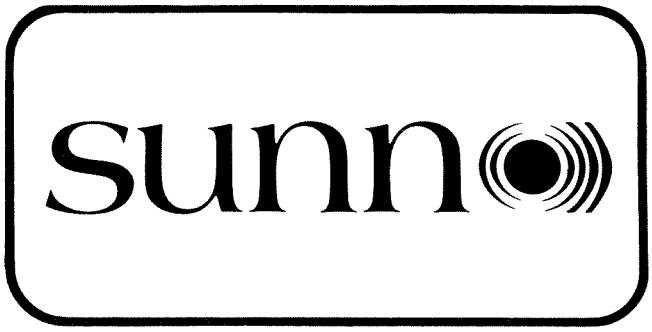
SA POWER AMPLIFIERS

OPERATOR'S MANUAL



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OPERATOR'S MANUAL

Sunn Electronics
19350 S.W. 89th
a Hartzell Corporation Company
Tualatin, Oregon 97062

INTRODUCTION

A superior quality audio power amplifier is distinguished by its quietness, clarity and dependability. Careful design and construction insure that these qualities are present in every **sunn** SA series amplifier. These amplifiers make use of a fully complementary direct-coupled symmetrical design which balances the drive throughout the amplifier and into the load. This design maximizes linearity, permitting the use of very low internal feedback and resulting in excellent transient response and low distortion.

Superior quality is also assured by inclusion of a temperature-sensitive bias control which maintains thermal stability over a wide operating range. Also, an overall DC integrator guarantees minimum DC offset and eliminates offset variations with time and temperature. Further, each channel has its own independent, self-protected low voltage regulated power supply to reduce crosstalk and maintain stability over a wide range of AC power line voltages.

Also integrated into the design is a distortion sensor that detects and indicates distortion due to clipping, short circuit or improper load conditions. The red limit indicator lights when these distortion conditions occur. Normal operation is shown with a green indicator.

The SA series power amplifiers are equipped with circuit-breaker protection on the AC power line, internal supply fusing and an electronic power limiting circuit that protects the amplifier under short circuit conditions. These features, along with a conservative power and heat design, assure that your SA power amplifier will operate reliably even under the most demanding conditions.

Other features of the SA power amplifier include a quiet cooling fan, DUAL (stereo) or BRIDGE (mono) operation, parallel input jacks and individual channel level controls. The SA 11 and SA 21 also feature balanced input jacks and a highly visible fluorescent output level display.

UNPACKING.

Your SA series power amplifier has been packed in a protective container. Keep this packing container and the protective foam end supports for any further shipping needs. After unpacking the amplifier, check it for any damage that might have occurred during shipment. If such damage has occurred, contact your dealer, as only he can initiate a claim with the carrier for shipment damage. Be sure to save the packing container as evidence of damage for the carrier's inspection.

INSTALLATION.

The SA series power amplifiers have been designed for mounting in an E.I.A. standard 19" rack.

Regardless of where the amplifier is located, make certain that it receives adequate air flow to prevent overheating. In portable applications, heavier units should be mounted near the bottom of the rack to provide a lower center of gravity for better stability.

INPUT CONNECTION - DUAL MODE (STEREO).

The SA 10 and SA 20 power amplifiers are equipped with unbalanced input phone jacks. Each channel has two input jacks wired in parallel, either of which may be used for the signal input. The unused jack is then available for patching the signal to the other channel of the amplifier, to a separate power amplifier, or to a signal processing accessory. Shielded cable should be used for all power amp input patching. The length of all unbalanced cables should be kept to a minimum and should be routed as directly as possible to the power amp inputs. When operating the SA amplifier in stereo, the DUAL-BRIDGE switch should be placed in the DUAL Position.

The SA 11 and SA 21 power amplifiers come with balanced 3-pin audio connector input jacks (commonly referred to as "Cannon" or "XL" connectors) and balanced 1/4" stereo phone jacks. These jacks are wired in parallel and will accept either a balanced or unbalanced line input. As with the unbalanced input jacks, either balanced input jack of each pair may be used as an amplifier input, and the remaining jack is available for patching to another power amplifier or accessory input. When patching between two power amplifiers in a balanced line system, use 2-conductor shielded cable with either 1/4" stereo phone or 3-pin audio connectors (depending upon which style of jack is available for patching).

BRIDGE MODE (MONO).

To operate your SA amplifier in the BRIDGE mode, place the DUAL-BRIDGE switch in the BRIDGE position. The CHANNEL A input jack then becomes the amplifier input and the CHANNEL B input is internally disconnected. Connect the speakers to the BRIDGE OUTPUT jack. The amplifier will now behave as a single higher-powered amplifier.

OUTPUT CONNECTIONS - DUAL MODE (STEREO).

To operate in the DUAL (stereo) mode, the DUAL-BRIDGE switch should be in the DUAL position. Both channels in the SA series power amplifier are equipped with two output phone jacks wired in parallel. The signal from the jacks should be connected to your speaker system. Each channel in the SA series power amplifiers can safely drive loads as low as 2 ohms. Loads having an impedance of less than 2 ohms can cause the circuit breaker to open and should be avoided.

BRIDGE MODE (MONO).

When using the SA series power amplifier in the BRIDGE mode, place the DUAL-BRIDGE switch in the BRIDGE position. Use the output jacks on the back panel labeled BRIDGE OUTPUT. Do not make any speaker connection to the jacks used in the dual output mode. The minimum speaker load that the SA power amplifier can safely drive in the bridge mode is 4 ohms, and any load below 4 ohms should be avoided.

CAUTION: High voltages are present at the bridge outputs. Care should be taken to avoid contact with the plug tip and shaft while the amplifier is activated.

SPEAKER LOADS

The following two charts show what the total impedance will be when connecting 2 speaker cabinets in parallel or in series. Chart A shows the impedance that will result when connecting two cabinets in parallel and Chart B shows the resulting impedance when two cabinets are connected in series. An example is given with each chart, and the mathematical formula used to derive the total impedance is also shown.

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 is parallel is $= \frac{1}{\frac{1}{8} + \frac{1}{4}} = 2.7$ ohms.

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.

SPEAKER WIRE

In the selection of two-conductor speaker wires it is important to keep the series resistance added by the wire to a minimum in order to retain the highest possible damping factor. The following chart shows the minimum gauge speaker wire that should be used, depending upon the length of wire and the impedance of the speaker load. The smaller the wire gauge number, the larger the wire size.

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.

OPERATION

OPERATING HINTS AND PRECAUTIONS

1. Avoid subjecting this unit 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 be the last unit in the sound system to be turned on. It should also be the first unit turned off. This prevents any turn-on and turn-off pops generated by other units in the sound system from reaching the loudspeakers.

5. Do not operate this unit 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. Any high power amplifier is capable of destroying almost any loudspeaker. **sunn** IS NOT LIABLE FOR ANY 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.

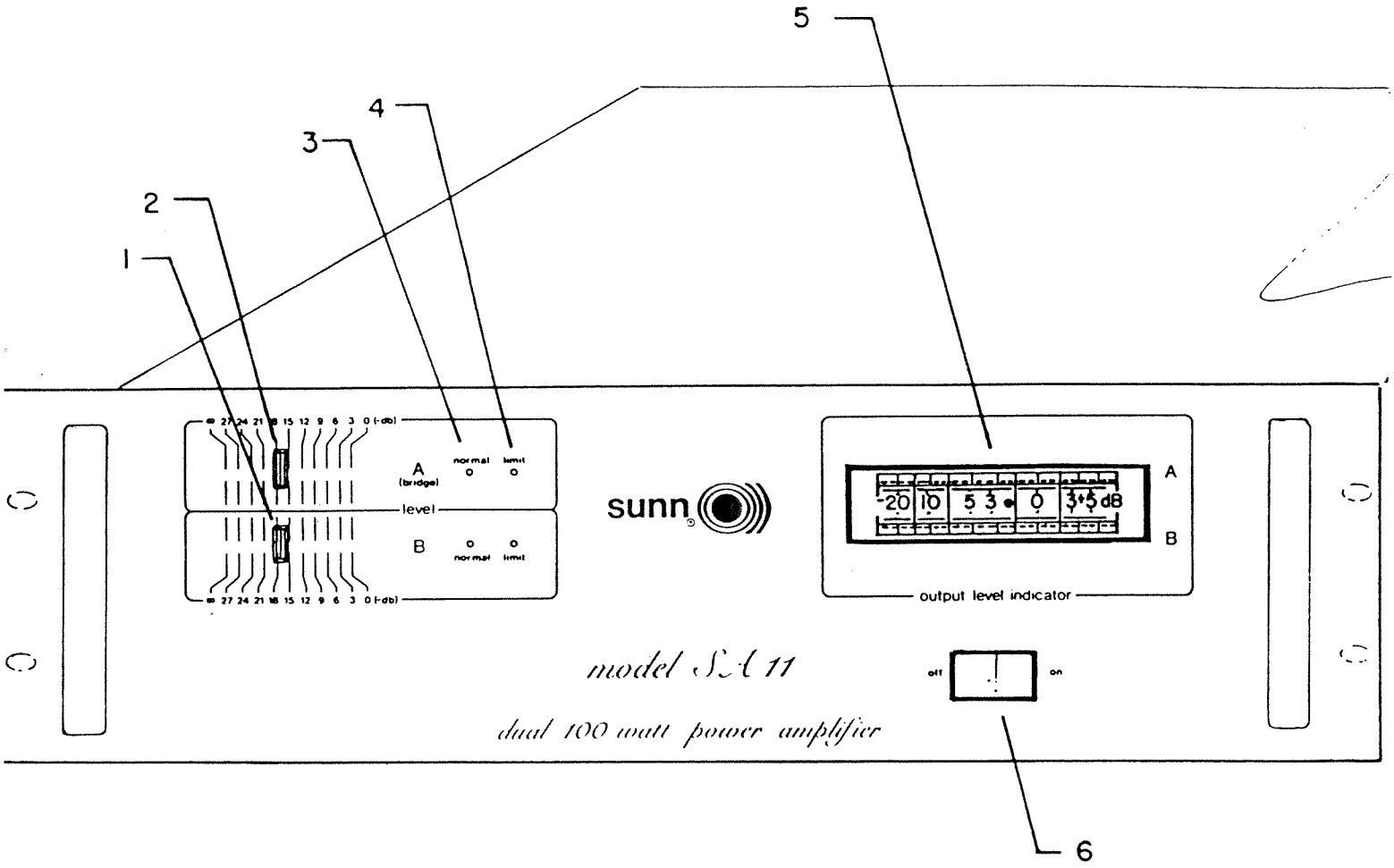
11. Operate domestic amplifiers (US-Canada) from 60Hz AC mains of not more than 10% above or below the specified line voltage. 50/60Hz operation approved for export units only.

12. Domestic units 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.

SET UP AND OPERATION

After assuring that all portions of the sound system are properly connected and that the power amplifier level control is turned all the way down, turn on everything but the power amp. Now, apply power to the power amp. The normal green LED indicator light should come on.

Set the level controls of all units in your sound system (mixers, EQ's, etc.) to their normal positions. Next, raise the level of the power amplifier to mid position and check for hum and buzz. If hum or buzz is heard, check all connections in the sound system and correct any problems. Finally, increase the level on the power amplifier to the necessary operating level.


5
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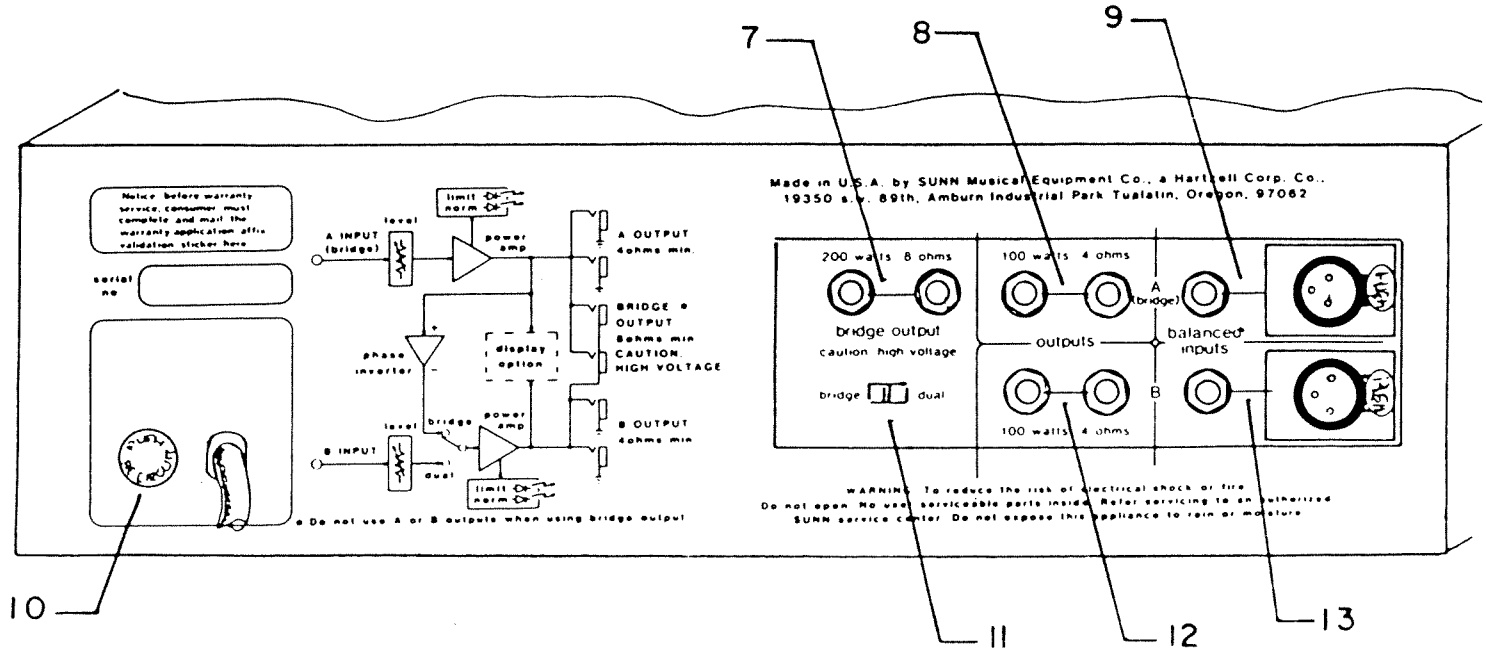
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8
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Notice: before warranty service, consumer must complete and mail the warranty application affix validation sticker here
serial no
A INPUT (bridge)
level
limit
norm
power amp
A OUTPUT 4ohms min
BRIDGE * OUTPUT 8ohms min CAUTION HIGH VOLTAGE
phase inverter
display option
B INPUT
level
bridge
power amp
dual
limit
norm
B OUTPUT 4ohms min
* Do not use A or B outputs when using bridge output
Made in U.S.A. by SUNN Musical Equipment Co., a Hartzell Corp. Co.
19350 s.w. 89th, Amburn Industrial Park Tualatin, Oregon, 97062
200 watts 8 ohms
bridge output
caution high voltage
bridge
dual
100 watts 4 ohms
outputs
100 watts 4 ohms
A (bridge)
B
balanced inputs
WARNING: To reduce the risk of electrical shock or fire
Do not open. No user serviceable parts inside. Refer servicing to an authorized
SUNN service center. Do not expose this appliance to rain or moisture
10
11
12
13

1. CHANNEL B LEVEL CONTROL: This control adjusts the output signal level for CHANNEL B when the amplifier is used in the DUAL mode. This control is not used in the BRIDGE mode.

2. CHANNEL A LEVEL CONTROL: This control adjusts the output signal level for CHANNEL A when the amplifier is used in the DUAL mode. In the BRIDGE mode, this control adjusts the bridge output signal level.

3. NORMAL LED INDICATOR: This green LED should come on when the amplifier is turned on and should remain on during normal amplifier operation.

4. LIMIT LED INDICATOR: This red LED will be off during normal operation and will come on if the amplifier clips or if distortion caused by shorted or improper loads is detected.

5. FLUORESCENT LEVEL INDICATOR: (SA 11 & 21 ONLY). Output signal levels are displayed by this fluorescent indicator.

6. POWER SWITCH: This switch is used to turn the power to the amplifier on and off.

7. BRIDGE OUTPUT: These two output jacks, wired in parallel, are used to patch the output signal to the speakers when the power amplifier is in the BRIDGE mode. These jacks are not used when the amplifier is in the DUAL mode.

8. CHANNEL A OUTPUT: These two jacks, wired in parallel, are used when patching CHANNEL A output to their speaker cabinets when the power amplifier is in the DUAL mode. These output jacks are not used when the amplifier is in the BRIDGE mode.

9. CHANNEL A INPUT: Use one of these jacks for the input signal for the CHANNEL A amplifier when the power amplifier is in the DUAL mode. These jacks are also used for the input signal when the power amplifier is in the BRIDGE mode. The jack not used for the input signal can be used for patching the same input signal to another power amplifier input. The SA 10 and SA 20 amplifier are equipped with two 1/4" phone input jacks for unbalanced input signals. The SA 11 and SA 21 come with one 1/4" phone jack and one three-pin audio connector for either balanced or unbalanced input signals.

10. CIRCUIT BREAKER: This circuit breaker will open when improper conditions occur causing excessive current overload. Check out your system for improper speaker impedance, faulty or incorrect connection, and defective speakers. Push in to reset.

11. DUAL-BRIDGE MODE SWITCH: This switch is used to select whether the power amplifier will operate in the DUAL or BRIDGE mode.

12. CHANNEL B OUTPUT: These two jacks, wired in parallel, are used when patching CHANNEL B output to its speakers when the power amplifier is in the DUAL Mode. These output jacks are not used when the amplifier is in the BRIDGE mode.

13. CHANNEL B INPUT: These input jacks are used for the input signal going to CHANNEL B when the power amplifier is in the DUAL mode. In the BRIDGE mode these input jacks are not used.

SPECIFICATIONS - SA 10 & 11

FREQUENCY RESPONSE: +0/-.25dB 20Hz - 20kHz
+0/-3dB 2Hz - 200 kHz

DISTORTION: THD less than .05% from 50Hz to 20kHz at 100 watts into 4 ohms
THD less than .05% from 50Hz to 20kHz at 70 watts into 8 ohms.
IMD less than .05% SMPTE at 100 watts into 4 ohms

SLEW RATE: 30V per microsecond (dual mode),
60V per microsecond (bridged mode)

COMMON MODE REJECTION RATIO (SA 11): -80dB at 1kHz, -60dB at 20kHz

DAMPING FACTOR: Greater than 300, 20Hz to 1kHz at 8 ohms, dual operation only.

SIGNAL TO NOISE RATIO: -105db from 100 watts, -111dB from 200W ANSI "A" WTD.

CROSSTALK: -80dB at 1kHz

INPUT SENSITIVITY: .67V RMS

INPUT IMPEDANCE: SA 10: 10K ohms; SA 11: 66K ohms

OUTPUT POWER: Dual mode: 150 watts into 2 ohms,
100 watts into 4 ohms,
70 watts into 8 ohms.
Bridge mode: 300 watts into 4 ohms,
200 watts into 8 ohms

POWER REQUIREMENTS: 120 VAC - 60Hz Domestic (US-Canada),
5 amp maximum (600 watts maximum)
240 VAC - 50/60Hz Export
2.5 amp maximum (600 watts maximum)

DIMENSIONS:

Height	x	Width	x	Depth
5.25"		19"		10.5"
13.3 cm		48.3 cm		26.7 cm

WEIGHT: 28 LBS. - 12.7kg

SPECIFICATIONS - SA 20 & 21

FREQUENCY RESPONSE: +0/-.25dB 20Hz - 20kHz
+0/-3dB 2Hz - 200kHz

DISTORTION: THD less than .05% from 50Hz to 20kHz at 200 watts into 4 ohms
THD less than .05% from 50Hz to 20kHz at 140 watts into 8 ohms.
IMD less than .05% SMPTE at 200 watts into 4 ohms

SLEW RATE: 30V per microsecond (dual mode),
60V per microsecond (bridged mode)

COMMON MODE REJECTION RATIO (SA 21): -80dB at 1kHz, -60dB at 20kHz

DAMPING FACTOR: Greater than 300, 20Hz to 1kHz at 8 ohms, dual operation only.

SIGNAL TO NOISE RATIO: -108db from 200 watts, -114dB from 400W ANSI "A" WTD.

CROSSTALK: -80dB at 1kHz

INPUT SENSITIVITY: 1.0V RMS

INPUT IMPEDANCE: SA 20: 10K ohms; SA 21: 66K ohms

MINIMUM OUTPUT POWER: Dual mode: 300 watts into 2 ohms,
200 watts into 4 ohms,
140 watts into 8 ohms.
Bridge mode: 600 watts into 4 ohms,
400 watts into 8 ohms

POWER REQUIREMENTS: 120 VAC - 60Hz Domestic (US-Canada),
10 amp maximum (1200 watts maximum)
240 VAC - 50/60Hz Export
5 amp maximum (1200 watts maximum)

DIMENSIONS:

Height	x	Width	x	Depth
5.25"		19"		12"
13.3 cm		48.3 cm		30.5 cm

WEIGHT: 36 LBS. - 16.3kg

sunn ELECTRONICS
LIMITED WARRANTY

sunn Electronics warrants new electronic products to be free from defective materials and workmanship for a period of three years from the date of purchase to the original owner when purchased from an Authorized **sunn** Dealer.

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 reponsible 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 of completing and mailing the warranty application.

sunn products that have been subject to accident, alteration, 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.

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