SPL 6800
OPERATOR'S MANUAL

19350 SW 89th Avenue

TUALATIN, OREGON 97062

A HARTZELL CORPORATION COMPANY

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1. OVERVIEW.

1-1. INTRODUCTION. Congratulations on your purchase of the SUNN SPL 6800 dual channel power amplifier. Combining precise digital control with state-of-the-art analog circuitry, the SPL 6800 stands at the cutting edge of amplifier technology. It has been carefully designed to meet the most critical demands of the professional sound engineer, to survive the punishment of heavy road use, and to provide reliable service that is at once powerful, versatile and simple to use.

The SPL 6800 has been designed to maintain safe operation for each of the thirty-two 250 watt power output devices. This is achieved by an automatic forced air cooling scheme which makes use of special high efficiency heatsinks. Independent temperature sensing of each channel's heatsink and digital control of the fan automatically increase the effective cooling as needed. If an extreme temperature condition should exist, the front panel TEMP light will come on and the overheated channel will be shut down until the temperature returns to a safe level.

Further protection for the amplifer is provided by S.O.A. (Safe Operating Area) current limiting, a unique protection method that continuously senses both output voltage and output current and keeps each output transistor operating within its ratings. This approach allows maximimum output power to be achieved with a minimum of distortion while providing a comfortable safety margin for the output devices. This, coupled with the employment of so many output devices, ensures the continued reliability of the amplifier even under the tortures of heavy use.

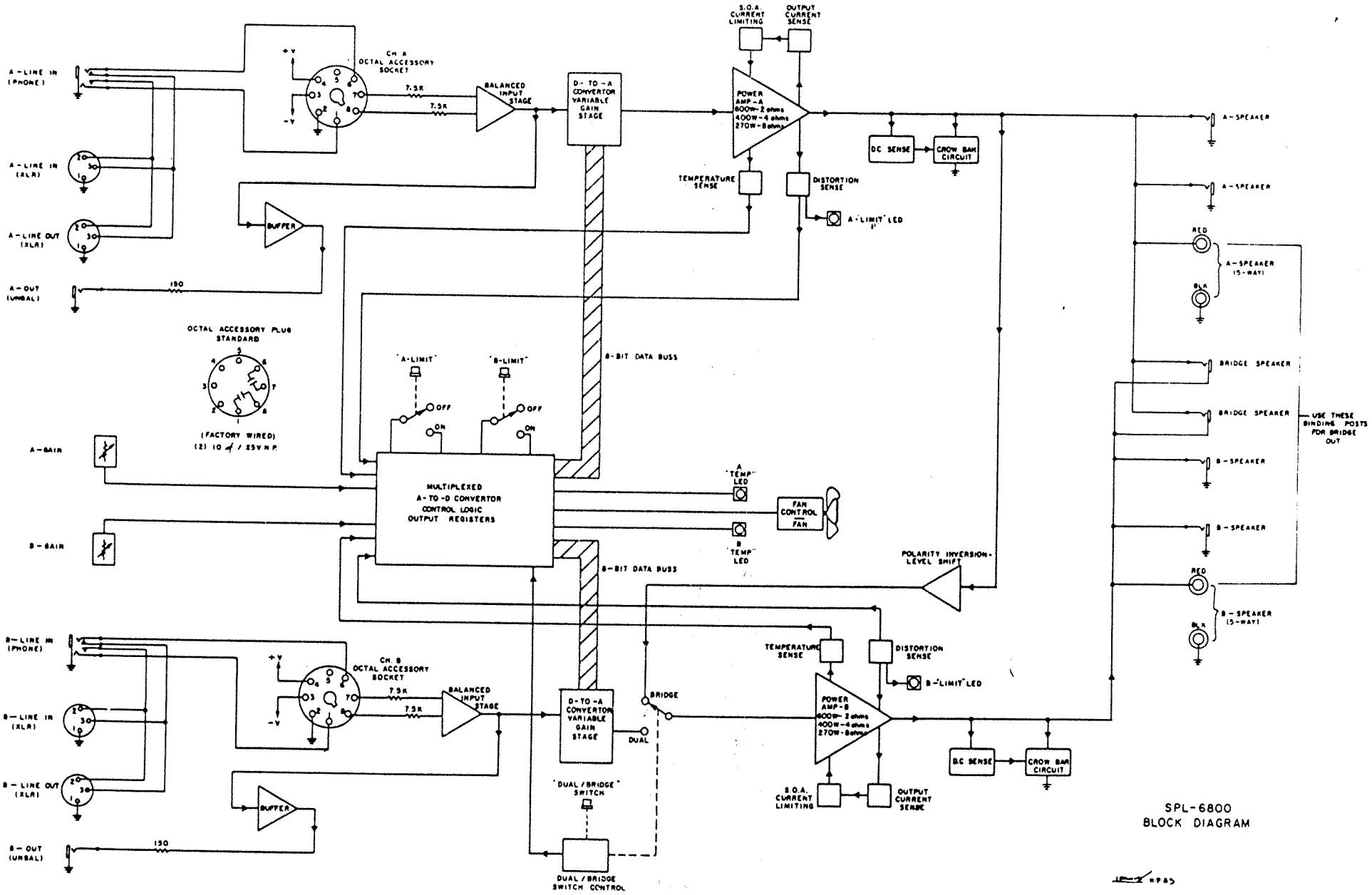
The distortion limiter in the SPL 6800 is an innovative digitally controlled system which senses amplifier error due to clipping, short circuit or improper load conditions, and automatically reduces the applied signal until the distortion is minimized. Indications of error or of the action of the limiter are displayed by each channel's front panel LIMIT light. If the limiter is activated by the front panel switch, clipping distortion and the high frequency energy which is often the cause of driver failure will be virtually eliminated.

Each channel of the SPL 6800 has DC sensing and crowbar circuitry that protects the speaker from a potential amplifier fault. Silent power-on sequencing eliminates speaker thumps by delaying the applied signal until the input transients have settled.

In its DUAL (stereo) mode, the SPL 6800 is a very powerful two channel amplifier. In its MONO/BRIDGE mode, the two channels operate in tandem to deliver even greater power to the load.

Expansion jacks and accessory plugs enhance the versatility of the SPL 6800. These include buffered line level output jacks which permit other power amplifiers to be paralleled easily with the SPL 6800 in larger sound systems; and an octal accessory connector on each channel that allows the channel to be reconfigured for transformer input balancing, or to include an integral passive or active crossover or subsonic filter as required by the application.

In using the SPL 6800, you will appreciate the careful and thorough engineering that make this amplifier the flagship of SUNN's professional power amplifier line. We hope you will use it with confidence and pride for many years to come.


A-LINE IN (PHONE)
A-LINE IN (XLR)
A-LINE OUT (XLR)
A-OUT (UNBAL)
CH. A OCTAL ACCESSORY SOCKET
+V
-V
7.5K
7.5K
BALANCED INPUT STAGE
BUFFER
150
D-TO-A CONVERTOR VARIABLE GAIN STAGE
S.O.A. CURRENT LIMITING
OUTPUT CURRENT SENSE
POWER AMP-A 600W-2 ohms 400W-4 ohms 270W-8ohms
TEMPERATURE SENSE
DISTORTION SENSE
DC SENSE
CROW BAR CIRCUIT
A-LIMIT LED
A-SPEAKER
A-SPEAKER
RED
BLK
A-SPEAKER (5-WAY)
BRIDGE SPEAKER
BRIDGE SPEAKER
USE THESE BINDING POSTS FOR BRIDGE OUT
B-SPEAKER
B-SPEAKER
RED
BLK
B-SPEAKER (5-WAY)
OCTAL ACCESSORY PLUG STANDARD
(FACTORY WIRED)
(2) 10 uf / 25V N.P.
"A-LIMIT"
"B-LIMIT"
OFF
ON
8-BIT DATA BUSS
A-GAIN
B-GAIN
MULTIPLEXED A-TO-D CONVERTOR CONTROL LOGIC OUTPUT REGISTERS
"A TEMP" LED
"B TEMP" LED
FAN CONTROL FAN
POLARITY INVERSION-LEVEL SHIFT
B-LINE IN (PHONE)
B-LINE IN (XLR)
B-LINE OUT (XLR)
B-OUT (UNBAL)
CH. B OCTAL ACCESSORY SOCKET
BRIDGE
DUAL
"DUAL/BRIDGE" SWITCH
DUAL/BRIDGE SWITCH CONTROL
B-"LIMIT" LED
SPL-6800
BLOCK DIAGRAM

1-2. FEATURES.

* Electronically balanced inputs (transformer balancing optional via octal accessory plugs).
* Silent AC power switching, delayed turn-on.
* Switch selectable dual or mono/bridge operation.
* Independent temperature sensing on each channel.
* DC crowbar protection on outputs.
* Selectable digitally controlled distortion-sensing limiter.
* Turbulent flow heatsink design.
* Automatic forced air fan cooling.
* Front panel channel temperature lights.
* Front panel channel limiter lights.
* Dual circuit breaker AC mains protection.
* Detented rotary channel level controls with recessed aluminum knobs.
* Massive custom handles on front, protection handles on rear.
* Line level balanced expansion jacks (male XLR style).
* 1/4" phone expansion jacks (in/buffered out).
* Standard octal accessory patching (for transformer balancing, active or passive crossovers, selectable subsonic filtering, etc.).
* 5 way binding posts for channel outputs, arranged for easy bridging.
* 1/4" phone speaker outputs (2 for each channel).
* 1/4" phone mono/bridge outputs (2 each).
* Lighted power switch.

1-3. BLOCK DIAGRAM AND TRUTH TABLES. The Block Diagram of the SPL 6800 is shown on the preceding page. The following Truth Tables indicate the functions of the LEVEL controls, LIMITER switches, TEMP and LIMIT LEDs and the Limiters in both the DUAL (stereo) mode and the MONO/BRIDGE mode.

TRUTH TABLE
DUAL (STEREO) OPERATION

CONDITION	RESULT	TEMP LED	LIMIT LED	COMMENTS
Level control rotation	Varies channel gain	N/A	N/A	11 Detents, 256 steps
Distortion sensed, LIMIT switch OFF	Distorted output	N/A	N/A	
Distortion sensed, LIMIT switch ON	Gain reduced until distortion is minimized	N/A	N/A	See Note 1 below
Heatsink temp. reaches 50° C.	Fan starts	Off	N/A	Fan stops when temp falls to 35° C.
Heatsink temp. reaches 100° C.	Channel shuts off, fan remains on	On	N/A	Channel comes back on when temp. falls to 80° C.

TRUTH TABLE
MONO/BRIDGE OPERATION

CONDITION	RESULT	CH. A TEMP LED	CH. A LIMIT LED	CH. B TEMP LED	CH. B LIMIT LED	COMMENTS
A Level control rotation	Varies bridge mode gain	N/A	N/A	N/A	N/A	11 Detents, 256 steps
B Level control rotation	No effect	N/A	N/A	N/A	N/A	
Distortion sensed, A LIMIT switch OFF	Distorted output	N/A	ON	N/A	ON	See Note 2 below
Distortion sensed, A LIMIT switch ON	Gain reduced until distortion is minimized	N/A	ON	N/A	ON	See Notes 1 and 2 below
B LIMIT switch ON or OFF	No effect	N/A	N/A	N/A	N/A	
Either heatsink temp. reaches 50° C.	Fan starts	Off	N/A	Off	N/A	Fan stops when BOTH heatsinks fall below 35° C.
Ch. A heatsink reaches 100° C.	Amplifier shuts off, fan remains on	On	N/A	Off	N/A	Amplifier comes back on when temp. falls to 80° C..
Ch. B heatsink reaches 100° C.	Amplifier shuts off, fan remains on	Off	N/A	On	N/A	Amplifier comes back on when temp. falls to 80° C..

NOTE 1. Limit switch has no effect when amplifier is not distorting.
NOTE 2. If one channel limits at a substantially different level than the other (MONO/BRIDGE mode only), the probable cause is an improper, unbalanced or grounded load. Correct the problem before continuing operation.

1-4. CIRCUIT DESCRIPTION. For the following circuit description, it is useful to refer to the block diagram (Figure 1). This description is fairly technical- if you are not technically inclined you may want to skip to the next section of the manual. To facilitate discussion, the subject has been broken into three parts: the SPL 6800 in DUAL mode; the SPL 6800 in MONO/BRIDGE mode; and the Digital Control Circuitry as it is used in each mode.

1-4-1. DUAL (STEREO) MODE. In the DUAL mode, the two channels function identically and independently. For this reason the operation of only one channel will be described.

A signal enters the amplifier by way of either the 1/4" phone INPUT jack or the female XLR INPUT jack. Either jack may be used with balanced input signals. Unbalanced signals require the use of a mono 1/4" phone plug and the 1/4" jack; the stem of the plug shorts the inverting half of the input to ground, unbalancing the input circuit. Whenever the 1/4" jack is employed, the XLR connector is removed from the circuit.

The input signal passes through the octal accessory plug which normally sets the low frequency cutoff point of the amplifier but optionally may provide transformer input balancing. A crossover or subsonic filtering may also be implemented through the use of the accessory plug.

The signal passes on to a differential (electronically balanced) input amplifier, the output of which branches into two signal paths: one branch leads to a buffer amplifier which drives the 1/4" stacking output jack (useful for patching other power amplifiers in parallel with the 6800), and the second branch AC-couples the input signal to the rest of the power amplifier. A CMOS multiplying DAC (Digital to Analog Converter), chosen because it adds no measurable distortion or noise to the signal, sets the input sensitivity of the amplifier, and serves as the control element for the limiter. Use of the DAC eliminates the need to route the signal from the input stage to a front panel level control and back to the rest of the circuitry; such routing is often the source of excess hum. The DAC is controlled by the Digital Control Circuitry, described in detail in Section 1-4-3.

From the DAC the signal travels on to the power amplifier itself. This amplifier is fully complementary and fully differential from input to output, ensuring symmetrical drive and minimum distortion for both positive- and negative-going signal excursions. This circuit has been carefully engineered for stability under all realistic load conditions including capacitive loads.

The amplifier employs sixteen 250 watt output devices per channel, as well as extensive heat-sinking for maximum reliability. In addition, the SPL 6800 utilizes S.O.A (Safe Operating Area) current limiting, a unique protection method that constantly monitors both output voltage and output current. It adjusts the threshold of current limiting in response to the two parameters, keeping the output transistors safely within their ratings. Unlike the fixed current limiting employed by other manufacturers, this approach maximizes available output power, minimizes distortion due to premature current limiting under reactive load conditions, and provides a wide margin of safety for the output devices.

Also incorporated into the power amplifier are circuits which constantly measure heatsink temperature and watch for amplifier error due to clipping, shorted speaker cables, etc. Should amplifier error occur, the LIMIT LED will light and, if the Limiter is selected, limiting action will take place. The outputs of the temperature sensing and error-detection circuits go to the Digital Control Circuitry where appropriate corrective action is initiated (see Section 1-4-3).

An independent "crowbar" system monitors the output for DC and, if DC is present, it clamps the output to ground to protect the loudspeakers. In such cases, the power supply fuses and/or the circuit breakers will also open, providing further protection both for the amplifier and for the loudspeakers.

NOTE: Although the amplifier is AC coupled and shuts down in the presence of DC on the output, there are provisions on the circuit board for DC coupling if the application absolutely requires it. Consult SUNN before attempting the required modifications.

1-4-2. MONO/BRIDGE MODE. In the MONO/BRIDGE mode, the Channel B input jacks are disconnected. A signal is taken from the Channel A output, attenuated and inverted, and fed into the input of Channel B. This causes Channel B to produce a mirror image of Channel A's output. By connecting the load between the two outputs, the voltage swing is twice that avilable from a single channel, and greater power is delivered to the load.

1-4-3. DIGITAL CONTROL CIRCUITRY. The Digital Control Circuitry (or D.C.C) does the housekeeping for the SPL 6800. It contains a precision multiplexed 8-bit A/D (Analog to Digital Converter) which sequentially scans the level controls, temperature sensors and distortion monitoring circuitry, sampling each one approximately 700 times each second. In turn, the D.C.C. controls the gain of the amplifier, the actions of the limiter, and turns the cooling fan and temperature indicating LEDs off and on as needed. The specific actions of the D.C.C. depend upon whether the amplifier is in DUAL or MONO/BRIDGE mode.

In the DUAL mode, the D.C.C. senses the settings of both LEVEL controls A and B, converting these settings into 8-bit digital values which it then passes on to the proper DAC gain control elements.

When the Limiter is enabled, information from the distortion (amplifier error) sensing circuitry is integrated with the LEVEL control information. If distortion is occurring, the appropriate channel's gain is reduced just enough to eliminate the distortion. In this way, maximum undistorted output power is available from the amplifier at all times.

The D.C.C. also monitors the temperature of the heatsinks. When the temperature of either channel's heatsink reaches 50° C, the cooling fan comes on and remains on until the temperature falls below 35° C. If the heatsink temperature should rise to 100° C, the D.C.C. turns the channel's TEMP LED on and reduces the channel's gain to zero. This effectively shuts the channel off- it remains off until the temperature falls below 85° C.

In the MONO/BRIDGE mode, the D.C.C. monitors the Channel A LEVEL control to determine the amplifier's overall gain. If the Limiter is selected, distortion information from both Channels A and B combines with the LEVEL control information to set the amplifier's gain.

As before, the fan turns on at 50° C and off at 35° C. However, should either channel's heatsink reach 100° C, both channels are turned off until the temperature falls below 85° C. The TEMP LEDs indicate which channel(s) has actually overheated.

1-5. SPECIFICATIONS.

FREQUENCY RESPONSE:	+0/-0.5 dB, 20 Hz to 20 kHz, +0/-3 dB 5 Hz to 80 kHz.
DISTORTION:	THD less than .05% from 20 Hz to 20 kHz at 600 watts into 2 ohms. THD less than .05% from 50 Hz to 20 kHz at 400 watts into 4 ohms. THD less than .05% from 50 Hz to 20 kHz at 270 watts into 8 ohms. IMD less than .05% SMPTE at 400 watts into 4 ohms.
SLEW RATE:	30 volts per microsecond (dual mode), 60 volts per microsecond (bridged mode).
COMMON MODE REJECTION RATIO:	-80dB at 1kHz, -60dB at 20kHz.
DAMPING FACTOR:	Greater than 300, 20 Hz to 1 kHz at 8 ohms, dual operation only.
SIGNAL TO NOISE RATIO:	-105 dB from 400 watts, - 111dB from 800 W ANSI "A" WTD.
CROSSTALK:	-80 dB at 1 kHz.
INPUT SENSITIVITY:	1.0 V RMS.
MAXIMUM INPUT SIGNAL LEVEL:	8 V RMS.
LEVEL CONTROL RESOLUTION:	8 bits / 0.39%.
INPUT IMPEDANCE:	15 K ohms.

SPECIFICATIONS (continued)

LIMITER DYNAMIC RANGE:	42 dB.
MAXIMUM THD AT FULL LIMITING:	0.5%.
OUTPUT POWER:	Dual mode: 600 watts into 2 ohms, 400 watts into 4 ohms, 275 watts into 8 ohms. Bridge mode: 1200 watts into 4 ohms (continuous duty limited by 20 amp AC mains), 800 watts into 8 ohms, 400 watts into 16 ohms.
"POWER ON" TIME DELAY:	approximately 2 seconds.
POWER REQUIREMENTS:	120 VAC - 60 Hz Domestic (US-Canada), 20 amp maximum (2400 watts maximum). 240 VAC - 50/60 Hz (Export), 10 amp maximum (2400 watts maximum).
DIMENSIONS:	Height X Width X Depth (including handles) 7" 19" 19.75" 17.8 cm 48.3 cm 50.2 cm.
WEIGHT:	67 LBS. - 147.4 kg.

NOTE: SUNN is constantly striving to improve its products. In view of such improvements, all specifications are subject to change without notice.

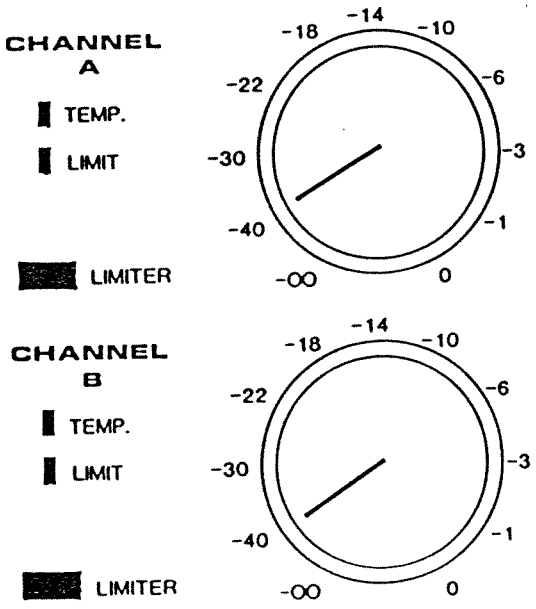


FIGURE 2

2. FRONT PANEL CONTROLS and LEDs

2-1. POWER SWITCH. This heavy duty lighted rocker switch controls the amplifier's AC power. Activating the POWER switch initiates a silent power-up sequence that prevents potentially damaging turn-on transients (pops and thumps) from reaching the loudspeakers. This sequence takes about two seconds to complete.

2-2. LEVEL CONTROLS. The two LEVEL controls are input sensitivity controls- that is, they determine what input signal level is required to achieve full output from the amplifier. With the controls all of the way up, a 1 V RMS input signal will drive the SPL 6800 to its full rated output. The LEVEL controls are tied into the Digital Control Circuitry, which divides the input sensitivity control range into 256 discrete steps, each step representing 0.39% of the total control range. The controls are detented so that settings may easily be repeated.

2-2-1. CHANNEL A LEVEL CONTROL. With the 6800 in DUAL mode (see Section 4-1-1), this control is the input sensitivity control for Channel A. With the 6800 in the BRIDGE mode (see Section 4-1-2), the CHANNEL A LEVEL control becomes the amplifier's sole level control.

2-2-2. CHANNEL B LEVEL CONTROL. With the SPL 6800 in the DUAL mode (see Section 4-1-1), the CHANNEL B LEVEL CONTROL determines the input sensitivity of Channel B. With the amplifier in the BRIDGE mode (see Section 4-1-2), this control is disabled, and the CHANNEL A LEVEL control becomes the amplifier's input sensitivity control.

2-3. LIMIT LIGHTS. Each channel has its own LIMIT light. The function of this light is two-fold: when a channel's limiter is not selected, that channel's LIMIT light indicates that distortion is taking place within the channel; with the LIMITER switch engaged, the LIMIT light indicates that limiting is taking place, preventing distortion.

When the amplifier is in the DUAL (stereo) mode, each LIMIT light indicates conditions occurring in its particular channel. With the amplifier in the MONO/BRIDGE mode, the CHANNEL A LIMIT light indicates the distortion and limiting status for the entire amplifier. See the TRUTH TABLE (Section 1-3) for a summary of LIMIT light action.

2-4. LIMITER SWITCHES. Each channel has an individually selectable limiter which monitors that channel's output and turns down the channel's input sensitivity when output distortion is detected. In this way, maximum undistorted output power is available from the amplifier at all times. The LIMITER switch is of the "push-on / push-off" variety; pushing the switch to its "in" position activates the limiter, and pushing the switch a second time (returning the switch to its raised position) deactivates the limiter.

When a limiter has been selected, the corresponding LIMIT LED indicates when limiting is actually occurring.

2-5. TEMP LIGHTS. When the temperature of a channel's heatsink reaches approximately 100° C, that channel's TEMP light comes on. With the amplifier in the DUAL (stereo) mode, that channel shuts down until the temperature returns to a safe level. In the MONO/BRIDGE mode both channels shut down until the overheated channel returns to a safe temperature; only that half of the amplifier which has overheated will have its TEMP light lit. See the TRUTH TABLE (Section 1-3) for a summary of TEMP light action.

If either channel should shut down due to overheating, no action is required to restore operation; the amplifier will automatically return to life when the temperature has fallen back into the safety zone. However, such overheating is not a normal condition, and generally indicates either that the amplifier is connected to an improper load (such as a shorted speaker cord, or a speaker system whose total impedance is too low), or that the airflow to the amplifier is severely restricted. In such cases steps should be taken to correct the condition.

NOTE: Although there is no front panel indication of this, the internal cooling fan automatically comes on when the heatsinks reach approximately 50° C, and turn back off at about 35° C. It is normal for the fan to cycle off and on.

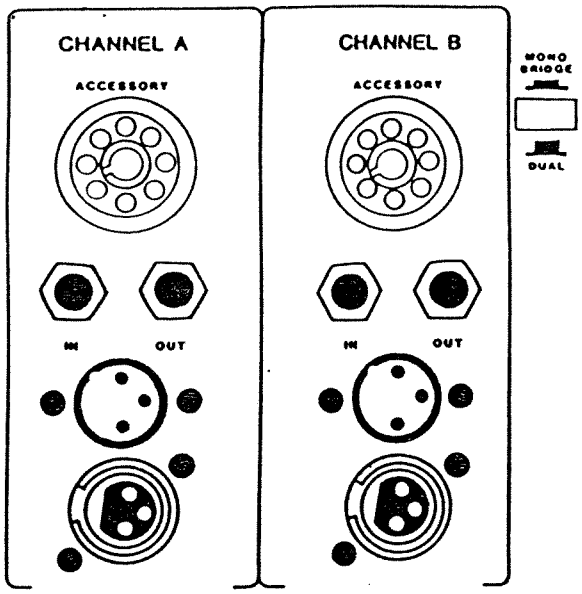


FIGURE 3

3. BACK PANEL JACKS, CIRCUIT BREAKER and POWER CORD.

3-1. 1/4" PHONE JACK INPUTS A and B. The two 1/4" INPUT jacks permit either balanced or unbalanced input signals to drive the SPL 6800. For balanced inputs, the input patch cable requires "stereo" style phone plugs wired according to the following convention (see Figure 4A):

The "tip" of the phone plug is the non-inverting, or "hot," contact,
The "ring" is the inverting contact, and
The "shell" is ground.

For unbalanced inputs, the input patch cable must employ a "mono" style 1/4" plug. In this case, the tip is hot and the shell is ground, as shown in Figure 4B.

When the amplfier is used in the DUAL (stereo) mode, each input drives its respective channel; in the MONO/BRIDGE mode, only INPUT A is used (see Sections 4-1-1 and 4-1-2).

The 1/4" and XLR INPUT jacks of each channel are wired in parallel; however, they cannot be used simultaneously for stacking, since use of the 1/4" jacks disconnects the XLR jacks from the input circuitry. For stacking, use the LINE OUTPUT jacks A and B (see Section 3-3).

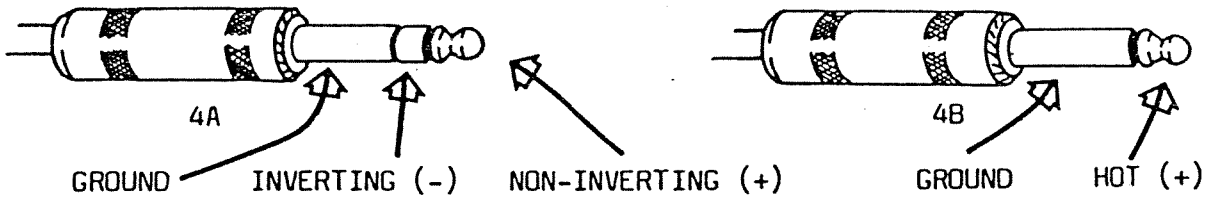


FIGURE 4

3-2. XLR (CANNON) INPUTS A and B. The two female 3-pin audio connectors, commonly referred to as "XLR" or "Cannon" connectors, are wired in parallel with the two 1/4" INPUT jacks A and B. They are intended for use with balanced input signals, and are wired according to the following convention:

Pin 1 is ground,
Pin 2 is the inverting input and
Pin 3 is the "hot," or non-inverting input.

When the amplfier is used in the DUAL (stereo) mode, each input drives its respective channel; in the MONO/BRIDGE mode, only INPUT A is used (see Sections 4-1-1 and 4-1-2).

Although the 1/4" and XLR INPUT jacks of each channel are wired in parallel, they cannot be used simultaneously for stacking, since use of the 1/4" jacks disconnects the XLR jacks from the input circuitry. For stacking, use the LINE OUTPUT jacks A and B (see Section 3-3).

3-3. LINE OUTPUTS A and B. Each channel of the amplifier has two LINE OUTPUT jacks: a 1/4" phone jack which provides a buffered unbalanced output and a male XLR jack whose output is balanced but unbuffered. These jacks allow multiple power amplifiers to be driven in parallel (stacked) when more power is needed. If you are using the 1/4" INPUT jack, the 1/4" LINE OUTPUT is available for patching to other amplifiers, and when the female XLR INPUT jack is used, both the male XLR and the 1/4" LINE OUTPUTS are available for use.

3-4. OCTAL ACCESORY SOCKETS. Each channel of the SPL 6800 has an octal accessory socket which provides a means of breaking the signal path between the balanced input stage and the rest of the amplifier, allowing the frequency response of the amp to be altered and permitting the addition of transformer balanced inputs and fixed crossovers. See Section 6-1 for additional information.

3-5. DUAL/BRIDGE SWITCH. With the DUAL/BRIDGE switch in its DUAL position (out), the SPL 6800 is a stereo amplifier, with its two channels functioning independently. With the switch in the BRIDGE position (in), the two channels function together as a single higher powered amplifier. For more information on these two modes, see Section 4-2.

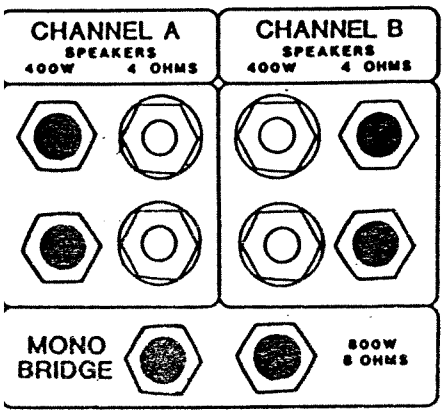


FIGURE 5

3-6. SPEAKER OUTPUTS. There are two styles of jacks for the SPEAKER OUTPUTS: 1/4" phone jacks and color-coded five-way binding posts. The phone jacks employ dual tip connections (custom-designed and manufactured for SUNN) for increased current handling and higher reliability. The five-way binding posts are spaced on standard 1" centers to mate with dual banana plugs, frequently used in professional installations.

3-6-1. DUAL (STEREO) MODE. In the DUAL mode, use the two 1/4" phone jacks and the red and black binding posts designated for each channel, making certain that the total load impedance is no lower than 2 ohms (see Section 4-6). Do not use a CHANNEL A or B OUTPUT and a BRIDGE OUTPUT at the same time.

3-6-2. BRIDGE (MONO) MODE. In the BRIDGE mode, output should be taken from the two 1/4" phone jacks marked "BRIDGE" and from the two red binding posts. It is important that NEITHER side of the speaker load is connected to ground- the speaker output is taken from the two HOT (red) binding posts and/or the two 1/4" BRIDGE OUTPUTS. The total load impedance should be no lower than 4 ohms (see Section 4-6). Do not use a CHANNEL A or B OUTPUT and a BRIDGE OUTPUT at the same time.

WARNING!! When the amplifier is in the BRIDGE mode, up to 90 V RMS may be present at the speaker outputs; this represents a potential shock hazard. Exercise great care when working around these outputs, and turn the amplfier all of the way down or, preferably, off when connecting and disconnecting loudspeakers.

3-7. CIRCUIT BREAKERS. There are two circuit breakers on the back panel of the SPL 6800. Generally if one of the circuit breakers opens both will open. Before resetting them, make sure that all output connections are correct, and turn down the LEVEL controls. The circuit breakers are reset by pushing on their center buttons.

The two ten amp circuit breakers permit a total of 2400 watts to be drawn by the power amplifier. This is adequate for most situations. However, continuous operation of the amplifier in the DUAL mode with 2 ohm loads, or in BRIDGE mode with a 4 ohm load at high duty cycles may cause the 20 amp combined rating of the circuit breakers and power cord to be exceeded. If such operation is necessary, it is recommended that the amplifier be rewired for 240 volt operation. This must be done by a qualified service technician. SUNN is not responsible for the costs incurred in making such a change.

3-8. POWER CORD. The power cord is rated at 20 amps, allowing the power amplifier to draw a total of 2400 watts. In cases where more continuous power is needed, the amplifier may be rewired for 240 volt operation, as mentioned in Section 3-7.

4. OPERATION.

4-1. SETUP. Interconnect the various portions of your sound system and double-check all connections. Before turning anything on, verify that the power amplifier level controls are turned completely down and that its inputs and outputs are wired correctly for the chosen mode (DUAL or MONO/BRIDGE- see Section 4-2); then turn on everything but the power amp. Finally, apply power to the SPL 6800. The pilot light in the power switch should come on.

Set the level controls of all portions of your sound system (mixers, EQ's, etc.) to their normal positions. Next, slowly turn up the power amplifier and listen for hum and buzz. If either is heard, recheck all connections in the sound system and correct any problems. Finally, increase the level controls on the SPL 6800 until the required output power is achieved. If the limiter is not engaged, the LIMIT lights should remain off; if they flicker, turn down the amplifier's level controls or engage the limiter.

4-2. DUAL AND MONO/BRIDGE OPERATION. The SPL 6800 has two basic modes of operation: stereo (DUAL mode) or higher-powered mono (MONO/BRIDGE mode).

4-2-1. DUAL (STEREO) OPERATION. To operate the 6800 as a two-channel amplifier, set the DUAL/BRIDGE switch to the DUAL position (out), patching the input cable for Channel A to one of the Channel A INPUT jacks and the input cable for Channel B to one of the Channel B INPUT jacks. If your input signal is balanced, either the XLR connector or the 1/4" phone jack may be used; for unbalanced signals use the 1/4" phone jack (see Sections 3-1 and 3-2).

The Channels A and B LEVEL controls now determine the input sensitivity of their respective channels. Likewise, the Channels A and B Limiters and LIMIT LEDs also serve their respective channels. See the TRUTH TABLE, Section 1-3, for a summary of the functions of all LEDs and switches.

Connect the speaker cables either to one red and one black binding post on each channel, or to the 1/4" jacks labeled "A" or "B." The total load impedance should be no lower than 2 ohms on either channel (see Section 4-6).

Do NOT connect a speaker between the two red binding posts or to the jacks labeled "MONO/BRIDGE" when the amp is in the DUAL mode.

Note: The Channels A and B 1/4" output jacks and the corresponding binding posts are wired in parallel. Both the jacks and the binding posts may be used simultaneously provided the combined load impedance is no lower than 2 ohms on either channel (see Section 4-6).

4-2-2. MONO/BRIDGE OPERATION. By pushing the DUAL/BRIDGE switch so that it stays in the BRIDGE position (in), the SPL 6800 is reconfigured as a single amplifier with twice the output power. The Channel A input jacks then become the inputs for the entire amplifier. Channel B internally receives an inverted version of this signal, causing the Channel B output to go negative as the Channel A output goes positive and vice-versa. By connecting the loudspeakers between the two channel outputs, a greater voltage swing, and hence more power, is made available to the speakers.

In this mode, the input cables should be patched to one of the Channel A input jacks; use either the 1/4" or the XLR jack for balanced input signals, or the 1/4" jack for unbalanced signals (see Sections 3-1 and 3-2).

The Channel A LEVEL control is now the sole level control for the amplifier, and the Channel A Limiter also serves the entire amplifier. See the TRUTH TABLE, Section 1-3, for a summary of the functions of all front panel LEDs and switches.

Connect the speaker cables either to the two red binding posts (the Channel A terminal is the non-inverted, or "hot" terminal) or to the 1/4" jacks labeled "BRIDGE." The amplifier's total load impedance should be no lower than 4 ohms (see Section 4-6).

Do NOT connect a speaker to either of the black binding posts or to the 1/4" phone jacks labeled "A" or "B" when the amp is in the BRIDGE mode. Also make certain that no inadvertant ground connection is made between the speakers and the amplifier through the amplifier's equipment rack.

Note: The 1/4" output jacks labeled "BRIDGE" and the two red binding posts are wired in parallel. Both the jacks and the binding posts may be used simultaneously provided the combined load impedance is not lower than 4 ohms (see Section 4-6).

4-3. LIMIT LEDs AND LIMITERS. When The Limiter is not selected, the LIMIT LEDs flash whenever distortion is detected within the amplifier. The high frequency component of such distortion is often the cause of loudspeaker failure. For this reason, the input levels should be set to minimize the flashing, or the Limiter should be engaged (the recommended approach).

Because of its unique design, the action of the Limiter is nearly transparent. There are two reasons for this transparency. First, the Limiter only reduces the gain far enough to eliminate the distortion. Second, the gain-reduction occurs in the same DAC used by the level control; thus, no additional circuitry (and hence no additional noise or distortion) is added to the signal path when the limiter is employed. When using the Limiter, levels should still be adjusted to minimize the flashing of the LIMIT LEDs. This prevents unnecessary "squashing" of the signal through excessive limiting.

4-4. STACKING. In many sound reinforcement applications it is necessary to drive more than one power amplifier with the same input signal. This is easily accomplished with the SPL 6800 using its LINE OUTPUT jacks.

A buffered unbalanced signal is available from the 1/4" phone LINE OUTPUT jack. Patch from this jack to the unbalanced inputs of the additional amplifiers using shielded unbalanced cable.

If you are using the female XLR INPUTS, an unbuffered balanced signal is available from the male XLR connector. Use balanced shielded cable to patch to the balanced inputs of additional amplifiers. If you are using the 1/4" INPUT jack, the male XLR LINE OUTPUT will be disconnected from the circuit and will be unavailable for use.

4-5. WIRES AND CABLES.

4-5-1. INPUT CABLES. In any professional sound system, balanced lines should be used wherever possible. Balancing minimizes stray-field interference, such as triac buzz and noise from electric motors. If the equipment driving the power amplifier has only unbalanced outputs, a balancing transformer, such as Shure Model A95UF, may be used to balance the output. This will ensure maximum common-mode noise rejection and allow the sound system to perform at its best.

If you must use unbalanced lines to drive the amplifier, keep them as short as possible, and make certain that the source impedance (the output impedance of the equipment driving the power amp) is low (600 ohms or less). Keep the unbalanced cables as far as possible from AC power mains, lighting cables and speaker wires.

4-5-2. SPEAKER CABLES. Use two conductor zip cord to connect the amplifier outputs to your speakers. The gauge of the wire is important; wire that is too light in gauge causes a loss in damping factor (the ability of the amplifier to control the motion of the speaker) and also consumes power (the power from the amplifier heats up the wire instead of driving the speakers). Use Figure 6 to choose the proper gauge of wire for your particular situation.

Speaker Wire Length	2	4	*8	16 ohms
100' - Up	8	10	12	14
50 - 100'	10	12	14	16
*25 - 50'	12	14	*16	18
10 - 25'	14	16	18	18
0 - 10'	16	18	18	18

Speaker Impedance

*Example - The length of speaker wire required is between 25 and 50 feet and the speaker impedance is 8 ohms. The minimum recommended gauge speaker wire is 16 gauge.

FIGURE 6

4-6. CALCULATING SPEAKER IMPEDANCES. To calculate the impedance that results from wiring speakers in series and parallel, use the chart and/or the mathematical formulas listed in Figure 7.

CHART A
Parallel Impedance

$$RT = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} \ldots \frac{1}{R_t}}$$

Cabinet B Impedance	2	4	8*	16
16	1.8	3.2	5.3	8
8	1.6	2.7	4	5.3
4*	1.3	2	2.7*	3.2
2	1	1.3	1.6	1.8

Cabinet A Impedance

*Example - Cabinet A is 8 ohms, Cabinet B is 4 ohms. The total impedance when connected in parallel is = $\frac{1}{\frac{1}{8} + \frac{1}{4}}$ = 2.7 ohms.

FIGURE 7

CHART B
Series Impedance

$$RT = R_1 + R_2 \ldots R_t$$

Cabinet B Impedance	2	4*	8	16
16*	18	20*	24	32
8	10	12	16	24
4	6	8	12	20
2	4	6	10	18

Cabinet A Impedance

*Example - Cabinet A is 4 ohms. Cabinet B is 16 ohms. The total impedance when connected in series is = 4 + 16 = 20 ohms.

4-7. OPERATING HINTS AND PRECAUTIONS.

1. Avoid subjecting the SPL 6800 to moisture, rain and spilled drinks.
2. Use care in patching all connections in the sound system. Incorrect patching can cause noise problems and component failure.
3. Make all connections in the sound system before turning on the power amplifier.
4. The power amplifier should always be the LAST unit in the sound system to be turned on, and the first one to be turned off. This protects the loudspeakers against damage from turn-on and turn-off pops generated by other equipment in the sound system.
5. Do not operate the amplifier with the top cover removed.
6. Never parallel the two amplifier output channels together, either directly, or indirectly by connecting to the same speaker.
7. Do not connect a speaker output directly to ground.
8. Driving the power amplifier continuously into clipping is very hard on speakers and should be avoided.
9. An amplifier as powerful as the SPL 6800 is capable of destroying almost any loudspeaker. SUNN IS NOT LIABLE FOR DAMAGE CAUSED BY OVERPOWERING THE LOUDSPEAKERS.
10. Keep all microphone and line level signal cables away from AC power cords, lighting cables and speaker wires.
11. Make certain that the line voltage is within 10% of that specified for the amplifier.
12. Domestic versions of the SPL 6800 (those manufactured for use in the U.S.A. and Canada) are equipped with a three prong AC plug. In applications where a grounded AC outlet is not available, use a three prong to two prong adapter and find a suitable ground for the ground wire on the adapter. DO NOT REMOVE THE GROUND PRONG.
13. When the amplifier is in the MONO/BRIDGE mode, as much as 90 VRMS may be present at the outputs. Exercise CAUTION when working around these terminals and around the speakers. Keep the amplifier turned down or off when changing these connections.

5. MECHANICAL CONSIDERATIONS. Every effort was made to make the SPL 6800 as rugged and roadworthy as possible. Still, the amplifier represents quite an investment, and mounting it in a good equipment rack will help to protect that investment. SUNN Model R7, R10 and R17 are all acceptable options, as are many racks offered by other manufacturers. Because the amplifier is heavy (an understatement), it should be mounted at the bottom of the rack if possible. Rear supports are also recommended. These may be attached to the rear protection handles if desired.

Adequate ventilation MUST be provided for the SPL 6800; the rear and sides of the amplifier must be left unobstructed if proper cooling is to take place. If several amplifiers are mounted in the same rack, additional cooling fans may be necessary.

6. OPTIONS.

6-1. OCTAL ACCESSORY PLUG OPTIONS. As mentioned in Section 3-4, the octal accessory plugs offer a means of altering the frequency response of the amplifier, or adding transformer balancing to the input. The pinout of the octal socket is accurately shown in the Block Diagram (Figure 1) and repeated here for convenience (Figure 7).

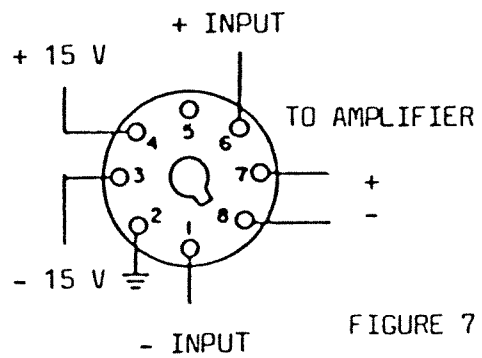


FIGURE 7

Regulated +/- 15 volts DC is available from pins 4 and 3, respectively, of the socket. Pin 2 is ground. The non-inverting signal from the input jacks appears at pin 6 and the inverting input signal appears at pin 1. The non-inverting input to the amplifier is through pin 7 of the socket and pin 8 is the inverting input to the amplifier.

6-1-1. CHANGING THE LOW FREQUENCY CUTOFF POINT. The factory-installed octal plug contains two ten microfarad bipolar electrolytic capacitors which set the low frequency -3 dB point of the amp to approximately 2 Hz. For different low-frequency rolloffs, other capacitors may be chosen according to the following formula:

$$C = \frac{1}{.04712 \times F}$$

Where C = the value of each of the two capacitors in microfarads, and
F = the desired low frequency -3 dB point of the amplifier.

Use only high quality bipolar capacitors.

Due to time constants built into the crowbar output protection circuit, corner frequencies lower than 2 Hz are not recommended. If DC coupling or extremely low frequency AC coupling is absolutely necessary, contact SUNN for modification instructions.

6-1-2. ADDING TRANSFORMER BALANCED INPUTS TO THE SPL 6800. The pinout of the octal accessory socket is compatible with several commercially available plug-in balancing transformers. Among these are ALTEC Models 15335 and 15335A and SESCOM Model R-8. There are probably others that will work as well. However, before using other transformers, compare their pinouts with the pinout of the octal accessory socket to assure compatibility.

6-2. REWIRING FOR 240 VOLT OPERATION. The power transformer in the SPL 6800 was designed to accommodate 240 VAC operation. This is advantageous in situations where continuous operation of the amplifier at high duty-cycles with low impedance loads (2 ohms per channel in DUAL mode or 4 ohms in MONO/BRIDGE mode) is necessary. For information on how to modify the amplifier for such operation, contact SUNN.

7. UPKEEP AND SERVICE. The SUNN SPL 6800 has been engineered to provide years of trouble-free use, provided the amplifier is given adequate physical protection and ample ventilation. However, if a problem should arise, refer it to qualified service personnel, as there are no user-serviceable parts in the SPL 6800. Contact your dealer for the location of the nearest Sunn Authorized Service Center.

8. SUNN MUSICAL EQUIPMENT COMPANY'S LIMITED WARRANTY.

SUNN Musical Equipment Company warrants this new product to be free from defective materials and workmanship for one year from date of purchase to the original owner when purchased from an AUTHORIZED SUNN DEALER according to the following conditions:

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 Musical Equipment Company in writing immediately. The purchaser has the sole responsibility for completing and mailing the warranty application.

Meters, meter light bulbs, vacuum tubes and lighting fixtures carry a 90 day warranty from date of purchase. There is no warranty on gels or lamps used in portable lighting systems.

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.

The normal wear and tear of appearance items such as handles, corners, casters and knobs are not covered under this warranty.

If your SUNN product requires service during the warranty period, SUNN will repair or replace, 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 service 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 damages 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!