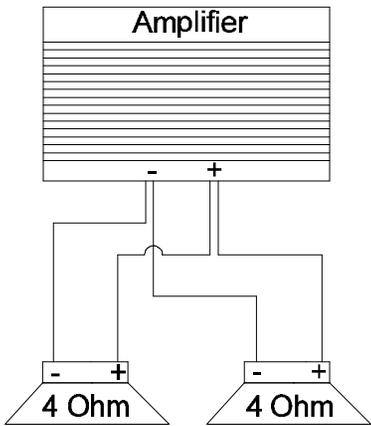
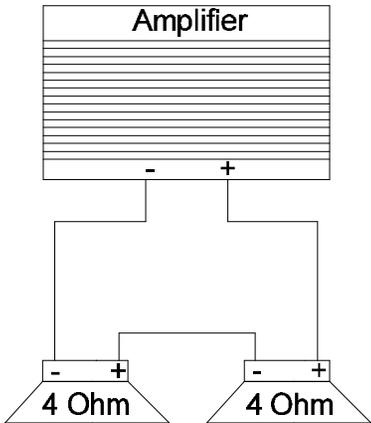


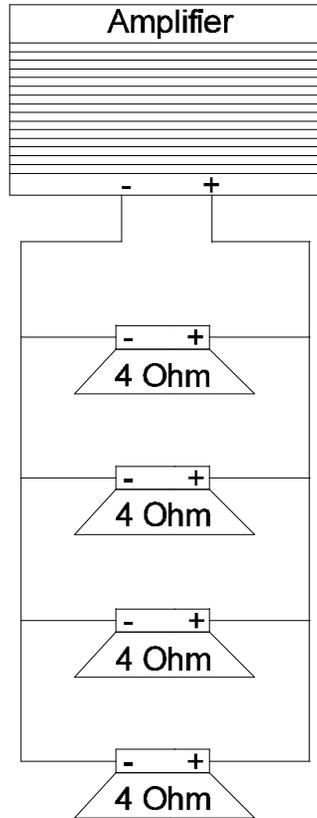
## SERIES AND PARALLEL WIRING



*2-4 ohm drivers in parallel  
= 2 ohms*



*2-4 ohm drivers in series  
= 8 ohms*



*4-4 ohm drivers in parallel  
= 1 ohm*

# REFERENCE

## 160s

## 200s

## Power Amplifiers

## OWNERS MANUAL AND INSTALLATION GUIDE

SOUNDSTREAM TECHNOLOGIES

120 Blue Ravine Road Folsom California 95630 USA  
ph 916.351.1288 fax 916.351.0414

rev C - 4.17.96

# SOUNDSTREAM®

T E C H N O L O G I E S

## CONGRATULATIONS!

You now own the **REFERENCE Amplifier**, the product of an uncompromising design and engineering philosophy. Your Soundstream REFERENCE amplifier will outperform any other amplifier in the world.

To maximize the performance of your system, we recommend that you thoroughly acquaint yourself with its capabilities and features. Please retain this manual and your sales and installation receipts for future reference.

Soundstream amplifiers are the result of American craftsmanship and the highest quality control standards, and when properly installed, will provide you with many years of listening pleasure. Should your amplifier ever need service or replacement due to theft, please record the following information, which will help protect your investment.

Model and Serial # \_\_\_\_\_

Dealer's Name \_\_\_\_\_

Date of Purchase \_\_\_\_\_

Installation Shop \_\_\_\_\_

Installation Date \_\_\_\_\_

## DESIGN FEATURES

- **Uncompromising Design and Construction** including mil-spec glass epoxy circuit boards and high current custom gold-plated solid brass connections that will accept up to 8 gauge power/ground wire.
- **High Power/High Current Capability** - Soundstream's exclusive circuit which permits customization of your amplifier to its particular application—high current, low impedance loads (multiple subwoofers, less than 2 ohms mono) or High Power, higher impedance loads (2 ohms mono and up).
- **Coherent Stereo™/Mixed Mono** selection for either "pure" stereo operation or mixed mono for simultaneous stereo and mono.

## SPECIFICATIONS

<b>POWER</b>	<b>4 Ω Stereo (8 Ω Bridged)</b>	<b>2 Ω Stereo (4 Ω Bridged)</b>	<b>1 Ω Stereo (2 Ω Bridged)</b>	<b>1/2 Ω Stereo (1 Ω Bridged)</b>
<i><b>REFERENCE160s</b></i>				
<b>High Power</b>	20 x 2 (40 x 1)	40 x 2 (80 x 1)	80 x 2 (160 x 1)	n/a
<b>High Current</b>	10 x 2 (20 x 1)	20 x 2 (40 x 1)	40 x 2 (80 x 1)	80 x 2 (160 x 1)
<i><b>REFERENCE200s</b></i>				
<b>High Power</b>	25 x 2 (50 x 1)	50 x 2 (100 x 1)	100 x 2 (200 x 1)	n/a
<b>High Current</b>	12.5 x 2 (25 x 1)	25 x 2 (50 x 1)	50 x 2 (100 x 1)	100 x 2 (200 x 1)
<b>THD</b>	<0.1%			
<b>Signal to Noise</b>	>100 dB			
<b>Frequency Response</b>	20 Hz to 20 kHz ± 0.5 dB			
<b>Stereo Separation</b>	>90 dB			
<b>Damping</b>	>200			
<b>Input Sensitivity</b>	200 mV - 5.0 V			
<b>Input Impedance</b>	12K ohms			

### **Crossover Specifications (REFERENCE200s)**

High Pass: 12 dB/octave, factory set at 150 Hz

Low Pass: 12 dB/octave, factory set at 75 Hz

### **Dimensions (W x D x H)**

REFERENCE160s: 6.25" x 9.8" x 2.25"

REFERENCE200s: 7.0" x 9.8" x 2.25"

### **CAUTION!**

*Prolonged listening at high levels may result in hearing loss. Even though your new Soundstream REFERENCE amplifier sounds better than anything you've ever heard, exercise caution to prevent hearing damage.*

## PROTECTION CIRCUITRY

Your REFERENCE amplifier is protected against both overheating and short circuits by means of the following circuits:

- Main power supply fuses
- Circuit breakers
- Smart Power Supply Thermal Rollback activating at 85°C (REF200s).
- A fail-safe thermal protection circuit activating at 95°C.

Your amplifier also incorporates an innovative Fault Diagnosis system that identifies a blown power supply fuse.

**NOTE:** *If you experience blown main power supply fuses, DO NOT increase values beyond the original fuse value! Doing so will void your warranty and*

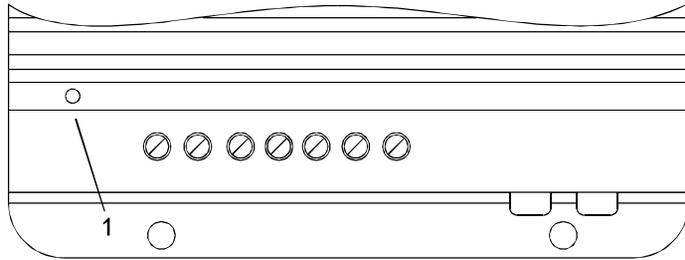
## TROUBLESHOOTING

<i>PROBLEM</i>	<i>CAUSE</i>
No sound and LEDs are not lit	<ul style="list-style-type: none"> <li>• no power or ground at amp</li> <li>• no remote turn-on signal</li> <li>• blown fuse near battery</li> </ul>
Fault LED is lit (REF200s) Amp has power, but the Power LED is not lit (REF160s)	<ul style="list-style-type: none"> <li>• amp power supply fuse is blown or missing</li> </ul>
Repeatedly blown amp fuse, frequent activation of Smart Power Supply Circuit	<ul style="list-style-type: none"> <li>• check speaker configuration, amp may be in “High Power” mode, put amp into “High Current” mode if speaker load is less than 2 ohms (see p.12, “Setting High Power/High Current Switch”)</li> <li>• speaker or leads may be shorted</li> <li>• verify adequate amplifier ventilation</li> </ul>

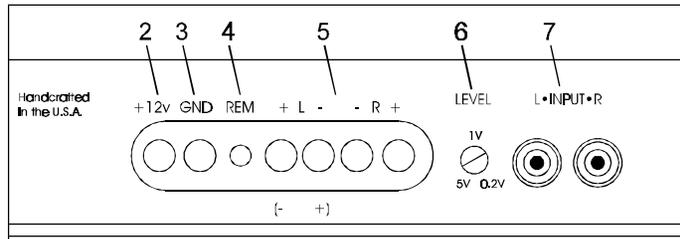
## SERVICE

Your Soundstream REFERENCE amplifier is protected by a limited warranty. Please read the enclosed warranty card.

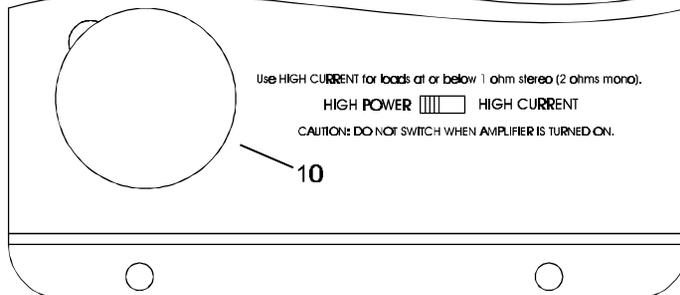
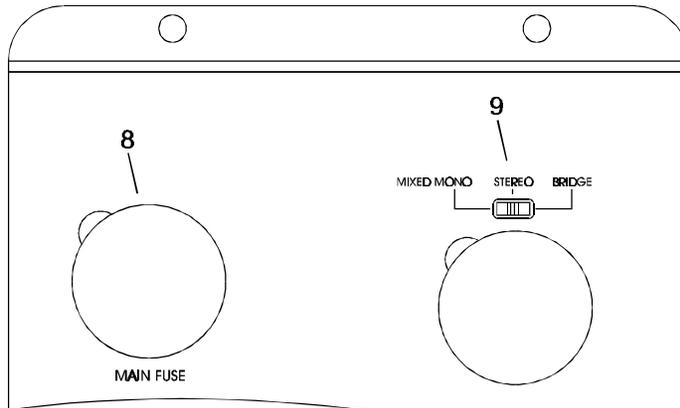
- **Chassisink™ Darlingon Power Array** - Soundstream's “overbuilding” of the output section incorporates multiple output transistors instead of a few for faster, stronger power delivery. The transistors are sandwiched between the circuit board and the heatsink in a design called Chassisink™ to ensure cool, efficient amplifier operation.
- **PowerGrid Power Supply Design** - All power supply components are located near one another, connected by thick, wide PCB traces, which ensures rapid, high current delivery. The entire power supply is isolated on one side of the circuit board while the audio stage is located opposite it, guaranteeing minimal noise.
- **Ultra-Low ESR Capacitance Bank** - Multiple small input power capacitors are used to provide a lower ESR (Equivalent Series Resistance), which *means more power in and out faster*.
- **Smart Thermal Rollback (Reference200s)** - Most amplifiers shut off when they get too hot. In the unlikely event the REFERENCE200s amplifier reaches 85° C, it will gradually roll back its average power (without affecting the dynamics). Once the amplifier has cooled off, it returns to full power output. If overheating should continue, a second thermal sensing protection circuit will shut off the amplifier if the heatsink reaches 95° C.
- **Unregulated Power Supply** - 4 ohm power ratings are measured at 12 volts, meaning substantially greater output in the real world when the vehicle is running, where voltages range from 13.2 to 14.4 volts.
- **Fault Monitor LED (Reference200s)** on the top panel notifies you of blown power supply fuses.
- **1/2 ohm Drive Ability** - The REFERENCE amplifiers are designed to drive virtually any load—all the way down to 1/2 ohm stereo (1 ohm mono).
- **Dual Discrete Class A Drive Stages** - Over six times the drive current of most amps, which maintains performance into low impedance loads.
- **Drive Delay™ Muted Turn-on/off Circuit** - A unique circuit which completely eliminates any amplifier-related turn-on/off noises.
- **Flexible Input Sensitivity** accepts voltages from 200 mV to 5.0 V, permitting maximum output from the amplifier with virtually any source unit.
- **Differential Balanced Input Design (Reference200s)** for added



TOP VIEW (PARTIAL)



FRONT VIEW



BOTTOM VIEW (PARTIAL)

## LEVEL SETTING

The input levels are adjusted by means of the input level controls located on the front of the amplifier. This is a unique dual-stage circuit that adjusts both level and gain. This topology maintains better Signal to Noise ratios even when using sources with minimal output.

In the ideal situation, all components in the audio system reach maximum undistorted output at the same time. The reason is because an amplifier will only make what comes into it bigger. So, if you send it a distorted signal from the head unit, the amplifier is going to amplify distorted information. The same thing holds true if an outboard processor or crossover begins to distort before you have maximum output from the amplifier. By setting all components to reach clipping at the same time, you can maximize the output of your system. For the REFERENCE amplifiers, follow the below procedure for the quickest, easiest means of setting the levels.

1. Turn the amp's input levels to minimum position (fully counter-clockwise).
2. Set source unit volume to approximately 3/4 of full volume.
3. While playing dynamic source material, slowly increase the amplifier's input level until a near maximum undistorted level is heard in the system.

**NOTE:** Even though the S/N ratio with low output sources is better with the REFERENCE amplifiers than others, your best combination of output level and Signal to Noise ratio will be achieved when the input levels are set

# INSTALLATION STEP 4

## INSTALLATION AND MOUNTING

### 1. **AMPLIFIER LOCATION**

The REFERENCE amplifiers employ highly efficient circuitry and a unique Chassisink™ design to maintain lower operating temperatures. Additional cooling may be required if the amplifier is located in a tightly confined area or when driving especially low impedance loads at extremely high levels.

When mounting the amplifier, it should be securely mounted to either a panel in the vehicle or an amp board or rack that is securely mounted to the vehicle. The mounting location should be either in the passenger compartment or in the trunk of the vehicle, away from moisture, stray or moving objects, and major electrical components. To provide adequate ventilation, mount the amplifier so that there are at least two inches of freely circulating air above and to the sides of it.

### 2. **SWITCHES**

Set High Power/High Current and Coherent Stereo™/Mixed-Mono/Bridged Mono switches to the appropriate positions (see pages 12 - 13).

### 3. **MOUNTING THE AMPLIFIER**

- Using the amplifier as a template, mark the mounting surface.
- Remove the amplifier and drill the holes.
- Mount the amplifier to the surface using the provided hardware.

### 4. **WIRING**

- Run and connect the audio signal and remote turn-on cables to the amplifier from the source unit.
- Carefully run the positive cable from the amplifier to a fuse or circuit breaker within 18" of the battery.
- Connect the fuse or circuit breaker to the battery. Leave the circuit breaker off or the fuse out until everything is bolted down.
- Secure the ground cable to a solid chassis ground on the vehicle. It may be necessary to sand paint down to raw metal for a good connection.

**NOTE:** *There may be a sizable spark when connecting the power and ground lead to the amplifier for the first time. This is caused by current rushing into the amplifier to charge the power supply capacitors, and is completely normal.*

- Double check each and every connection!
- Re-connect the fuse or circuit breaker.

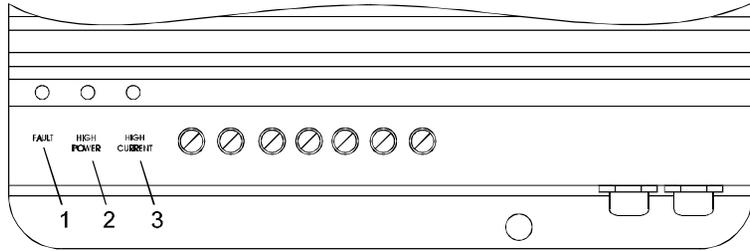
### 5. **POWER UP**

Power up the system and look at the green and red LEDs; depending on the

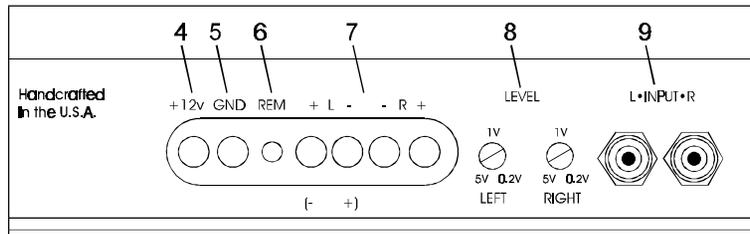
## Key to Callouts

- Power LED** - Indicates amplifier power on in either "High Power" or "High Current" mode.
- +12V** - Connected to a fuse or circuit breaker, then to the battery's positive post.
- GND** - Main ground connection. Bolt to a clean chassis ground in the vehicle.
- REM** - Remote turn-on input from the head unit. Accepts +12V.
- Speaker Output Connections** - Channels 1 & 2.
- Input Level** - Variable from 200 mV to 5 V.
- Inputs** - Right and left channel inputs; only right channel input is used in "Mono" mode.
- Main Fuse** - Main power supply fuse. Replace only with the same value fuse.
- Coherent Stereo/Bridge/Mixed Mono switch** - Select "Bridge" for bridged mono operation (use right channel input). Select "Stereo" for coherent stereo operation. Select "Mixed Mono" for simultaneous stereo / bridged mono operation.
- High Power / High Current Switch** - Use HIGH CURRENT for loads at or below 1 ohm stereo (2 ohms mono).
- CAUTION: DO NOT SWITCH WHEN AMPLIFIER IS TURNED ON.**
-

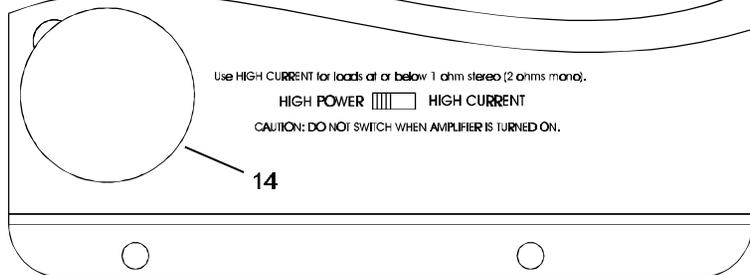
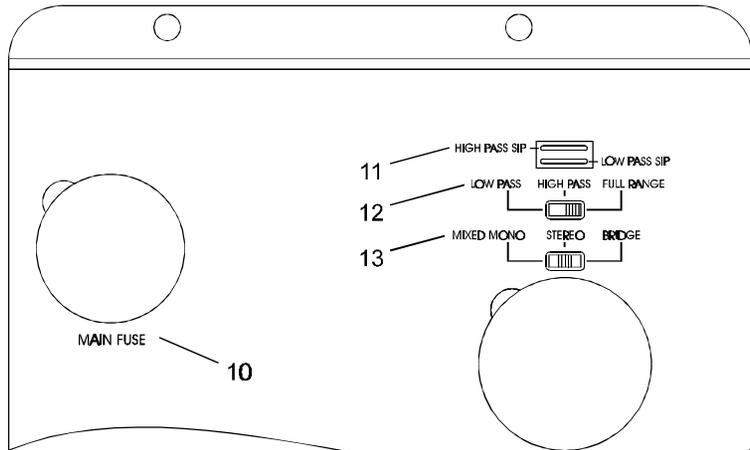
# Reference200s



TOP VIEW (PARTIAL)



FRONT VIEW



BOTTOM VIEW (PARTIAL)

## WIRING (cont.)

### REMOTE TURN-ON

Connect the "Remote" to the turn-on lead from the source unit. When +12 volts is received, the amplifier will turn on.

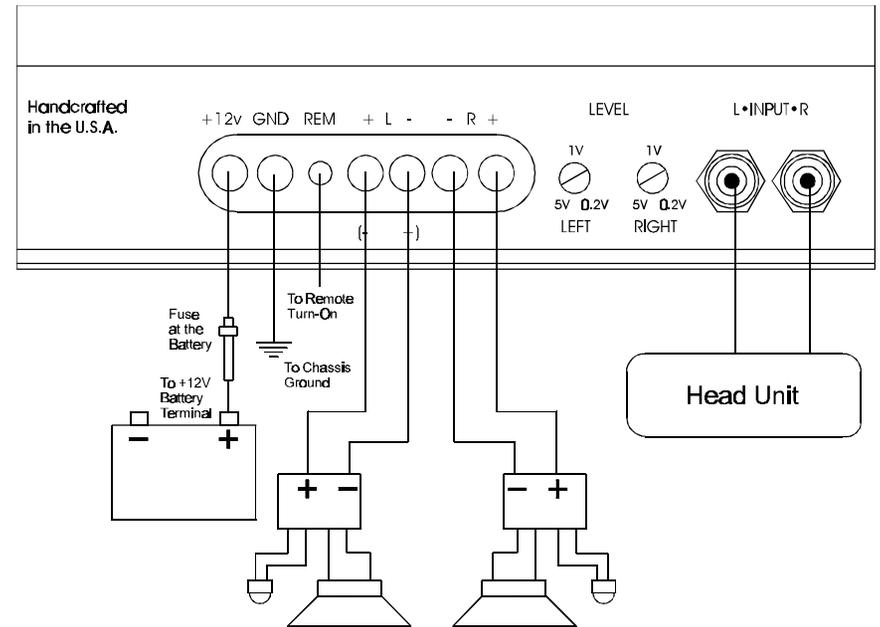
### SIGNAL CABLE

Use a high-quality cable that will be easy to install and has minimal signal loss to guarantee optimum performance. Soundstream's DL 1 and SL 1 are ideal.

### SPEAKER CABLE

The REFERENCE amplifiers will accept up to 8 gauge speaker cable. Use a high quality, flexible, multi-strand cable for best performance and longevity.

## WIRING DIAGRAM



# INSTALLATION STEP 3

## WIRING

### POWER AND GROUND

To ensure maximum output from your REFERENCE amplifier, use high quality, low-loss power and ground cables. The REFERENCE amplifiers will accept up to 8 gauge power and ground cables. Determine from the chart below the minimum gauge power and ground wire for your application.

	<i>up to 10'</i>	<i>up to 20'</i>
<b>REFERENCE160s</b>	Soundstream Power80 or Power100 (8 or 10 ga.)	Soundstream Power80 (8 ga.)
<b>REFERENCE200s</b>	Soundstream Power80 or Power100 (8 or 10 ga.)	Soundstream Power80 (8 ga.)

### CIRCUIT BREAKERS/FUSES

#### EXTERNAL

Like all audio components, the REFERENCE amplifiers must be fused near the battery. A fuse or circuit breaker must be located within 18" of the battery. This will prevent a fire in the event of a shorted cable. See the chart below to determine the correct fuse value.

#### INTERNAL

The REFERENCE amplifiers are fused with automotive-type fuses. In the event of blown power supply fuses, the "Fault" indicator on the top panel will light. The fuses are accessible via a plastic plug on the bottom of the amplifier. See the chart below to determine the fuse value. **Never replace the fuses with a higher value than what is supplied. This may result in amplifier damage and will void the warranty!**

#### REFERENCE Amplifier Fuse Values

<i>Amplifier</i>	<i>Amplifier Fuse</i>	<i>Battery Fuse</i>
<b>REFERENCE160s</b>	25 amp automotive	30 amp
<b>REFERENCE200s</b>	25 amp automotive	30 amp

## Key to Callouts

- Fault LED** - Indicates a blown fuse.
- High Power LED** - Indicates amplifier power on in "High Power" mode.
- High Current LED** - Indicates amplifier power on in "High Current" mode.
- +12V** - Connected to a fuse or circuit breaker, then to the battery's positive post.
- GND** - Main ground connection. Bolt to a clean chassis ground in the vehicle.
- REM** - Remote turn-on input from the head unit. Accepts +12V.
- Speaker Output Connections** - Channels 1 & 2.
- Input Level** - Independent Left and Right channel input level controls, variable from 200 mV to 5 V.
- Inputs** - Right and left channel inputs; only right channel input is used in "Mono" mode.
- Main Fuse** - Main power supply fuse. Replace only with the same value fuse.
- Crossover S.I.P.s** - Crossover frequency settings for the amplifier. See page 7 for more details.
- Amplifier Crossover** - Select high pass, low pass or full range or full range operation.
- Coherent Stereo/Bridge/Mixed Mono switch** - Select "Bridge" for bridged mono operation (use right channel input). Select "Stereo" for coherent stereo operation. Select "Mixed Mono" for simultaneous stereo / bridged mono operation.
- High Power / High Current Switch** - Use HIGH CURRENT for loads at or below 1 ohm stereo (2 ohms mono).
- CAUTION: DO NOT SWITCH WHEN AMPLIFIER IS TURNED ON.
-

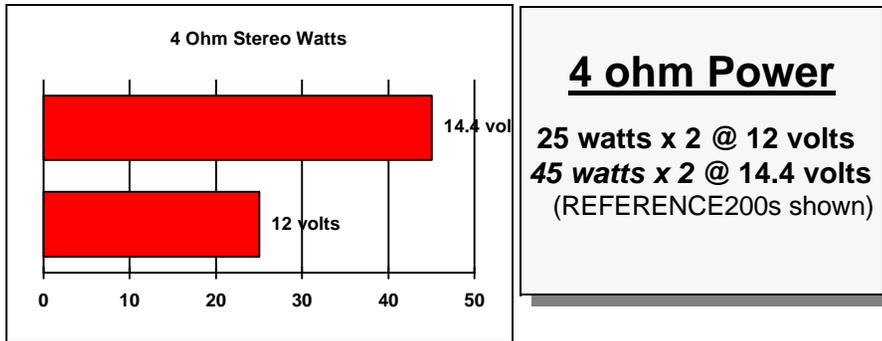
# INSTALLATION STEP 2

## REFERENCE POWER SUPPLY DESIGN

The REFERENCE amplifiers employ an extremely efficient unregulated pulse-width modulated power supply. REFERENCE amplifiers from Soundstream are rated at 12 volts but are designed to take advantage of the additional voltage available when the vehicle is running. The two major advantages of the unregulated power supply are:

- awesome dynamic power capabilities
- added continuous power with higher voltages (see chart below)

Because of the dynamic properties of most music, all audio components should be able to react accordingly. Thanks to their unregulated power supplies, the REFERENCE amplifiers can comfortably exceed their rated



## PASSIVE AND ELECTRONIC CROSSOVERS

Your REFERENCE amplifier is unique in its ability to switch between Coherent Stereo™ and mixed mono output mode. The REFERENCE amplifiers are capable of driving a complete subwoofer and satellite system in the Mixed Mono configuration. However, for lowest distortion, maximum output, and best sound quality, we recommend that you use an electronic crossover and multiple channels of amplification.

If a single REFERENCE amplifier is to drive a subwoofer and satellite system, passive high and low pass crossovers will be necessary. Use the charts on

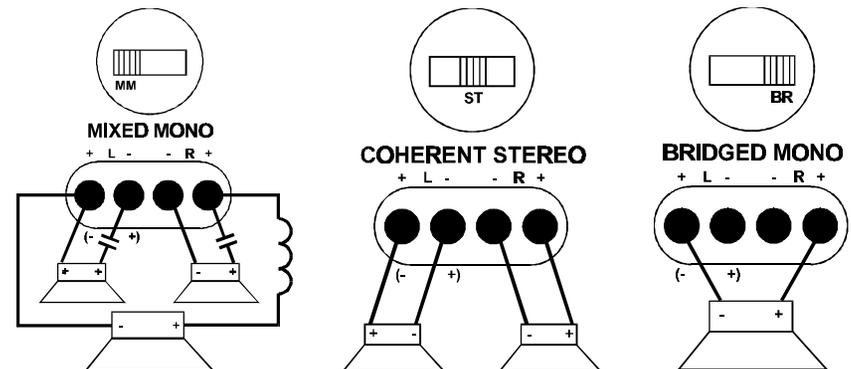
## COHERENT STEREO™ / MIXED-MONO / BRIDGED MONO

The REFERENCE amplifiers have the ability to operate in any one of the following modes:

**Coherent Stereo™** with identical left and right stereo channels for maximum fidelity. Best choice for satellite speakers. Use this mode unless Mixed-Mono is necessary.

**Mixed-Mono** in order to drive stereo and mono simultaneously; works well for center channels. It can be used anytime you need a summed mono channel. Somewhat sacrifices sonic accuracy as additional circuitry is introduced to one channel. **In Mixed-Mono, the left channel is inverted, see diagram below or on the bottom of the amplifier.**

**Bridged Mono** for dedicated single channel operation; ideal for driving subwoofers. It is also used when large amounts of power are necessary for single speakers. **In bridged mono, only the right channel input is active.**



*In bridged mono, only the right channel input is active.*

**NOTE:** If you intend to drive a REFERENCE amp in Mono but have stereo outputs from your crossover or source unit, you can put the switch in Mixed-Mono but follow the normal wiring for Bridged Mono.

# INSTALLATION STEP 1

## SETTING THE HIGH POWER/HIGH CURRENT SWITCH

The High Power/High Current switch allows the REFERENCE amplifier to be one of two types of amps: either producing maximum power at higher impedances (perfect for satellites) or at lower impedances (usually with multiple subwoofers).

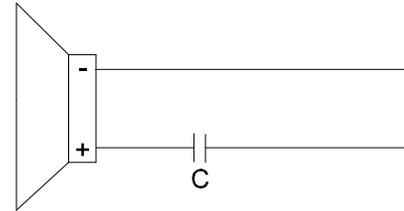
The circuit operates by selecting a set of power supply voltage rails best suited to your particular application. One is a higher voltage "tap" optimized for high impedance applications while the other is lower voltage designed to provide more current. Unlike other amplifiers, Soundstream's REFERENCE amplifiers can be configured to drive virtually any impedance *and* make maximum power!

<b>POWER</b>	<b>4 Ω Stereo (8 Ω Bridged)</b>	<b>2 Ω Stereo (4 Ω Bridged)</b>	<b>1 Ω Stereo (2 Ω Bridged)</b>	<b>1/2 Ω Stereo (1 Ω Bridged)</b>
<b>REFERENCE160s</b>				
<b>High Power Watts</b>	20 x 2 (40 x 1)	40 x 2 (80 x 1)	80 x 2 (160 x 1)	n/a
<b>High Current Watts</b>	10 x 2 (20 x 1)	20 x 2 (40 x 1)	40 x 2 (80 x 1)	80 x 2 (160 x 1)
<b>REFERENCE200s</b>				
<b>High Power Watts</b>	25 x 2 (50 x 1)	50 x 2 (100 x 1)	100 x 2 (200 x 1)	n/a
<b>High Current Watts</b>	12.5 x 2 (25 x 1)	25 x 2 (50 x 1)	50 x 2 (100 x 1)	100 x 2 (200 x 1)

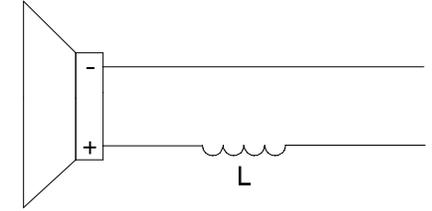
### **OTHER COMMENTS:**

If you blow fuses with the REFERENCE amplifiers, switch to the High Current mode. If the problem persists, it is likely that the amplifier is seeing a dead short, either in the speaker wire or in the speaker itself. **Rectify the problem before blowing multiple fuses!**

## 6 dB/OCTAVE PASSIVE CROSSOVER CHART



**6 dB/octave high pass**



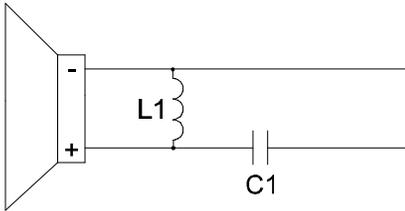
**6 dB/octave low pass**

### **KEY**

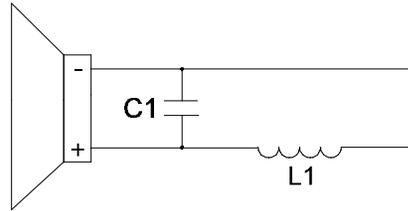
L = high quality (DCR < 1 ohm) inductor/coil  
C = non-polarized 50 v (or greater) capacitor

<b>FREQ.</b>	<b>2 ohms</b>		<b>4 ohms</b>		<b>8 ohms</b>	
	<b>L</b>	<b>C</b>	<b>L</b>	<b>C</b>	<b>L</b>	<b>C</b>
80 Hz	4.1 mH	1000 μF	8.2 mH	500 μF	16 mH	250 μF
100 Hz	3.1 mH	800 μF	6.2 mH	400 μF	12 mH	200 μF
130 Hz	2.4 mH	600 μF	4.7 mH	300 μF	10 mH	150 μF
200 Hz	1.6 mH	400 μF	3.3 mH	200 μF	6.8 mH	100 μF
260 Hz	1.2 mH	300 μF	2.4 mH	150 μF	4.7 mH	75 μF
400 Hz	0.8 mH	200 μF	1.6 mH	100 μF	3.3 mH	50 μF
600 Hz	0.5 mH	136 μF	1.0 mH	68 μF	2.0 mH	33 μF
800 Hz	0.41 mH	100 μF	0.82 mH	50 μF	1.6 mH	26 μF
1000 Hz	0.31 mH	78 μF	0.62 mH	39 μF	1.2 mH	20 μF
1200 Hz	0.25 mH	66 μF	0.51 mH	33 μF	1.0 mH	16 μF
1800 Hz	0.16 mH	44 μF	0.33 mH	22 μF	0.68 mH	10 μF
4000 Hz	0.08 mH	20 μF	0.16 mH	10 μF	0.33 mH	5 μF

## 12 dB/OCTAVE PASSIVE CROSSOVER CHART



**12 dB/octave high pass**



**12 dB/octave low pass**

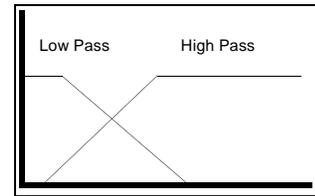
**KEY**

L1 = high quality (DCR < 1 ohm) inductor/coil  
C1 = non-polarized 50 v (or greater) capacitor

FREQ.	2 ohms		4 ohms		8 ohms	
	L1	C1	L1	C1	L1	C1
80 Hz	5.5 mH	680 µF	11 mH	330 µF	22 mH	180 µF
100 Hz	4.7 mH	560 µF	9.1 mH	270 µF	18 mH	150 µF
130 Hz	3.3 mH	400 µF	6.8 mH	200 µF	15 mH	100 µF
200 Hz	2.2 mH	300 µF	4.7 mH	150 µF	9.1 mH	75 µF
260 Hz	1.8 mH	200 µF	3.6 mH	100 µF	6.8 mH	50 µF
400 Hz	1.1 mH	150 µF	2.2 mH	68 µF	4.7 mH	33 µF
600 Hz	0.75 mH	100 µF	1.5 mH	47 µF	3.0 mH	26 µF
800 Hz	0.5 mH	68 µF	1.0 mH	33 µF	2.0 mH	15 µF
1000 Hz	0.47 mH	50 µF	0.9 mH	27 µF	1.8 mH	13 µF
1200 Hz	0.33 mH	44 µF	0.75 mH	22 µF	1.5 mH	11 µF
1800 Hz	0.27 mH	30 µF	0.50 mH	15 µF	1.0 mH	6.8 µF
4000 Hz	0.10 mH	15 µF	0.22 mH	6.8 µF	0.47 mH	3.3 µF

## CROSSOVER ADJUSTMENTS (Ref200s only)

In most car audio installations, there is a tendency for a “midbass boom.” Because of their interior dimensions, most cars will resonate or ring at these midbass frequencies. If we design the system so there is less musical information in this region, the final response is very smooth and natural sounding.

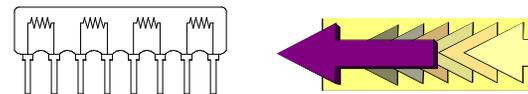


The Reference200s incorporates a staggered electronic crossover. The high and low pass portions of the crossover can be set independent of one another.

**Staggered Crossover**  
12 dB/octave low pass,  
12 dB/octave high pass

Below is a chart of S.I.P. values which can be used for changing the factory preset crossover points for the Reference200s.

FREQUENCY	RESISTOR VALUE	COLOR CODE
53 Hz	30 K Ω	Green-Green
73 Hz	22 K Ω	Green-White
89 Hz	18 K Ω	
107 Hz	15 K Ω	Violet-Green
145 Hz	11 K Ω	Violet-White
195 Hz	8.2 K Ω	
286 Hz	5.6 K Ω	
485 Hz	3.3 K Ω	
800 Hz	2.0 K Ω	



**NOTE:** The following formula may be used to determine values in creating “custom” resistor packs. The frequency is equal to 1,600,000 divided by the individual resistor value, or  $1,600,000 / R \text{ ohms} = X \text{ Hz}$ . To make a custom S.I.P., use 4 identically valued resistors of 2% or tighter tolerance. See the drawing of the S.I.P. for more information.

Example:  $1,600,000 / 22,000 = 73 \text{ Hz}$