



SB-200
OPERATORS MANUAL



SB-200

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A HARTZELL CORPORATION COMPANY

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Speakers carry a one year warranty from date of purchase.

Light bulbs, vacuum tubes and meters carry a 90 day warranty from date of purchase.

The following conditions apply to all **sunn** product warranties:

The purchaser is responsible for completing and mailing to **sunn**, within 15 days of purchase, the warranty application enclosed with each product. Upon receipt of the warranty application, **sunn** will issue a warranty validation sticker that must be affixed to the product. Where a warranty validation area has not been provided on a few **sunn**, products, the validation sticker is to be affixed to your original proof of purchase and presented at the time of warranty service. **Proof of Purchase On Unregistered Equipment Is Not Sufficient for Receiving In-Warranty Service.** In the event you do not receive your validation sticker within 60 days of mailing, you are to notify **sunn ELECTRONICS** in writing immediately. The purchaser has the sole responsibility for completing and mailing the warranty application.

sunn products that have been subject to accident, alterations, abuse, rental or defacing of the serial number are not covered by this warranty. Loudspeakers and drivers misuse due to overpowering or improper installation resulting in torn, burned or charred components will not be covered by this warranty.

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If your **sunn** product requires service during the warranty period, **sunn** will replace or repair, at its option, defective materials provided you have identified yourself as the owner of the validated product to any **sunn** authorized service center or contact **sunn** for assistance. Transportation charges to and from an authorized service center or factory for **sunn** products and components to effect repairs shall be the responsibility of the owner. In the event a product is to be returned to **sunn** for repairs, a written return authorization from **sunn** must be obtained prior to shipping.

sunn is not liable for any incidental or consequential damage resulting from any defect or failure of this instrument other than the repair of the **sunn** product subject to the terms of this warranty. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state. This warranty is expressly in lieu of all other agreements and warranties, expressed or implied, except as may be otherwise required by law.

Thank you for choosing **sunn!**

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1. OVERVIEW.

1-1. INTRODUCTION.

sunn was founded over twenty years ago by a bass guitarist who was dissatisfied with the bass amplifiers that were commercially available at that time. He designed an amplifier that offered power and performance that set new standards for the music industry. In the years that have followed, **sunn** has made a tradition of producing industry standards. To maintain this tradition, **sunn** has had to remain sensitive to the changing needs of musicians. The SB200 is **sunn's** latest entry into the field of superior quality bass amplification. Like its predecessors, the SB200 has been carefully engineered to meet the needs of the times, and combines high power and sonic versatility with portability and rugged construction.

The SB200 offers wide tonal control through its **Normal** and **Brite** inputs, its contour filter and its active equalizer circuitry. An on-board compressor provides precise control over the dynamic range and sustain of the notes, and doubles as a "foldback limiter" to prevent clipping in the preamplifier stages. **Preamp Out** and **Power Amp In** jacks allow additional signal processing equipment and auxiliary power amplifiers to be added readily to the signal path. The built-in power amplifier can drive the self-contained 15" speaker to over 200 watts, and can provide up to 300 watts when additional speakers are connected to the speaker output jacks. The power amplifier also has its own limiter to prevent clipping in that section of the SB200. This combination of features results in an amplifier that offers the cleanest sound with the greatest headroom possible.

As you begin to unleash the power of the SB200, you will realize that **sunn** has never lost sight of its roots and has continued to produce bass guitar amplifiers that set new standards for the music industry. Regardless of your playing style, we are certain that you will be satisfied with the years of superior service you will receive from the SB200.

1-2. FEATURES

- **Normal** and **Brite** inputs.
- Input gain control to aid in achieving optimum signal to noise ratio.
- A compressor to control the dynamic range of the bass guitar's sound, and to increase the sustain of the notes.
- A "foldback limiter" that minimizes signal distortion due to clipping in the preamplifier.
- A contour filter which, when selected, adds a bass and treble boost to the bass guitar's signal.
- A four-band equalizer whose frequency ranges are specially tailored to the bass guitar.
- A master level control that allows the volume of the amplifier to be varied without altering the overall sound.
- A "preamp out/power amp in" patch loop that permits external effects and auxiliary amplifiers to be added to the SB200's signal path. The preamplifier output jack may also be used as a direct send to a recording console or to the mixing console of the main PA system.
- A 300 Watt power amplifier.
- A limiter that senses distortion originating in the power amplifier and reduces the power amplifier sensitivity just enough to eliminate the distortion.
- A loudspeaker specially-designed for high power bass guitar operation, mounted in a ported enclosure.
- Extension loudspeaker jacks.

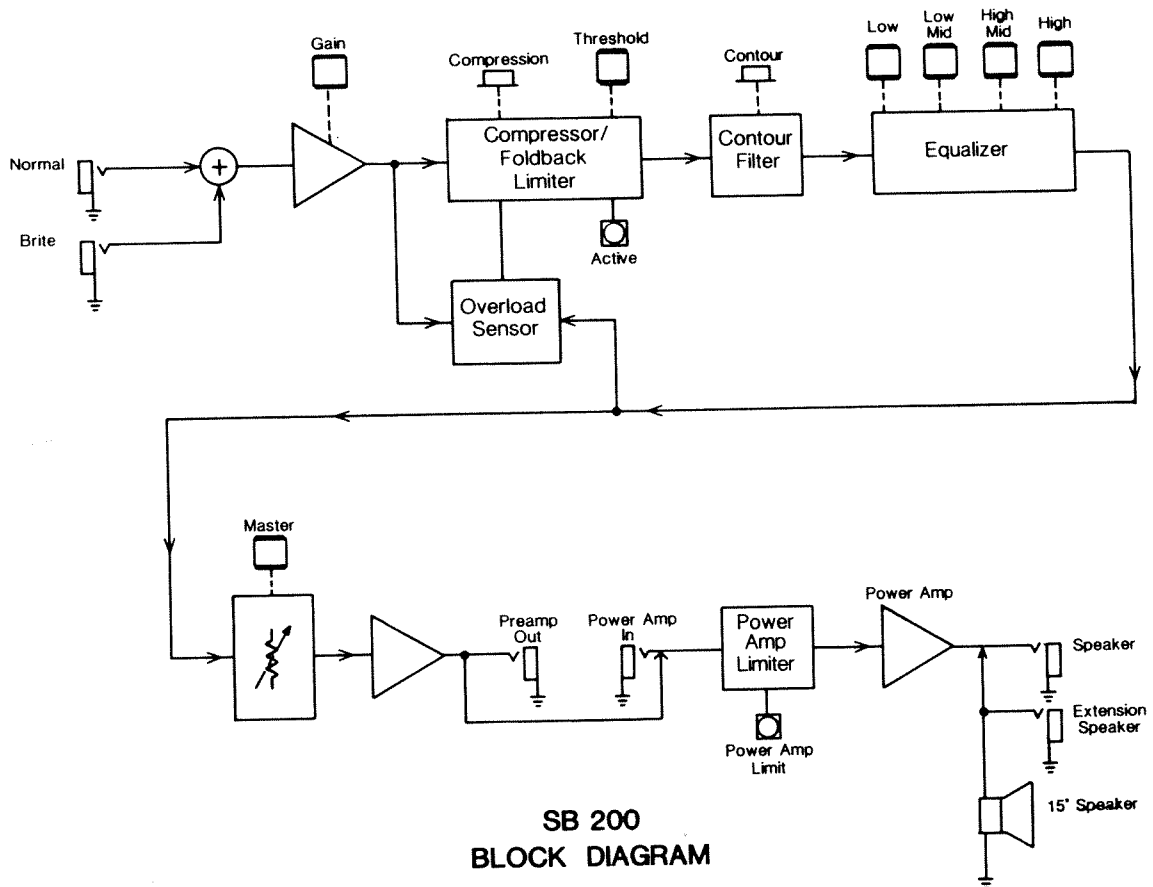


FIGURE 1

1-3. CIRCUIT DESCRIPTION AND BLOCK DIAGRAM.

The Block Diagram of the SB200 is shown in **Figure 1**. Refer to this as you read the following circuit description.

The signal from the bass guitar enters the SB200 through either the **Normal** or **Brite** input jack; use of the **Brite** jack boosts the guitar's higher frequencies (those above 500 Hertz). The signal is then amplified to a level determined by the **Gain** control. The **Gain** control is useful for obtaining the best signal to noise ratio and works with the compressor to provide the desired signal sustain.

From the input gain stage, the signal passes through the compressor. When the compressor is activated by the **Compression** switch, the signal level is monitored by the compression control amplifier. Signal levels exceeding a level set by the **Threshold** control cause the gain of the compressor to be reduced, thereby reducing the signal level. Since hotter signals reach the threshold level sooner, they experience compression and sustain.

The compressor also works to prevent signal distortion within the preamplifier section by acting as a "foldback limiter." The signal level is sensed at two different points in the signal chain, and when the signal level is excessive the compressor reduces the gain of the preamp, preventing harsh-sounding clipping distortion.

From the compressor, the signal passes through a special "contour" filter and on to a four stage equalizer which uses the same circuitry employed in professional graphic equalizers. The contour filter and the equalizer controls allow the player to shape the frequency response of the signal to bring out the guitar's best qualities and to create the type of sound required by the musician.

The output of the equalizer circuitry goes to the **Master** level control and preamp output stage where it passes through the **Preamp Out** and **Preamp In** jacks to the power amplifier.

At the input of the power amplifier is a power amp limiter which senses distortion occurring within the power amplifier itself. When such distortion is detected, the limiter reduces amplifier gain just enough to eliminate the distortion. **A Power Amp Limit LED** lights to give the user visual indication of the limiter's action.

The power amplifier develops the power needed to drive the loudspeaker(s).

The SB200 has a specially-designed high-power bass speaker built into its ported enclosure. In addition, two output jacks allow additional speakers to be added as required.

1-4. SPECIFICATIONS.

Input Sensitivity:

Normal Input: 400 microvolts RMS (**Gain, Master** at 10;
Compressor, Contour off; EQ controls at 0)
Power Amp In: 1 VRMS

Input Impedance:

Normal Input: 40 K ohms
Brite Input: 40 K ohms at 500 Hz.
Power Amp In: 10 K ohms

Preamp Output Impedance: 150 ohms

**Minimum Recommended
Speaker Load Impedance:** 2 ohms total

Maximum Gain Available: 92 dB

Equalization:

Brite Input: 500 Hz corner frequency, +3 dB @ 1 kHz., +10 dB
@ 10 kHz.
Contour: +6 dB @ 60 Hz., -3 dB
@ 500 Hz., +10 dB @ 5 kHz.
Low: 62.5 Hz. center frequency, +/- 15 dB
Low Mid: 250 Hz. center frequency, +/- 15 dB
High Mid: 1 kHz. center frequency, +/- 15 dB
High 4 kHz. center frequency, +/- 15 dB

Power Amp Thd: less than 1%, 20 Hz to 20 kHz

Power Amp lmd (SMPTE): less than .05%

Output Power: 200 W. @ 4 ohms, 300 W. @ 2 ohms

Loudspeaker: **sunn** Model 81-0144, 8 ohms, 15", 200 W.

Shipping Weight: 70 lbs., 31.7 kg.

Dimensions:

Height	X	Width	X	Depth
25"		24"		13"
63.5 cm.		61.0 cm.		33.0 cm.

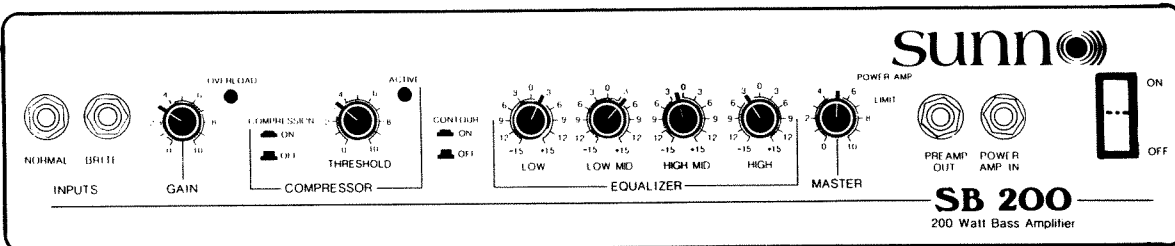


FIGURE 2

2. FRONT PANEL JACKS, CONTROLS and LEDs. Refer to **Figure 2** for the locations of the jacks and controls described in the following paragraphs.

2-1 INPUT JACKS.

2-1-1. **NORMAL INPUT.** For a “flat” frequency response, plug your guitar cord into the **Normal** input. Always use guitar cords of the highest possible quality.

2-1-2. **BRITE INPUT.** When the bass guitar is plugged into this input, the signal receives a boost in the higher frequencies (above 500 hz). Again, for best results, use only high quality guitar cords.

2-2. **GAIN CONTROL.** The **Gain** control determines the gain of the input stage. To achieve the best signal to noise ratio (s/n) this control should be adjusted as high as possible without causing overload in later gain stages. Monitor the **Overload LED** for indication of excessive level (see Section 2-3).

Note: The **Gain** control interacts with the compressor, since it determines the signal level present at the compressor’s input. This interaction can be used to your advantage when you desire more signal sustain. For more information, see Section 2-4 and Section 5.

2-3. **OVERLOAD LED.** The **Overload LED** is driven by circuitry which senses the signal level at two different points in the SB200 preamplifier: at the output of the first gain stage (the input stage) and at the output of the Equalizer. Excessive signal levels, which can be the cause of signal distortion, cause the **Overload LED** to light. When the **LED** first lights, approximately 6 dB of headroom remains before clipping occurs. Thus, occasional flashes of the **LED** are not causes for concern. However, if the **LED** lights frequently or remains lit continuously, distortion due to clipping is probably occurring, and the signal level should be reduced. Signal level reduction is usually accomplished by turning down the **Gain** control, but since excessive gain in the **EQ** can also be the culprit, lowering **EQ** settings can also reduce distortion.

2-4. COMPRESSOR. The **Compressor** circuitry serves a dual role: it adds compression to the signal, and it acts as a “foldback limiter.”

In its role as a compressor, it reduces signal peaks and boosts lower level portions of the guitar’s signal. This process has the effect of increasing the sustain of the bass guitar’s signal, raising the average volume of the guitar, and at the same time keeping the peak volume to a chosen level. The compressor is turned on and off with the **Compression** switch (see Section 2-4-1).

As a foldback limiter, the compressor circuitry monitors the signal in the same places as the **Overload LED** driver; when excessive levels are detected, the foldback limiter reduces the amplifier gain to minimize distortion. Note that the foldback limiting function is always active. That is, it is not affected by the position of the **Compression** switch.

2-4-1. COMPRESSION SWITCH. Pressing this switch activates the compressor. The switch does not affect the foldback limiting.

2-4-2. THRESHOLD CONTROL. This control sets the level at which the signal begins to be affected by the compressor circuit. Turning the control clockwise lowers the threshold, increasing the degree of compression and sustain. When the signal exceeds the level set by the **Threshold** control, the signal experiences a “compression ratio” of 2:1. That is, for every two volts that the signal level at the input of the compressor increases, the signal level at the output of the compressor increases one volt.

2-5. CONTOUR SWITCH. When the “push on/push off” style **Contour** switch is in its “in” (depressed) position, the signal passes through a filter that boosts the low and high frequency portions of the bass guitar’s spectrum. This selective boosting imparts a quality to the sound that many bass guitarists appreciate. Whether or not you use it is a matter of your own personal taste.

2-6. EQUALIZER. The Equalizer employs the same high quality circuitry employed by **Sunn’s** graphic equalizers. This circuitry gives the bass guitarist precise control of the sound of his instrument. Each band of the Equalizer provides up to 15 dB of cut or boost within its frequency range. The filters in the Equalizer are broad-banded and combine with each other smoothly, avoiding annoying peaks and valleys in response present in many designs.

NOTE: If possible, avoid extreme **EQ** settings, as such settings are often the cause of distortion and unwanted limiting.

2-6-1. LOW. The **Low** control is centered at the low end of the bass guitar range, 62.5 Hz. (The low E on a bass guitar is tuned to 41.25 Hz.) This filter primarily affects frequencies below 125 Hz.

2-6-2. LOW MID. The **Low Mid** Equalizer section is centered on 250 Hz, and has the greatest affect on frequencies from 125 Hz to 500 Hz.

2-6-3. HIGH MID. The **High Mid** section of the Equalizer is centered on 1 KHz, covering the range from 500 Hz to 2 kHz.

2-6-4. HIGH. The **High** section of the Equalizer is centered on a frequency of 4 kHz and primarily affects frequencies above 2 kHz.

2-7. MASTER LEVEL CONTROL. The **Master** control determines the level of the signal sent to the Power Amplifier. The **Master** level control also governs the signal level at the **Preamp Out** jack (see Section 2-9).

2-8. POWER AMP LIMIT LED. The power amplifier in the SB200 has a built-in limiter that responds to signal distortion occurring within the amplifier. When such distortion occurs, the power amp limited reduces amplifier gain just enough to eliminate the distortion. The **Power Amp Limit LED** lights to inform you of this condition. Occasional flashes of the **Power Amp Limit LED** are normal, but if the **LED** lights frequently or continuously, the **Master** level control, the **Gain** control, or both should be turned down.

2-9. PREAMP OUT JACK. An unbalanced line level preamp output signal is available from this jack. This jack follows the **Master** level control in the signal path, and thus the signal level present at this jack can be adjusted with the **Master** knob. The **Preamp Out** jack can be used to drive an external effect (phase shifter, equalizer, etc.), with the **Power Amp In** jack used for the signal return. The **Preamp Out** jack may also be used as a direct send to the mixing console of the main PA system of recording setup, or it can be used to drive an auxiliary power amplifier or crossover when more power is needed. See Section 4 for more information on patching the SB200 to other equipment.

Note that inserting a plug into the **Preamp Out** jack does not interrupt the normal flow of the signal from the preamplifier to the power amplifier.

2-10. POWER AMP IN JACK. Inserting a 1/4" plug into this jack interrupts the normal signal flow, and only signals carried by the plug enter the power amplifier. This allows an external signal processing device, such as an equalizer or crossover to be patched between the **Preamp Out** jack and the **Power Amp In** jack. For patching examples, see Section 4.

2-11. AC POWER SWITCH. This lighted rocker switch controls the SB200's AC power.

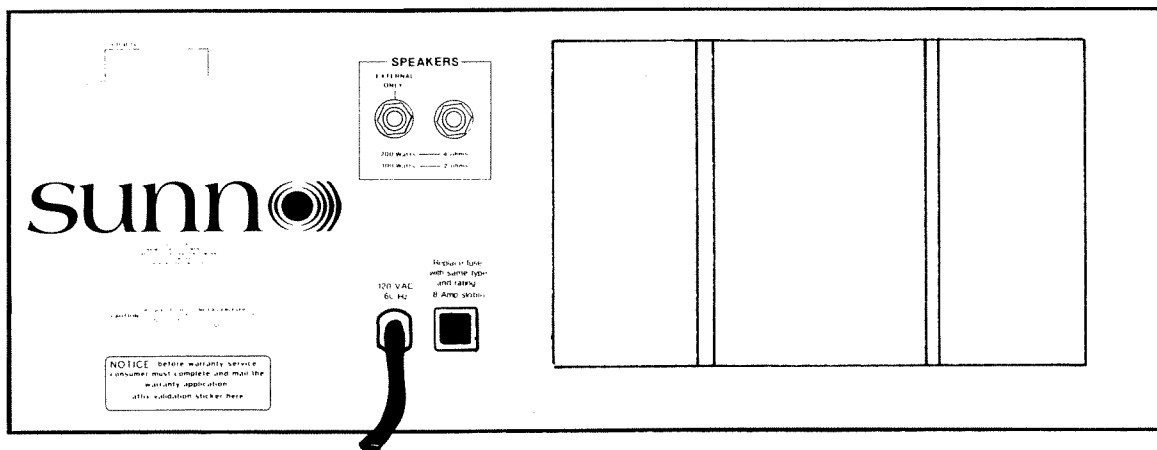


FIGURE 3

3. BACK PANEL JACKS, FUSE, POWER CORD AND HEATSINK. For reference, the back panel connectors are illustrated in **Figure 3**.

3-1. OUTPUT JACKS. The two output jacks allow external loudspeakers to be plugged into the SB200. Your choice of jacks depends on whether or not you want the internal speaker to remain connected.

NOTE: For best results, use 16 gauge or heavier zip cord for your speaker cable. Do not use a guitar cord as a speaker cable, as it is not heavy enough to handle the current being supplied to the loudspeaker.

3-1-1. SPEAKER OUTPUT. Plugging a speaker into this jack puts it in parallel with the SB200's internal speaker, with both loudspeakers being active.

CAUTION: The combined impedance of the SB200's speaker load must not be below 2 ohms. Since the SB200's internal speaker has an impedance of 4 ohms, the impedance of a speaker plugged into the **Speaker Output** should be no lower than 4 ohms. See Section 4-6 for further information.

3-1-2. EXTERNAL SPEAKER OUTPUT. When a loudspeaker is plugged into this jack, the SB200's internal speaker is disconnected and the external speaker operates alone.

CAUTION: Never plug a speaker or set of speakers into the **External Speaker Output** of the SB200 if the total loudspeaker impedance is lower than 2 ohms. See Section 4-6 for more information.

3-2. FUSE. This is the SB200's AC power fuse. If it blows, turn the amplifier off and remove the fuse by pushing a small screwdriver or bent paper clip into the slot located at the top of the fuse holder. The cap of the fuse holder should release and pop partially out, bringing the fuse with it. Remove the fuse and replace it with another fuse of the same type and rating.

If the fuse blows repeatedly, verify that your speaker cords are not shorted, and that the total impedance of the loudspeakers is no lower than 2 ohms (see Section 4-6 for information concerning speaker impedance). If the cord(s) and speaker(s) are OK, there may be a problem in the amplifier. Because there are no user-serviceable parts in the SB200, such problems should be referred to qualified service personnel.

3-3. POWER CORD. The power cord employs a standard PBG (parallel blades plus ground) three prong plug. The ground prong is there for your protection and should remain in an operable condition.

Warning! Do not remove the grounding prong of the AC plug. To do so risks exposure to potentially lethal voltages and voids the warranty.

3-4. HEATSINK. The heatsink carries the heat produced by the power amplifier to the outside air. The heatsink is designed to provide adequate cooling to the amplifier under most circumstances. It will be unable to provide proper cooling, however, if its fins are covered. It is important, therefore, not to drape coats, etc., over these fins.

It is normal for the heatsink to be fairly hot. If you believe the amplifier is running too hot (for example, when the amp is being used in extremely hot environments), a fan may be directed at the heatsink to increase cooling.

4. PATCHING. There are three basic methods of patching external equipment into the SB200: inserting a signal processing device between the guitar and the guitar input; inserting a line level signal processor in a patch loop between the **Preamp Out** jack and the **Power Amp In** jack; and connecting an SB200 output to external equipment without returning the signal to an SB200 input.

The following subsections describe several patching possibilities:

4-1. PATCHING AN EFFECT BETWEEN THE GUITAR AND INPUT JACK. Any low level (guitar-level) signal processing device, such as a phase shifter, digital delay or distortion device, can be inserted in the signal path between the bass guitar and one of the two guitar inputs. Run a guitar cord from the bass guitar to the input of the signal processor, and run a second guitar cord from the signal processor output to either the **Normal** or **Brite** input.

4-2. ADDING AN AUXILIARY POWER AMP TO THE SB200. As illustrated in **Figure 4**, a power amplifier can be added to supplement the output power of the SB200 by connecting a shielded cable from the **Preamp Out** jack to the input jack of the external power amplifier. Because the use of the **Preamp Out** jack does not interrupt the signal flow within the SB200, the SB200's internal amplifier continues to operate normally.

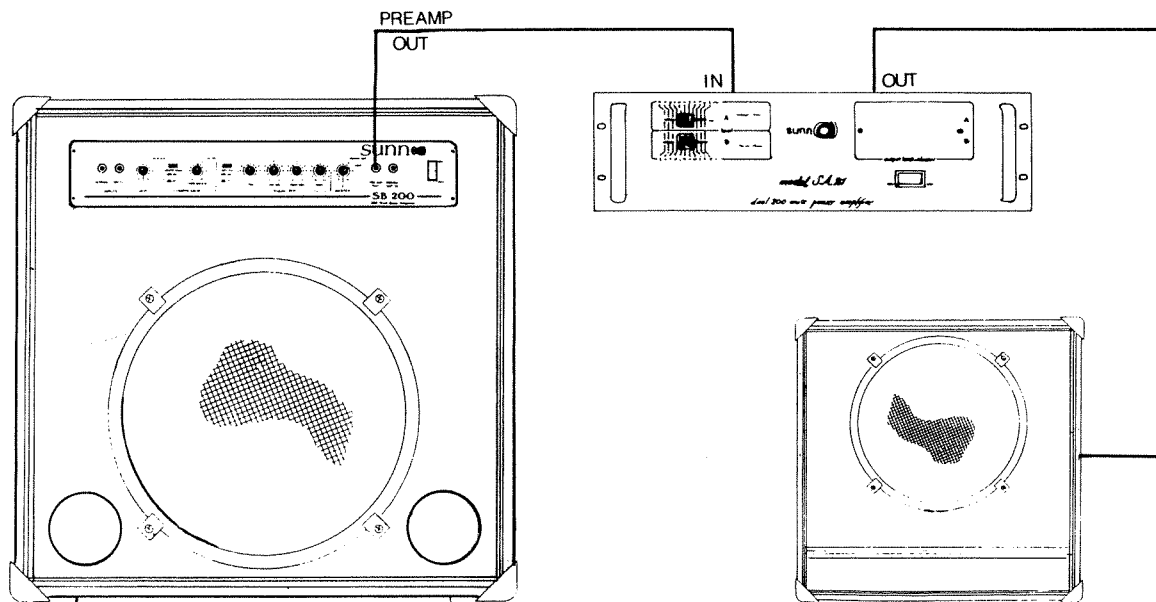


FIGURE 4

4-3. USING THE PREAMP OUT JACK AS A DIRECT SEND. The **Preamp Out** jack can be used to provide a line level unbalanced send from the preamplifier to a mixing console. If you use this feature, use only the highest quality shielded patch cable. If the signal must travel more than 25 feet, it is advisable to use a balancing transformer, such as **SHURE** Model A95UF, and standard balanced microphone cable. Doing so will minimize hum pickup and signal loss.

4-4. ADDING A LINE LEVEL EFFECT IN A PATCH LOOP. **Figure 5** shows how to insert a line level effect, such as an equalizer, digital delay or limiter, into the signal path. The signal from the SB200 preamplifier passes from the **Preamp Out** jack to the input of the external effect, and from the output of the effect the signal is returned to the SB200 power amplifier via the **Power Amp In** jack.

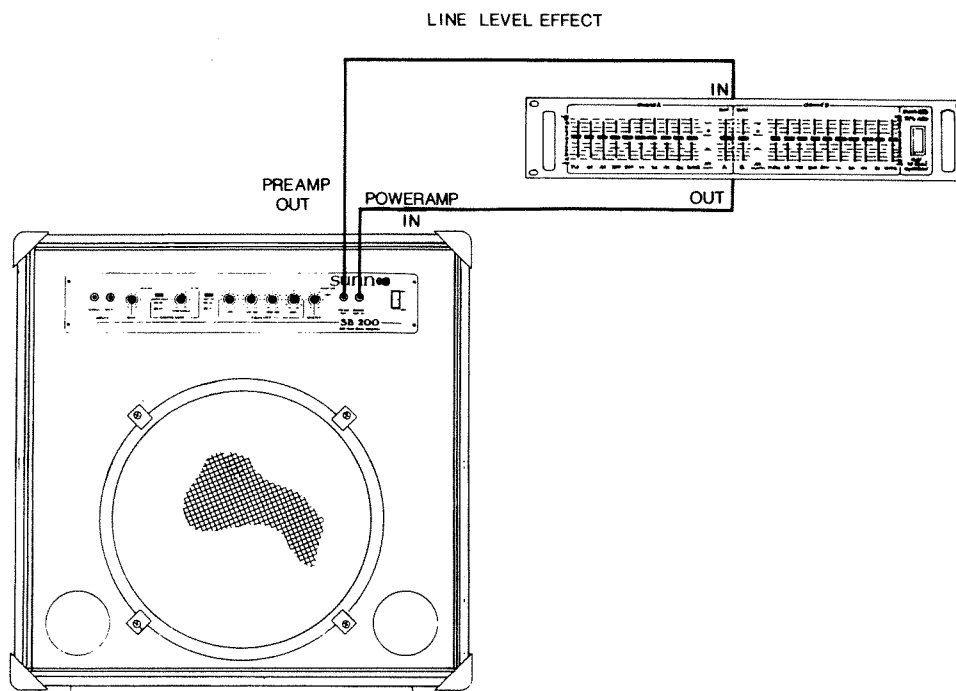


FIGURE 5

Note that the signal levels present at the **Preamp Out** jack generally range from one to ten volts RMS. At these levels, guitar level effects (the small battery-powered devices usually patched between a guitar and the input of an amplifier) would overload and distort the signal. Therefore, it is important that only devices designed for line level operation be used in the manner shown in **Figure 5**. Check the owner's manual of the device to verify its suitability in this application.

4-5. BI-AMPING THE SB200. Many bass guitarists like to bi-amplify their bass system. In a bi-amplified system, the signal is divided into two or more frequency ranges and each range is sent to its own amplifier and loudspeaker. **Figure 6** illustrates how this can be done with the SB200.

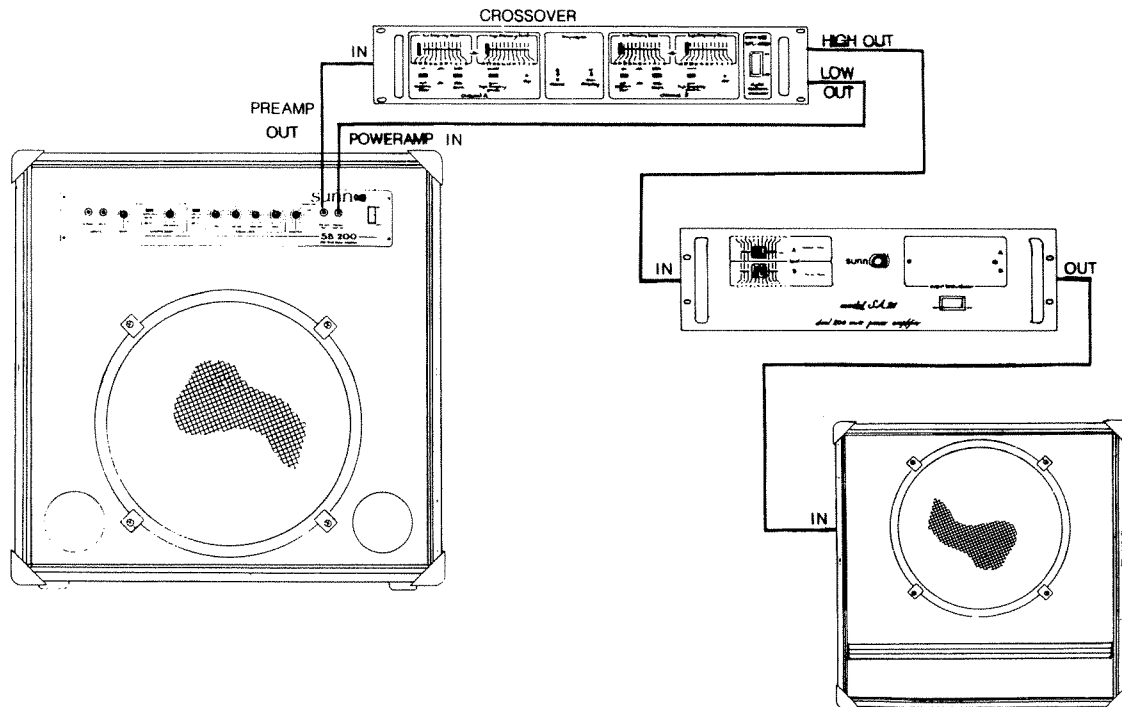


FIGURE 6

A patch cord connects the **Preamp Out** jack to the input of the crossover, and the low frequency output of the crossover is returned to the SB200 through the **Power Amp In** jack. The SB200's internal power amplifier then drives the bass speaker in the bi-amplified system. The high frequency output of the crossover goes to the input of an auxiliary power amplifier, and the high frequency speakers are connected to the output of the amplifier.

4-6. PATCHING EXTENSION SPEAKERS INTO THE SB200. The use of an outboard speaker or speakers with the SB200 was described in Section 3-1. Summarizing, there are two speaker jacks: If the one labeled "**External**" is used, the internal speaker is disconnected and all power is delivered to the external speaker; when only the other speaker output jack is used, the SB200's internal speaker remains active.

Whenever you use external speakers with the SB200, it is **important** that the total impedance of the speakers is no lower than 2 ohms. The following formulas can be used to calculate the speaker load impedance:

* For speakers connected in series,

$$R_t = R_1 + R_2 + \dots + R_n,$$

where R_t is the total impedance of the load, and R_1, R_2, \dots, R_n are the impedances of each of the individual speakers.

* For speakers connected in parallel,

$$R_t = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \dots + \frac{1}{R_n}}$$

where R_t is the total impedance of the load, and R_1, R_2, \dots, R_n are the impedances of the individual speakers.

When you use only the speaker jack that keeps the internal SB200 speaker active, the external speaker will be connected in parallel with the internal one. Because the internal speaker has an impedance of 4 ohms, the total impedance of the external speakers must not be lower than 4 ohms.

5. OPERATING HINTS.

The SB200 has been engineered for simple operation. Still, it is a versatile amplifier, and a little exploration of its features will help you to realize its full potential.

To gain familiarity with the SB200's tonal possibilities, first plug your instrument into the **Normal** input jack, set the Equalizer controls "flat" (straight up, pointing toward "0"), and try the **Contour** switch in both positions. Now do the same with the guitar plugged into the **Brite** input jack. This procedure should give you a good idea of the nature of the two input jacks and the **Contour** filter. Now try moving each of the Equalizer controls through its range to see what part of the sound spectrum they cover. When you have tried all of these controls and jacks, you should be able to find a combination that suits your guitar playing style.

The Compressor is subtle; it doesn't "breathe" like many lower cost outboard compressors. If you want more compression and sustain, try boosting both the **Gain** control and the **Threshold** control. Note that when the **Gain** control is boosted, you may have to back off on the settings of the Equalizer controls and the **Master** level control to avoid preamplifier overload.

For best signal to noise ratio (S/N), run the **Gain** control high and the **Master** level low.

Always keep an eye open for the two red **LEDs** on the front panel. Occasional flashes from these indicators is normal, but if either one lights frequently or remains lit, you should probably reduce the gain (see Sections 2-2 and 2-7).

6. UPKEEP AND SERVICE. The **Sunn** SB200 has been designed to provide you with years of trouble-free service. If, however, your amplifier should fail in any way, refer the problem to qualified service personnel, as there are no user-serviceable parts in the SB200. Contact your dealer for the location of the nearest Authorized **Sunn** Service Center.
