
- Rear channels configured for stereo operation
- Front and rear gain controls are set independently
- Front channels can be configured for high-pass, low-pass, band-pass or full range operation
- Rear channels are configured for either high-pass or low-pass operation



TUNING NOTE: The front channel high-pass crossover can be used as a subsonic filter with "Q" Boost. Configure the high-pass crossover for "LOW" frequency range operation and set according to instructions explained in the ***Front Channel High-Pass Crossover*** section in this manual.

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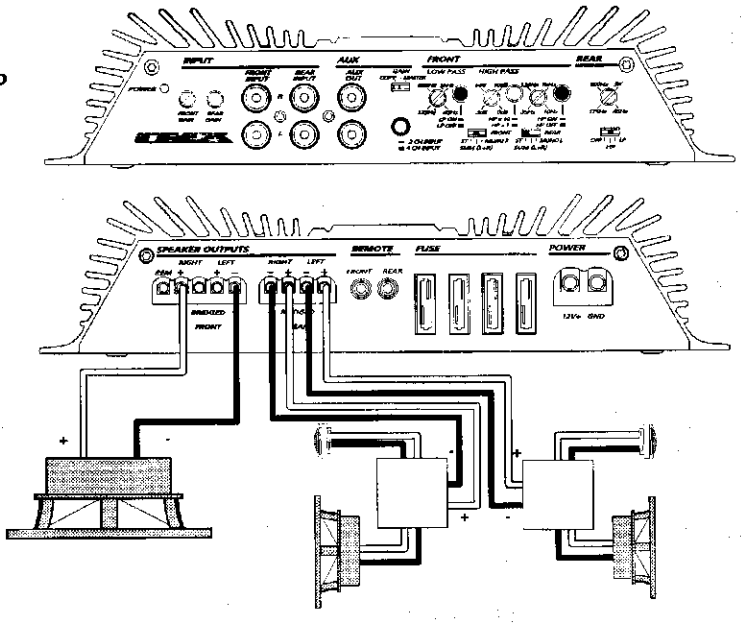
SPEAKER CONNECTIONS

THREE CHANNEL BRIDGED HIGH-CURRENT

- Front channels lowest recommended impedance 1Ω bridged mono
- Rear channels lowest recommended impedance 1Ω per channel stereo
- RCA inputs are connected to both left and right channels
- 2 Ch/4Ch configured for either setting
- Front channels configured for summed bridged-mono operation which is ideal for subwoofer applications
- Rear channels configured for stereo operation
- Front and rear gain controls are set independently
- Front channels can be configured for high-pass, low-pass, bandpass or full range operation
- Rear channels are configured for either high-pass or full range operation



TUNING NOTE: The front channel high-pass crossover can be used as a subsonic filter with "Q" Boost. Configure the high-pass crossover for "LOW" frequency range operation and set according to instructions explained in the ***Front Channel High-Pass Crossover Section*** in this manual.

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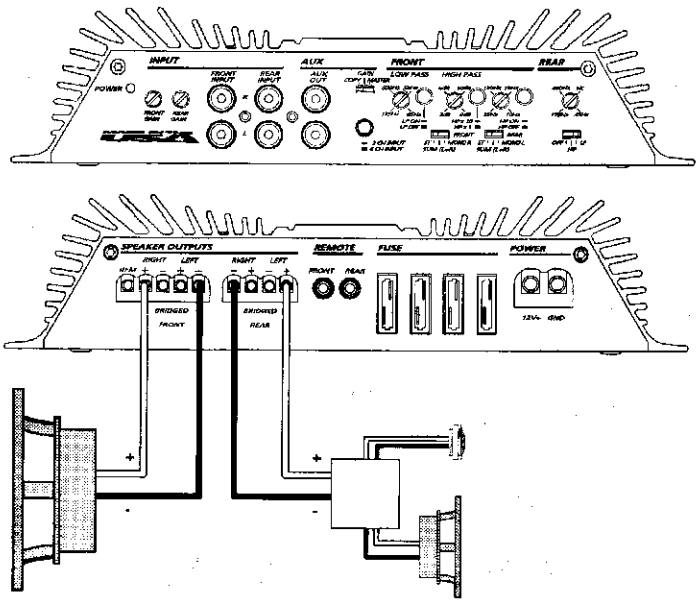
SPEAKER CONNECTIONS

TWO CHANNEL BRIDGED

- Front channels lowest recommended impedance 1Ω bridged-mono
- Rear channels lowest recommended impedance 2Ω bridged-mono
- RCA inputs are connected to both left and right front RCA inputs
- Amplifier configured for 2 channel input
- Front channels configured for right mono-bridged operation
- Rear channels configured for left mono-bridged operation
- Front and rear gain controls are set independently
- Front channels can be configured for high-pass, low-pass, band-pass or full range operation
- Rear channels are configured for either high-pass or full range operation

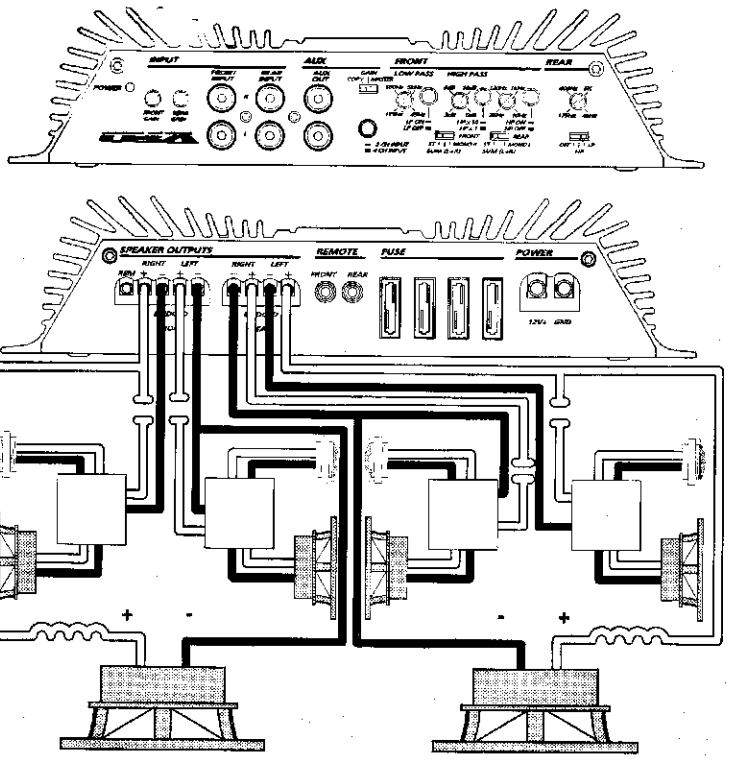


TUNING NOTE: The front channel high-pass crossover can be used as a subsonic filter with "Q" Boost. Configure the high-pass crossover for "LOW" frequency range operation and set according to instructions explained in the ***Front Channel High-Pass Crossover*** section in this manual.

SPEAKER CONNECTIONS

SIX CHANNEL TRI-MODE OPERATION

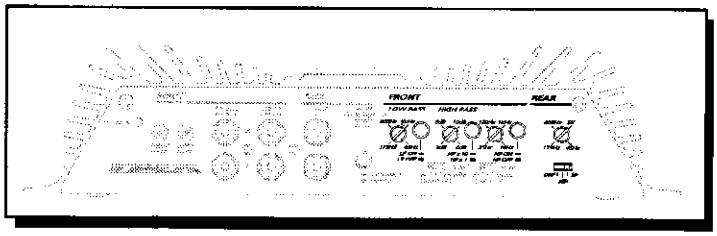
- Front channels lowest recommended impedance 1Ω bridged-mono or 0.5Ω stereo
- Rear channels lowest recommended impedance 2Ω bridged-mono or 1Ω stereo
- RCA inputs are connected to both left and right front RCA inputs
- Amplifier configured for 2 channel input
- Front channels configured for tri-mode operation
- Rear channels configured for tri-mode operation
- Front and rear gain controls are set independently
- Front channels must be configured for full range operation
- Rear channels must be configured for full range operation
- Both front and rear channels must be configured for stereo operation
- Passive crossover frequencies must not overlap!



TUNING NOTE: The front channel high-pass crossover can be used as a subsonic filter with "Q" Boost. Configure the high-pass crossover for "LOW" frequency range operation and set according to instructions explained in the ***Front Channel High-Pass Crossover*** section in this manual.

INTERNAL CROSSOVER SECTION

The crossover section of the HCCA 150R amplifier is continuously variable and extremely flexible. For the front channel crossover, there are eight different crossover configurations possible allowing high-pass, low-pass and bandpass configurations. The front channel crossover has Orion's new feature INTELLi Q. INTELLi Q is a feature that maximizes bass performance of any subwoofer enclosure. The rear crossovers are fully variable with a choice of high-pass or low-pass configurations.

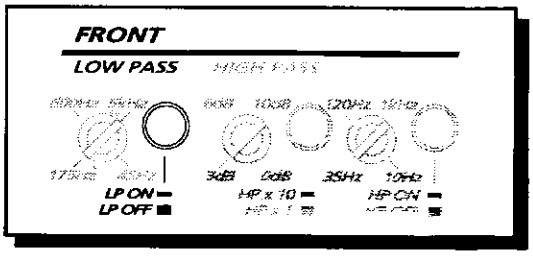


When using ORION loudspeakers, minor deviations from the recommended frequency ranges can provide superior results depending on your speaker locations and your vehicle acoustics. Setting crossover frequencies higher than recommended will not cause damage and may provide superior sonic results depending on your system's performance goals. Refer to your loudspeaker owner's manual for assistance in choosing the proper crossover frequencies for your system.

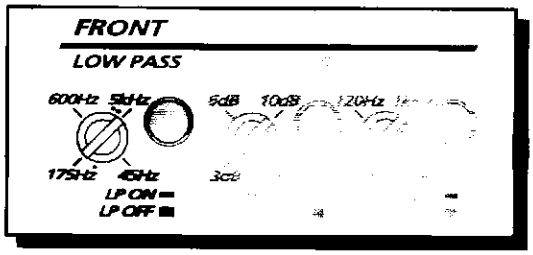
WARNING!!! DO NOT set crossover frequencies lower than the speakers recommended operating range. This can cause driver failure that is not covered by manufacturer's warranty.

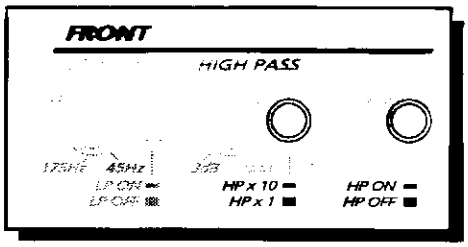
FRONT LOW-PASS CROSSOVER

When the push button is in the "out" position, the low-pass crossover is bypassed.



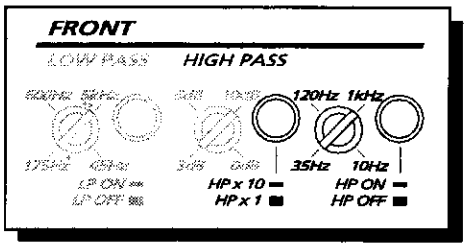
When the push button is in the "in" position, the low-pass crossover is active. The low-pass crossover is continuously variable from 45Hz to 5kHz.





FRONT HIGH-PASS CROSSOVER

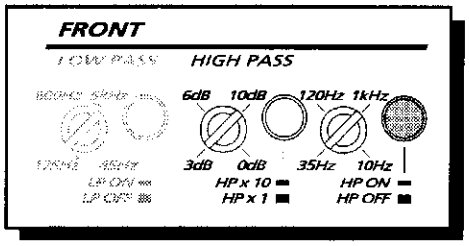
When both push buttons are in the "out" position, the high-pass crossover is bypassed.



MID AND TWEETERS

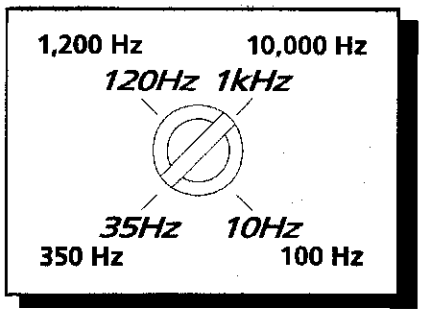
When both push buttons are in the "in" position, the high-pass crossover is active in the "HIGH" frequency range. The high-pass crossover is continuously variable from 100Hz to 10kHz. This setting is used for crossing over midrange and tweeter speakers. Set the "Q" boost level to "0dB." **NOTE:** When the high-pass crossover is in the "HIGH" frequency range, the frequency indicators represent 1/10 of the crossover frequency. 35Hz = 350Hz.

WARNING!!! When using the crossover in the "HIGH" range, it is not recommended to use the "Q" boost as it may potentially damage your midrange or tweeter speakers.



HIGH-PASS WOOFERS

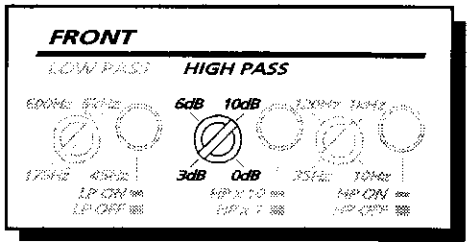
When only the push button to activate the high-pass crossover is in the "in" position, the high-pass crossover is active in the "LOW" frequency range. The high-pass crossover is continuously variable from 10Hz to 1kHz. The high-pass crossover is now optimized for use as a subsonic filter for subwoofers. Additionally, boost can be added at the high-pass crossover frequency for improved bass output while still protecting the woofer from excessive excursion. The "Q" value adjustment allows up to 10dB increase of output at the crossover frequency. Care must be taken when setting the "Q" boost at or near the maximum boost.



FINE TUNING THE HIGH-PASS CROSSOVER "HIGH RANGE"

The crossover section is marked at four frequency points for ease of system adjustment. These points are 10Hz, 35Hz, 120Hz and 1Hz. Specific crossover points can be to be chosen based on the recommended operational bandwidth of your speakers.

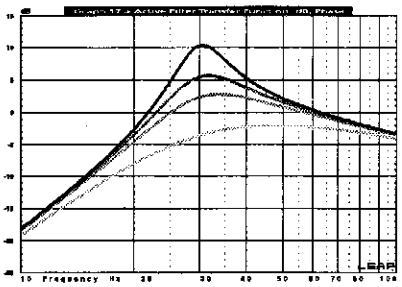
Note: When the high-pass crossover is set in the "HIGH" frequency range, the corner frequencies are 100Hz, 350Hz, 1.2kHz and 10kHz respectively.



ADJUSTING INTELLI Q

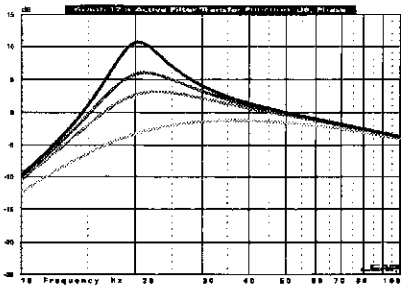
The INTELLi Q incorporated in the high-pass crossover allows amplifier the ability to maximize the performance of a subwoofer. The high-pass removes unwanted signal to the woofer, increasing the output of a subwoofer by as much as 3 dB due to the increased mechanical power handling. Depending on the enclosure, using the INTELLi Q can increase the low frequency response by an additional 10dB!!! The INTELLi Q level is identified by the corner frequency markings. The type of enclosure used and the woofer's excursion capability determine acceptable boost levels. Following are recommended boost levels for different enclosure designs.

Boost Levels Enclosure Type:	**0dB**	**+3dB**	**+6dB**	**+10dB**
Infinite Baffle	Acceptable No Problems Tune above Fs of woofer	High X-Max Drivers Tune above Fs of woofer	**Not Recommended**	**Not Recommended**
Sealed	Acceptable No Problems Tune above Fs of woofer	Acceptable No Problems Tune above Fs of woofers	High X-Max Drivers Tune above FS of woofer	Not Recommended
Vented	Acceptable No Problems Tune to port frequency	Acceptable No Problems Tune to port frequency	Acceptable No Problems Tune to port frequency	High X-Max Drivers Tune to port frequency
Sealed Bandpass	Acceptable No Problems Tune above Fs of woofer	Acceptable No Problems Tune above Fs of woofers	High X-Max Drivers Tune above Fs of woofer	Not Recommended
Vented Bandpass	Acceptable No Problems Tune to port frequency	Acceptable No Problems Tune to port frequency	Acceptable No Problems Tune to port frequency	High X-Max Drivers Tune to port frequency
Aperiodic	Set crossover to Fs of woofer	Set crossover to Fs of woofer	Set crossover to Fs of woofer	Not Recommended

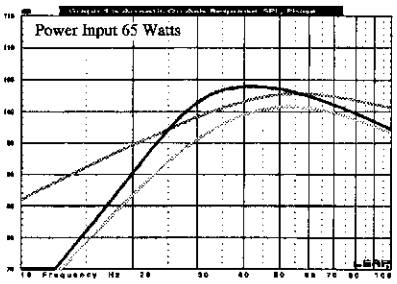


INTELLI Q FILTER RESPONSE

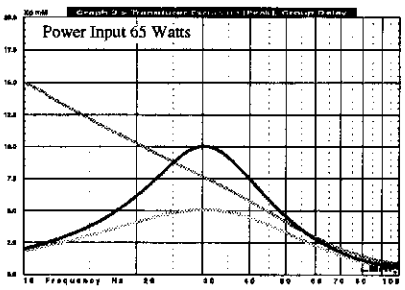
On the left is a frequency response of the high-pass filter set to 30Hz. On the right frequency response of the high-pass filter is set to 20Hz. INTELLi Q levels of 0dB, 3dB, 6dB and 10dB are displayed respectively.



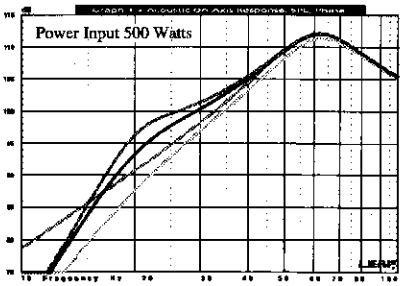
INFINITE BAFFLE EXAMPLE HIGH-PASS SET @ 30HZ



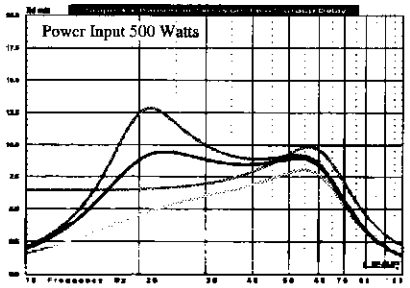
By removing low frequency signal the woofer cannot produce, the woofer can play its capable range louder. The first example is an infinite baffle situation. The left graph displays the frequency response of 2NT 12 SVC in an infinite baffle application without the high-pass filter, with the filter, and with the filter and the INTELLi Q set to +3dB. As you can see with +3dB of boost and the high-pass filter set to 30Hz, the woofer has more output down to 25Hz and less overall excursion when compared to the non-high-pass response. Maximum physical excursion capability of the 2NT 12SVC1515mm.



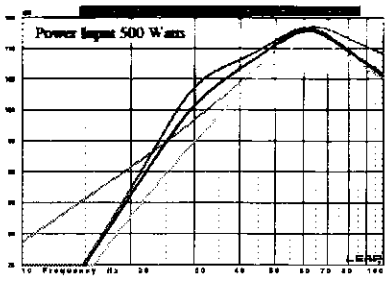
SEALED EXAMPLE HIGH-PASS SET @ 20HZ



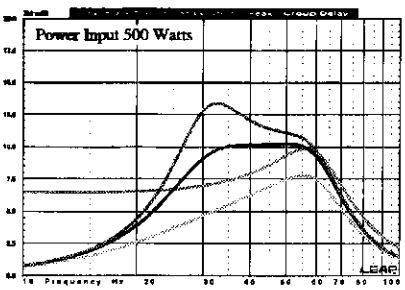
This sealed example is the same 2NT 12SVC in the recommended sealed enclosure. Up to 6dB of boost is capable at 20Hz was used. With +6dB of boost, the woofer has more output down to 15Hz.



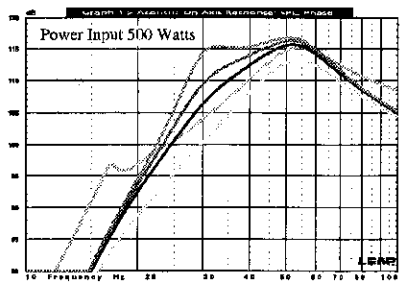
SEALED EXAMPLE HIGH-PASS SET @ 30HZ



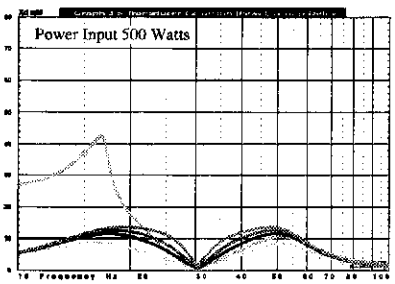
In this example, the frequency has been increased to 30Hz. Up to 6dB of boost is capable at this frequency. With +6dB of boost, the woofer has more output down to 23Hz. Overall usable output is increased.



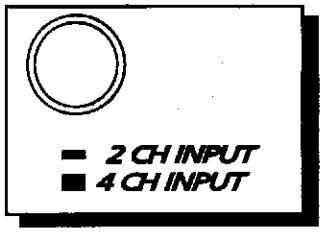
VENTED EXAMPLE HIGH-PASS SET @ 30HZ



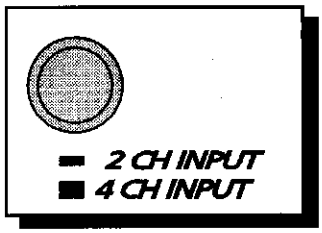
Vented enclosures benefit most from the HCCA's INTELLi Q filter. Up to 10dB of boost is capable at the box tuning frequency of 30Hz. With +10dB of boost, the woofer has more output down to 22Hz. The excursion below the tuning frequency has been greatly reduced.



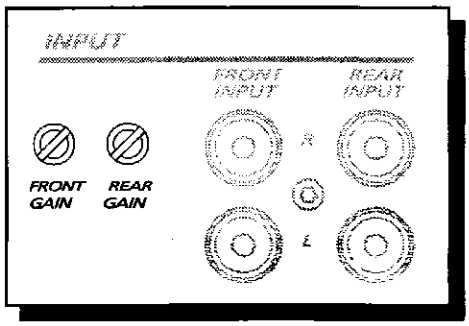
2-CHANNEL / 4-CHANNEL INPUT SWITCH



When the switch is in the out position, the front and rear channels receive signal independently.



When the switch is in the in position, the front and rear channels can receive signal from either the front or the rear RCA inputs. Additionally, the unused RCA and serve as outputs for daisy chaining signal to other Orion amplifiers in the signal chain.



INPUT GAIN

HCCA amplifiers have separate front and rear level adjustments. The input sensitivity of these adjustments range from 200mV up to 5Vrms to easily integrate with any source unit both after market and OEM (Original Equipment Manufacturer) Refer to the ***Testing the System*** and the ***Adjusting the Sound of the System*** for detailed instructions on setting up the level controls.

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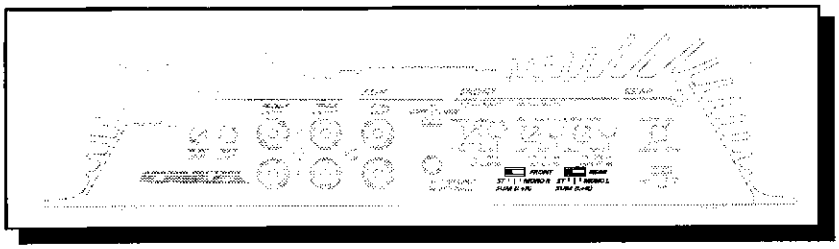
INPUT SECTION

The input section of the amplifier consists of output configuration switched for front and rear channels, front and rear gain controls and separate left and right inputs.



OUTPUT CONFIGURATION SWITCHES

When the switches are in the left position, the amplifier is configured for stereo output using both the left and the right RCA inputs.

When the switches are in the center position, the amplifier is configured for summed mono operation. The amplifier can either be summed stereo or summed bridged depending on the load impedance to the amplifier.

When the switches are in the right position, the amplifier is configured for a single channel output. The right channel RCA input feeds the front channels, while the rear channels are fed by the left channel RCA input.

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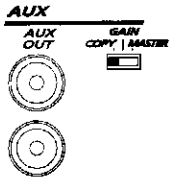
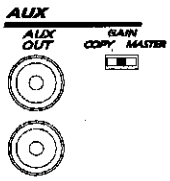
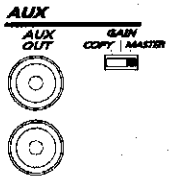
AUXILIARY OUTPUT SECTION



The auxiliary outputs offer ORION amplifiers easy unlimited system expansion. Routing signal from a source unit, pre-amplifier or equalizer is a matter of routing RCAs into the RCA Inputs and out the AUX outputs to the next HCCA or XTREME amplifier in the signal chain.

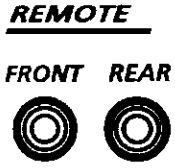


When the switch is in the "MASTER" position, the AUX RCA are buffered through the gain stage of the amplifier and filtered through the crossover section of the amplifier. When set this way, one amplifier's gain and crossover setting can be sent to other amplifier down the signal chain. This can be useful for configuring multiple same power subwoofer amplifiers easily in a large SPL system. A Remote gain controller will also control the level of all the amplifiers following the amplifier configured in this master setting. An infinite number of HCCA or XTREME amplifiers in the signal chain without signal loss or overloading of the source unit. This maximizes the amplifier output and minimizes the potential for system noise.



When the switch is in the "GAIN" position, the AUX RCAs are buffered through the gain stage of the amplifier. When set this way in the first amplifier in the signal chain, a remote gain controller can be installed in the amplifier and act as a "PRE-AMP" controlling the overall level of the system. Following amplifiers can be configured in either the "COPY" or "MASTER" configuration for an infinite number of HCCA or XTREME amplifiers in the signal chain without signal loss or overloading of the source unit. This maximizes the amplifier output and minimizes the potential for system noise.

REMOTE GAIN SECTION



The remote gain port provides easy remote access to the internal gain structure of the HCCA 150R power amplifier. The HCCA 150R has dual remote gain ports for separate front and rear gain control. The RGC-1 plugs into the amplifier via the 1/8" mini jack plug. The RGC-1 can be installed in the front of the vehicle to control the amplifier gain level. The RGC-1 can be used as a bass level control when used on an amplifier dedicated to subwoofers or as a overall system level when used in the first amplifier in a chain of HCCA amplifiers.

INSTALLATION TIPS

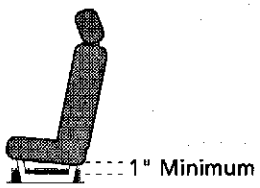
TOOLS OF THE TRADE

Listed are the majority of the tools required to perform the installation. Having the proper tools will make the installation much easier. Some of these tools are necessities. Some make the job much easier.

- marking pen
- electric drill with assorted drill bits
- utility knife
- Phillips and flat blade screw drivers
- pliers (standard and needle nose)
- wire brush or sandpaper for chassis grounding
- solder iron and solder
- grommets
- heat shrink tubing
- nylon tie straps
- volt-ohm meter (optional)
- wire cutters
- wire crimpers
- wire strippers
- RTA (real time analyzer)
- Reference CD with 1 kHz Sine Wave at 0dB level (all bits high)

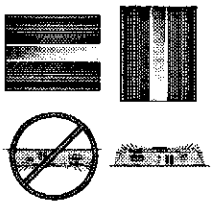
CHOOSING MOUNTING LOCATIONS

The location of your HCCA amplifier will depend on several important issues. Due to the low profile size of the HCCA amplifiers, there are many possible installation locations that will yield satisfactory amplifier performance. Always mount the amplifier in a place that protects the amplifier from the elements. In addition, mount the amplifier on a stable, flat mounting surface. As with any amplifier, there are several possible mounting locations and configurations that can be optimal. We will cover the most obvious of situations.



PASSENGER COMPARTMENT

If you are going to mount the amplifier in the passenger compartment, make sure you have adequate room for ventilation. The HCCA amplifiers have been designed to make possible under seat mounting. When mounting your amplifier under a seat or similar area, keep a minimum of 1" of clearance around the amplifier for adequate cooling.



TRUNK COMPARTMENT

Mounting the HCCA amplifier in the trunk provides excellent performance as long as you do not mount the amplifier upside down or restrict the airflow around the heatsink of the amplifier. For optimal results, mount the amplifier with the cooling fins in the vertical position. This type of mounting will yield the best cooling due to the convection effect of the amplifier chassis.

ENGINE COMPARTMENT MOUNTING

Do not mount the HCCA amplifier in the engine compartment. The amplifier was not designed to endure the harsh environment of the exterior elements.

GENERAL PRECAUTIONS AND INSTALLATION TIPS

Caution: Be careful not to cut or drill into gas tanks, fuel lines, brake lines, hydraulic lines, vacuum lines, or electrical wiring when working on your vehicle.

Disconnect the **vehicle's ground wire at the battery before making or breaking connections to the audio system's power supply terminals.**

Do not use the HCCA Amplifier unmounted. Failing to securely mount the amplifier can result in damage or injury, particularly in the event of an accident. An unmounted amplifier acts like a heat-seeking missile in the event of a crash. Never mount a HCCA Amplifier where it might get wet. Mount the HCCA amplifier so the wire connections will not be pulled. Route the wires where they will not be scraped, pinched or damaged in any fashion.

The +12V power supply wire must be fused as close as possible to the battery terminal, ideally within 18". Use the recommended fuse size or circuit breaker listed in the POWER CONNECTIONS section of this manual.

If you need to replace the fuse plugged into the side of the HCCA amplifier, replace the fuse with the same size ATC type fuse that came with the amplifier. If you are not sure as to the correct value, refer to the POWER CONNECTIONS section of this manual for details. Using a higher current fuse may result in damage to the HCCA amplifier which is not covered under warranty.

NOTE: Make sure all the equipment in the system is turned off when making or breaking connections to the HCCA input RCAs or speakers terminals. Turn on the system and slowly turn up the volume control only after double checking all wire connections.

Power for systems with a single HCCA amplifier can be supplied by most any automotive electrical system. Systems with multiple amplifiers may require a higher capacity battery, alternator or the use of a storage capacitor. We strongly recommend the use of both an MBR70 with an extra battery in larger stereo systems.

HCCA amplifiers generate a certain amount of heat as part of normal operation. Be sure the area around the cooling fins is unobstructed to allow adequate air circulation. Remember, beach blankets, last weeks laundry, school books and homework papers located on top of the amplifier, do not improve air flow.

STEP BY STEP INSTALLATION

Step 1 Determine the location for the amplifier. Refer to the ***Mounting Locations*** section in this manual for detailed information.

Step 2 Decide on the system configuration for your amplifier. For system suggestions, refer to the ***System Planning*** section of this manual.

Step 3 Run all the wires from the amplifier location to the speakers, source unit and battery. Do not connect the battery at this time. Be sure to run RCAs, power and speaker wires away from factory electrical wires and system as they pose a great potential for induced system noise.

Step 4 Pre-drill amplifier mounting holes. Be sure to "think before you drill". Gas tanks, fuel lines, and other obstructions have a nasty way of hiding themselves. For best results use a marking pen to mark the mounting holes and pre-drill these holes with a standard 1/8" drill bit.

Step 5 Mount the amplifier. Make sure the amplifier is mounted on a flat surface. If this is not possible, do not over tighten the screws such that the chassis of the amplifier is twisted or bent.

Step 6 Turn the vehicle's key switch on the off position.

Step 7 Disconnect the vehicle's battery ground terminal.

Step 8 Connect the RCA and speaker wires to the amplifier. Check the quality of your speakers and signal connections. This will determine the ultimate performance of your ORION amplifier. Refer to the Input section of this manual for correct wiring instructions.

Step 9 Connect power wires to the amplifier. At this time do not connect the fuse at the main battery.

Step 10 Reconnect the ground terminal to the battery.

Step 11 Set crossovers. Refer to the ***Internal Crossover*** Sections of this manual for detailed instructions.

Step 12 Once satisfied that all connections and settings are correct, install the fuse located near the vehicle's battery and proceed to the testing the system section of this manual.

WARNING! Never exceed the recommended fuse size of this amplifier. Failure to do so will result in the void of your warranty. After you have completed the installation, you need to test the system. This will help ensure years of trouble free operation. Please refer to the listed steps below when testing the sound of your ORION HCCA system.

TESTING THE SYSTEM

Step 1 Check all the wiring connections to be sure they are correct and secure.

Step 2 Turn the signal source volume control down all the way. Set any tone controls to their flat or defeated positions. This includes the loudness control.

Step 3 Turn the level controls of the amplifier to their minimum positions.

Step 4 Turn the source unit on. Check to see if the remote power LED locate on the connection side of the amplifier is lit. If not, please refer to the power connections section and the trouble shooting section of this manual for instructions.

Step 5 If using a aftermarket source unit, turn the level controls of the amplifier about one quarter of a turn. Slowly increase the volume level of the source unit to so that you can hear the output of the system. If no sound is heard or if the output is distorted, turn the system off immediately. Refer to the power connections section and the trouble shooting section of this manual to solve your installation problems.

Step 6 Check to make sure the output for each channel is correct. If the active crossovers are used, check to make sure that each output is correct from the amplifier. When using active crossovers on midrange and tweeters, do not use crossover frequencies lower than recommended. If the system is not configured properly, refer to the internal crossover section of this manual and take corrective action.

Step 7 If the output is clear and undistorted, continue to the adjusting the sound of the system section of this manual.

ADJUSTING THE SOUND OF THE SYSTEM

Once you have checked the system's operation, adjust the sound of the system. Adjusting the sound of the system is accomplished by setting the level controls and adjusting the internal crossovers.

Step 1 Turn the signal source volume control down all the way. Set any tone controls to their flat or defeated positions. This includes the loudness control.

Step 2 Turn the level controls of the amplifier to their minimum positions.

Step 3 Choose music with high dynamic content that you like and that you are familiar with and will be most often used in the system.

Step 4 Turn the unit up to its highest undistorted output level. If you lack test equipment, this point occurs between 3/4 to full volume depending on the quality of your source unit. Listen for any audible distortion, if any distortion is audible, reduce the volume of the source unit until you have an undistorted output. Leave the volume control at this position during your system tuning.

Step 5 While listening to your chosen dynamic music, turn up the level control corresponding to the midrange output until you hear slight distortion and turn back the level control slightly for an undistorted output. Depending on your system the midrange and tweeter output may be on the same output channels.

Step 6 Turn up the level control corresponding to the tweeter output until you hear slight distortion and turn back the level control slightly for an undistorted output. Depending on your system the midrange and tweeter output may be on the same output channels.

Step 7 Fine tune crossover setting and output level between midrange and tweeters. Refer to the internal crossover section of this manual for detailed instructions.

Step 8 Repeat Steps 5-7 for the rear speakers. If you do not have rear speakers continue to Step 10.

Step 9 Set levels between the front and rear midrange and tweeters for optimum front/rear balance.

Step 10 Turn up the level control corresponding to the woofer output until you hear slight distortion and turn back the level control slightly for an undistorted output.

Step 11 Fine tune crossover setting and output level between satellite speakers and the woofers. Refer to the internal crossover section of this manual for detailed instructions. If using an RGC-1, adjust the level to match the output of the woofer to match the sonic requirements of the system.

Step 12 Enjoy your awesome ORION sound system.

TROUBLESHOOTING TIPS

SYMPTOM	PROBABLE CAUSE	ACTION TO TAKE
No output	Low or no remote turn-on input	Check remote turn-on voltage output at amplifier and fix as needed.
	Fuse blown	Check power wire integrity and check for speaker shorts. Fix as needed and replace fuse.
	Power wires not connected	Check power wire and ground connections and fix or replace as needed.
	Audio input not connected	Check RCA connections and fix or replace as needed.
	Speaker wires not connected	Check speaker wires and fix or replace as needed.
	Speakers are blown	Check system with known working speaker and fix or replace speakers as needed.
Audio cycles on and off	Thermal protection engages when amplifier heatsink temperature exceeds 90°C (190°F)	Make sure there is proper ventilation for amplifier and improve ventilation as needed
	Loose or poor audio input	Check RCA connections and fix or replace as needed.
	Loose power connections	Check power wire and ground connections and fix or replace as needed.
Distorted output	Amplifier level sensitivity set too high Exceeding maximum capability of amplifier	Readjust gain. Refer to ***Adjusting the Sound of the System*** section of this manual for detailed instructions.
	Impedance load to amplifier too low	Check speaker impedance load. If below If below recommended impedance loads, rewire speakers to achieve a higher impedance.
	Shorted speaker wires	Check speaker wires connections and fix or replace as needed.
	Speaker not connected to amplifier properly	Check speaker wiring and fix or replace as needed. Refer to the ***Speaker Connections*** section of this manual for detailed instructions.

Distorted output	Internal crossover not set properly for speakers	Readjust crossovers. Refer to the ***Internal Crossover*** section of this manual for detailed instructions.
	Speakers are blown	Check system with know working speakers and fix or replace as needed.
Poor bass response	Speakers wired with wrong polarity causing cancellation at low frequency	Check speaker polarity and fix as needed.
	Crossover set incorrectly	Reset crossovers. Refer to the ***Internal Crossover*** section of this manual for detailed instructions.
	Impedance load at amplifier is too low	Check speaker impedance load. If below If below recommended impedance loads, rewire speakers to achieve a higher impedance.
Battery fuse blowing	Short in power wire or incorrect power connections.	Check power and ground connections and fix or repair as needed.
	Fuse used is smaller than recommended	Replace with proper fuse size.
	Too much current being drawn	Check speaker impedance load. If below If below recommended impedance loads, rewire speakers to achieve a higher impedance.
		Check power and ground connections and fix or repair as needed.
Amplifier fuse blowing	Too much current being drawn	Check speaker impedance load. If below If below recommended impedance loads, rewire speakers to achieve a higher impedance. Replace with recommended size fuse if needed.
		Check power and ground connections and fix or repair as needed.
	Fuse used is smaller than recommended	Replace with proper fuse size.
	Impedance load at amplifier too low	Check speaker impedance load. If below If below recommended impedance loads, rewire speakers to achieve a higher impedance.
	Speaker is blown with shorted outputs	Check system with know working speakers and fix or replace as needed.

AUTOSOUND 2000 TROUBLESHOOTING TIPS

QUICK CHECK FOR TROUBLESHOOTING CAR AUDIO SYSTEMS

Preface:

All audio systems exhibit noise; however, if the level of noise is low enough, and the signal level high enough, noise should not be a problem. This means that it is very important that the signal level throughout the system be optimized BEFORE dealing with your noise problem. Using a scope (or a small portable amplifier) and Track 99 (1kHz at all high bits) of Autosound 2000's CD #101, or tracks 24 through 29 of Autosound 2000's CD #102, adjust the system so that when the maximum usable signal level of the deck is fed into the system, all the preamp level components clip at the same time. However, we recommend up to as much as a 3:1 voltage overlap with the power amplifiers; i.e. an amplifier with a 2 volt minimum sensitivity can be driven by up to 6 volts of signal.

Noise Overview:

Car audio electrical accessories are notorious for interfering with car audio systems. The interference commonly arises from three areas:

1) Power line noise (5%), which can be attenuated with in-line noise filters,

2) Inadequate power supply isolation (45%), which can be cured with transformer signal coupling, additional isolated power supplies, or changing out components, or

3) Inductive interference (45%) - including loop area inductive noise picked up by the signal cables - which can be remedied by relocating or rewiring components, rerouting signal cables, or using twisted cable or balanced transmission systems.

AUTOSOUND 2000 1-2-3 METHOD OF LOGICAL TROUBLESHOOTING

I. **MUTE THE AMP(S).** Insert a muting plug (shorted male RCA connector) into each amplifier channel. Turn up the amp sensitivity. Start the car and turn on the headlights, air conditioning, brake lights, etc. Listen for noise in each speaker. Be very picky here!

   A. If still noisy, substitute a small test speaker with short leads for the speakers, crossovers, and speaker leads in the car. If still noisy, substitute an isolated power supply (120 VAC to 13.8 VDC bench supply or a small motorcycle battery) for the car's alternator. If the amplifier is noisy with the test speaker, you have a BAD amp. Send it in. It really doesn't matter if it is quiet or noisy while running on the isolated supply because you have a BAD amp. Send it in for repair and if it was quiet on the isolated supply, indicate so on the repair tag.

   B. If your muted amp is quiet, you've just joined 99.5% of car audio. Amps are usually very clean and do NOT pick up unwanted noise! Continue on to Step II.

II. **DECK TO AMP.** Using a new set of signal cables, connect one channel from the output of the deck directly into one channel of your clean amp. Run the cables outside the car and as far away as possible from the metal of the car. (For noise purposes, consider a 2" thick cushion of electromagnetic energy emanating from every metal surface in the car.)

   A. If still noisy, congratulations, in all probability your equalizer, electronic crossover, DSP whatchamacallit, are just fine. This means that you can't get your deck playing quiet with your amp, right? Go to Step III.

   B. If all is quiet, congratulations, in all probability your deck and amplifier(s) are fine - you obviously have a problem with your equalizer, electronic crossover, DSP, etc. Skip on down to "Time for the Processors."

III. **MOVE THE DECK.** If you're at this step, it is time to turn your system into an "amplified deck" by temporarily relocating the deck right ON TOP of the clean amplifier. Then using very, very short signal cables, connect the output of the deck into the input of the amp and test for noise. Play a zero bit track - silence - and make sure all is completely quiet.

   A. If still noisy, you're in a heap of trouble, We suggest that you try another deck and give us a call so that we can put your name into the record books. It's a bad car audio day for you.

   B. If the deck is quiet, then congratulations, you're on your way to a successful installation. It is now time to slowly, methodically, reinstall the deck back into its final position. Test for noise each step of the way. If the noise returns, suspect the signal cables, forget shielding because it will have only a very, minimal effect within the audio band. We highly suggest using twisted pair cables or a balanced transmission system for cable induced noise.

TIME FOR PROCESSORS

By the end of Step III, you should have the deck playing quietly with the amp, with the quiet cables quietly routed. So it's time to add the signal processors - one at a time - back into the system. Simply reclean steps I and II with the equalizer then the electronic crossover, etc. However, before **MOVING THE SIGNAL PROCESSORS** to the amplifier, we highly suggest that you supply power to the noisy processor from an isolated power supply rather than the car's +12 volt DC and chassis ground. Make sure to also connect the turn-on lead to the isolated power supply. If the processor is now quiet , then it is highly probable that the component has inadequate isolation. Solutions include, changing components or permanently adding an external isolated power supply (Call Autosound 2000 at 209-465-3450 for info on isolated power supplies).

SUMMATION

During the design stage of your vehicles, try to avoid using extra batteries and high output alternators. Extra batteries are nothing but loads as soon as the engine is started and high output alternators usually make more noise than stock alternators. Also, extra batteries installed in the trunk of a car will **ALWAYS** force extra ripple current to flow over the car.

Install Transient Storage as close to the power supply input of your amplifier as possible. The big caps will feed the switching power supplies of your amps and minimize the inductive losses in your power wiring. Plus, they will help your peak system response.

In problem cases, we highly recommend the use of twisted pair cable rather than coaxial cable for RCA leads. This practice will greatly minimize cable induced noise - especially in four channel amps!

Don't forget that your system is only as good as its worst component. Do **NOT** use components with inadequate power supply isolation or you will be asking for problems.

The best electrical ground on a car is the **CHASSIS** of the car. Do **NOT** run ground leads up to the case of the alternator or the negative battery post. Keep **ALL** ground leads as short as possible.

With properly isolated components, it does **NOT** matter where the component is grounded. With inadequately isolated components, it matters! With poorly isolated components, different grounds can cause different noises.

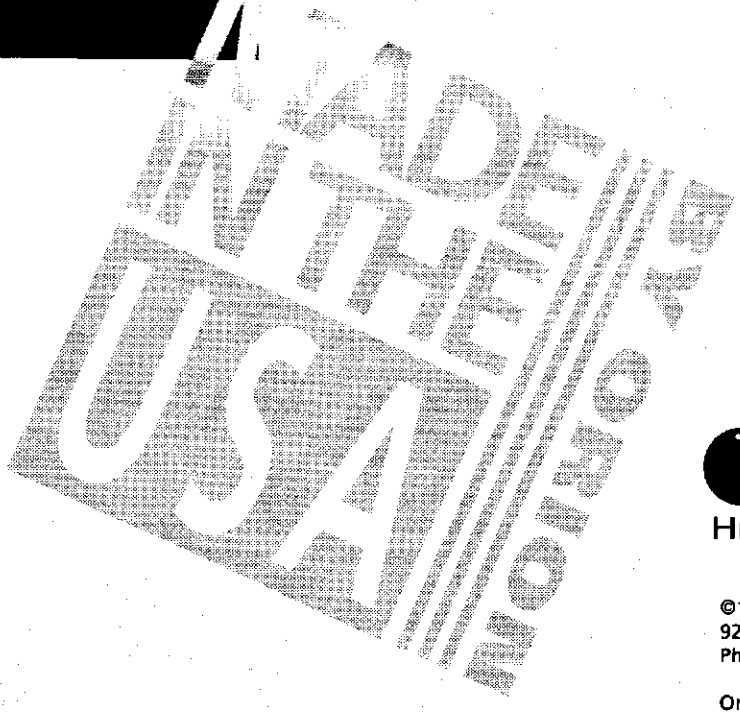
The deck is the signal reference ground for the entire sound system. The deck usually has **THREE** connections to the car's chassis: The black ground lead, the base of the antenna, and the metal-to-metal bond between the case of the deck and the chassis of the car. With three grounds, there is usually NO cause to worry about the ground of a deck.

Amplifiers are usually designed with adequate power supply isolation. This means that it should not matter where a deck is grounded. (Decks are grounded three times and amps float. This is car audio!)

The more components installed on a signal path, the more chances for noise to enter a system. The more electrical accessories on a car, the more noise will be produced by the alternator.

This information was compiled from more than 20 years of working in car audio. If you would like more information on this topic, or any other technical aspect of car audio, please call 209-465-3450 and ask for a subscription to Autosound 2000 Tech Briefs - the monthly magazine for the technically inclined.

HIGH PERFORMANCE CAR AUDIO AMPLIFIERS, SIGNAL PROCESSORS AND LOUDSPEAKERS



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