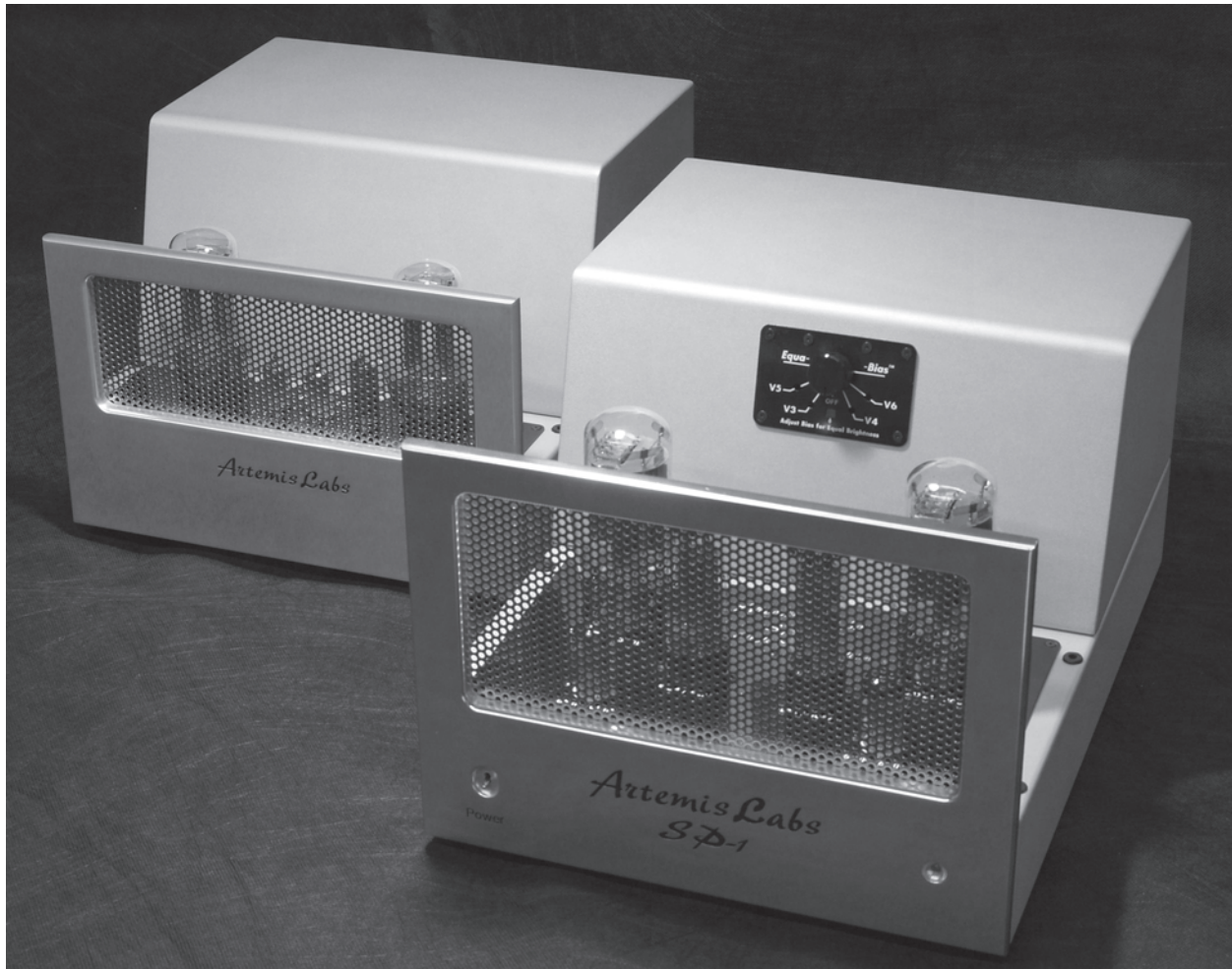


# *Artemis Labs SP-1*

Single-Ended Stereo Power Amplifier



Operating Manual

# Important Safety Instructions

1. Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. Do not use this apparatus near water.
6. Clean only with a dry cloth.
7. Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
8. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus.
9. Do not defeat the safety purpose of the grounding-type plug. A grounding-type plug has two blades and a third grounding prong. The third prong is provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
10. Protect the power cord from being walked on or pinched, particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.
11. Only use attachments/accessories specified by the manufacturer.
12. Unplug this apparatus during lightning storms or when unused for long periods of time.
13. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as if the power-supply cord or plug is damaged, liquid has been spilled inside the appliance or it has been exposed to moisture, the appliance does not operate normally, or has been dropped.
14. **WARNING:** To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.

## Explanation of Safety Symbols:



**CAUTION:** To reduce the risk of electric shock, do not remove the covers. No user-serviceable parts inside. Refer Servicing to qualified service personnel.



This symbol is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.



This symbol is intended to alert the user to the presence of important operating and maintenance (servicing) instruction in the literature accompanying the appliance.

# INTRODUCTION & SPECIFICATIONS

The Artemis Labs SP-1 Stereo Power Amplifier is a no-compromise purist design. It is designed to get the most from the “super 300Bs” such as the KR 300BXLs and Full Music 300B+, delivering from 13 to 18 watts (depending on the tube type) of clean single-ended power. Careful power supply filtering and regulation of critical voltages ensure stable, quiet operation. All aspects of the design were done by John Atwood of One Electron™.

Given that the SP-1 amplifier puts out about 15 watts per channel, it must be used with relatively efficient loudspeakers. The minimum efficiency required depends on many factors including room size, room absorption, preferred listening levels, etc., but in general, an efficiency of 90dB or higher per watt at 1 meter is needed. Work with your dealer for the best speaker combination for your listening set-up.

The SP-1 is conservatively designed and is built to last for many years. The only maintenance needed is the occasional bias adjustment and replacement of tubes. Please read this entire user’s manual so that you can understand all the features and get the most from the SP-1. The Warranty is on a separate card. Read it and send it in to get full warranty coverage.

## SPECIFICATIONS:

**Input Impedance:** 100K ohms.

**Power Gain:** 0.7VRMS in for 10W out (1KHz)

**Frequency Response & Distortion:** (measured with KR 300BXLs tubes)

### 1 watt output:

Frequency Response: 14Hz – 38KHz ± 1dB

THD+N at 1KHz, < 0.5%

### 10 Watts output:

Frequency Response: 15Hz – 35KHz ± 1dB

THD+N at 1KHz, < 1.5%

**Output for 5%THD (1KHz):** 13 to 18W, depending on output tube

**Damping Factor:** (1KHz, 5W): 4.8

**Output Noise:** (grounded input, 8 ohm output into 8 ohm load, rms detector):

22Hz - 30KHz: < -88dB below 10W output

“A-weighted”: < -105dB below 10W output

### Crosstalk:

1KHz: < -81dB

20KHz: < -57dB

**Mains Voltage:** Wired at factory for one of the following voltages: 100, 110, 120, 220, 230, 240V, 50 to 60Hz.

**Power Consumption when powered-off (rms):** 2.3 Watts nominal

**Power Consumption when powered-on (rms):** 340 Watts nominal

**Size:** Power Supply Chassis: 9 ½" (241 mm) Height, 12 ¼" (311 mm) Width, 13 ⅜" (340 mm) Depth  
Amplifier Chassis: 9 ½" (241 mm) Height, 12 ¼" (311 mm) Width, 16 ¾" (425 mm) Depth

**Mass:** Power Supply Chassis: 51 lbs. (23.2Kg)  
Amplifier Chassis: 55 lbs. (25Kg)

**Note:** These specifications are subject to change at any time.

# INSTALLATION & OPERATION

To install the SP-1 Amplifier, follow these steps:

1. Locate the SP-1 amplifier and SP-1PS power supply where they can receive adequate fresh air for cooling. Do not block the cooling holes on the bottom, i.e. do not set on carpet. They may be operated without the perforated covers, *unless they can be accessed by small children or animals, in which case the covers must be used.* The tubes will run coolest without the covers.

Leave enough slack in the interconnecting cable so that there is no strain on the connector. The power supply puts out a small magnetic hum field - make sure that is located far away from components sensitive to hum, such as phono cartridges or preamps.

2. Connect the amplifier to the signal source by RCA interconnect cables to the left and right inputs. *The SP-1 has no volume control, so the signal source must have some means of controlling the volume.* Do not change cables while the SP-1 is power-on.

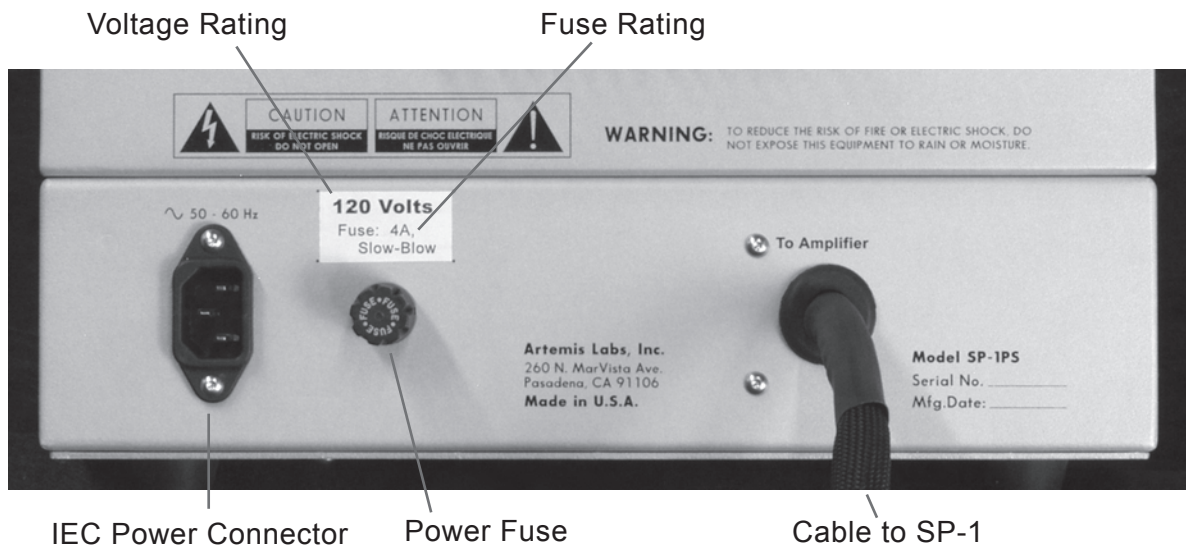
3. Connect the speakers to the SP-1 by speaker cables to the output banana jacks. Choose the impedance so that it is equal to or lower than the rated impedance of the speaker. On highly-sensitive speakers 8-ohm, it may be helpful to connect them to the 4-ohm outputs.

The amplifier must not be run with the outputs unconnected. If only one channel is used or while being tested, dummy load resistors should be connected to the unused outputs. These can be 8 to 20 ohms, rated at least 10 watts.

4. Connect the SP-1PS to an AC power source. It consumes 340 watts when running, so any power conditioning, if used, must accommodate this power level. If problems with hum occur, it is recommended that the signal source and SP-1 be connected to the same AC outlet.

The SP-1PS consumes about 2 watts of power, even when turned-off. If the amplifier will not be used for a long time, or if lightning or other power surges are expected, it should be unplugged. The SP-1PS contains built-in surge suppression which can be damaged by excessive surges. If the power fuse is blown by lightning or another kind of power surge, contact AYDN for authorization to return the SP-1PS, even if it still works.

The **Power Switch** on the front of the amplifier chassis applies power when flipped up. The **Power Indicator** will glow red while the tubes warm up, then after approximately 60 seconds, will glow green. The SP-1 is now ready for use. If the power is removed, even briefly, then restored, the warm-up time delay process will start over again.



# REAR PANELS

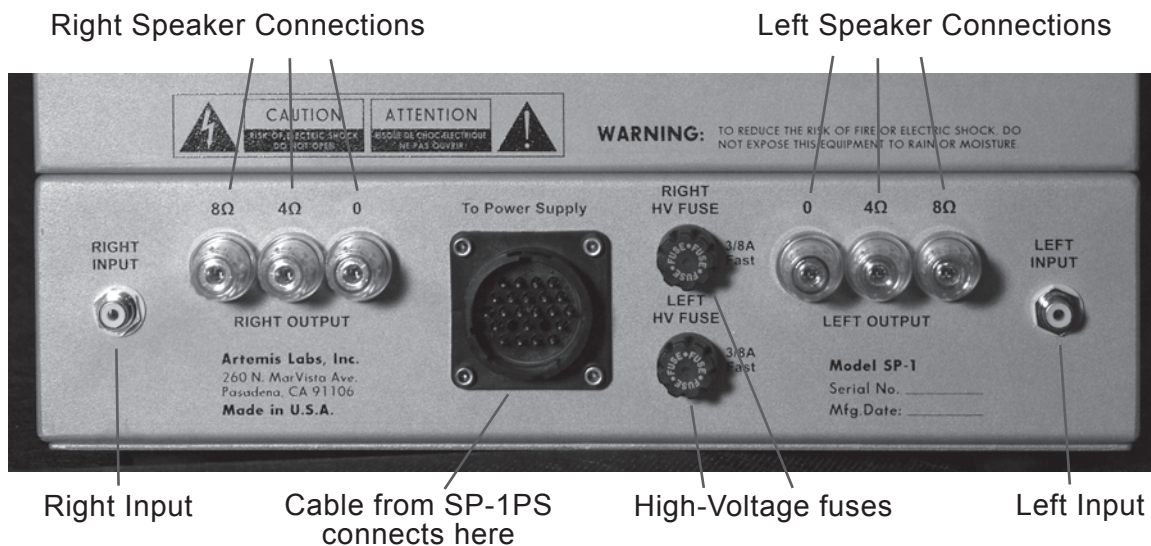
Refer to the photo on the previous page:

Make sure that the **Voltage Rating** of your SP-1PS matches the power mains voltage at your location. The voltage can be changed by internal rewiring, which can be done by Artemis Labs or by a qualified technician. The **Fuse** is a 1" x 1¼" "3AG" Slow-blow type. Its value is given on the **Voltage Rating** sticker.

A power cord is supplied with each unit. If the mains plug does not match your socket, contact your dealer to exchange it for the correct type. The power cord plugs into the **IEC Power Connector**. If the power cord is frayed or damaged, replace it with a new one. Use only power cords that meet the safety standards of your location.

The **Power Cable** supplies power to the amplifier chassis. To connect the power cable to the amplifier chassis, gently rotate the female cable connector body against the male chassis connector until you feel it engage. Then rotate the screw shell clockwise until a slight click is felt. *Do not force the connector!* Only gentle force is needed to engage it.

*Never disconnect the Power Cable when the amplifier is powered-on!*



The amplifier is driven by RCA cables connecting to the **Right and Left Input Connectors**.

The speaker cables connect to the Right and Left Speaker Connectors. Either banana jacks, wires, or spade lugs can be used. If bare wire is used, be careful that no stray strands get loose that could cause a short-circuit. The "Common" or "Ground" lead connects to the black jacks. The "Hot" lead goes to either the 4 ohm or 8 ohm red jacks, depending on the speaker used.

The **High Voltage Fuses** are used to protect the amplifier from damage if an output tube or other component short-circuits. If there is no sound and it is impossible to bias the amplifier tube, check the fuse for the affected channel. The **Fuse** is a 1" x 1¼" "3AG" standard type (*not* slow-blow) rated at either 3/8 Amp (0.375A) or 1/2 Amp (0.5A).

# TUBES

**There are six tube types used in the SP-1 amplifier. Their use and replacement strategy are described here.**

**6N1P (Russian 6H1П)** - This twin triode is used as the first audio amplifier and part of the voltage regulator. This is similar to the 6DJ8/ECC88, but has better sonic properties. This tube was widely used in Russian industrial and military equipment and is currently available from most tube distributors. Some types are marked 6H1П-EB - this is an enhanced reliability version.

**EL34/6CA7** - This tube is triode-connected and is used as the driver tube. This is one of the most common output tubes, and many versions are available. Another equivalent, but rare, type is the KT-77. All will work in the SP-1, and you can try different versions for the best sound. Remember to re-bias after changing tubes.

Occasionally an EL34 will be found that is too microphonic, i.e. is very sensitive to mechanical vibrations. All tubes are microphonic to a degree, but if sound is heard from the speakers if the chassis is lightly tapped, then a different EL34 should be used.

Since the EL34 is run very lightly in the SP-1, it should last a long time, and fail by eventual cathode wear-out. This will be evidenced by an inability to correctly bias the tube. There is no need to match the two EL34s, since each one is used for each channel and is individually biased by the Bias Panel.

**300B+/300BXLS** - This is the power output tube, and is crucial to the sound quality and power output of the amplifier. This tube is a "super" 300B and must have a plate dissipation rating of at least 60 watts. Both the KR 300BXLS and Full Music 300B+ have been tested in this amplifier. New versions of super 300Bs may become available, so check with your dealer or AYDN on the applicability of newer types.

*Do not* use regular 300Bs, since the Bias Panel will

set their bias to 120mA - which results in a plate dissipation of 60 watts - far higher than the 40 watt rating of conventional 300Bs. Artemis Labs is not responsible for damage caused by the use of unqualified output tubes!

Depending on the tolerances of the tube sockets and pins, it may be possible to incorrectly insert the 300BXLS/300B+, causing possible damage to the amplifier. Make sure the two large pins are inserted facing the outside edge of the chassis, as shown in the diagram on the next page.

The normal failure mode for these tubes is wear-out of the cathode coating, resulting in low current or the inability to bias up the tube. However, if the tube goes gassy, it is possible for the tube to arc over. This will likely blow the high-voltage fuse on the amplifier chassis. When replacing the tubes, there is no need to match the two tubes, since each one is used for each channel and is individually biased by the Bias Panel.

**5U4G/274B** - Two of these are rectifiers in the high-voltage power supply. Although any rectifier with the same pin-connections and power ratings as the 5U4G or the Western Electric type 274B could be used, other types may produce an incorrect high voltage. Only exact equivalents of the 5U4G (such as the 5U4GB, 5AS4, Russian 5LJ3C, etc.) or 274B are recommended.

These rectifier tubes are exposed to high voltages and currents, and although protected by delayed high-voltage and transient snubbers, may fail by arcing. This will typically blow the line fuse on the power supply chassis. There is no need to match the two rectifier tubes, but it is recommended that they be replaced as a pair.

**6AL5/5726/6H2P (Russian 6X2П)** - These dual diodes are used to generate the negative bias supply. Although no longer manufactured, these tubes were extensively used in televisions, FM radios, industrial and military equipment, and are readily available as "N.O.S." (New Old Stock) for reasonable prices. The 5726 is a ruggedized version of the 6AL5, and the 6H2P (6X2П) is a Russian equivalent. All equivalent types will work well.

# TUBES

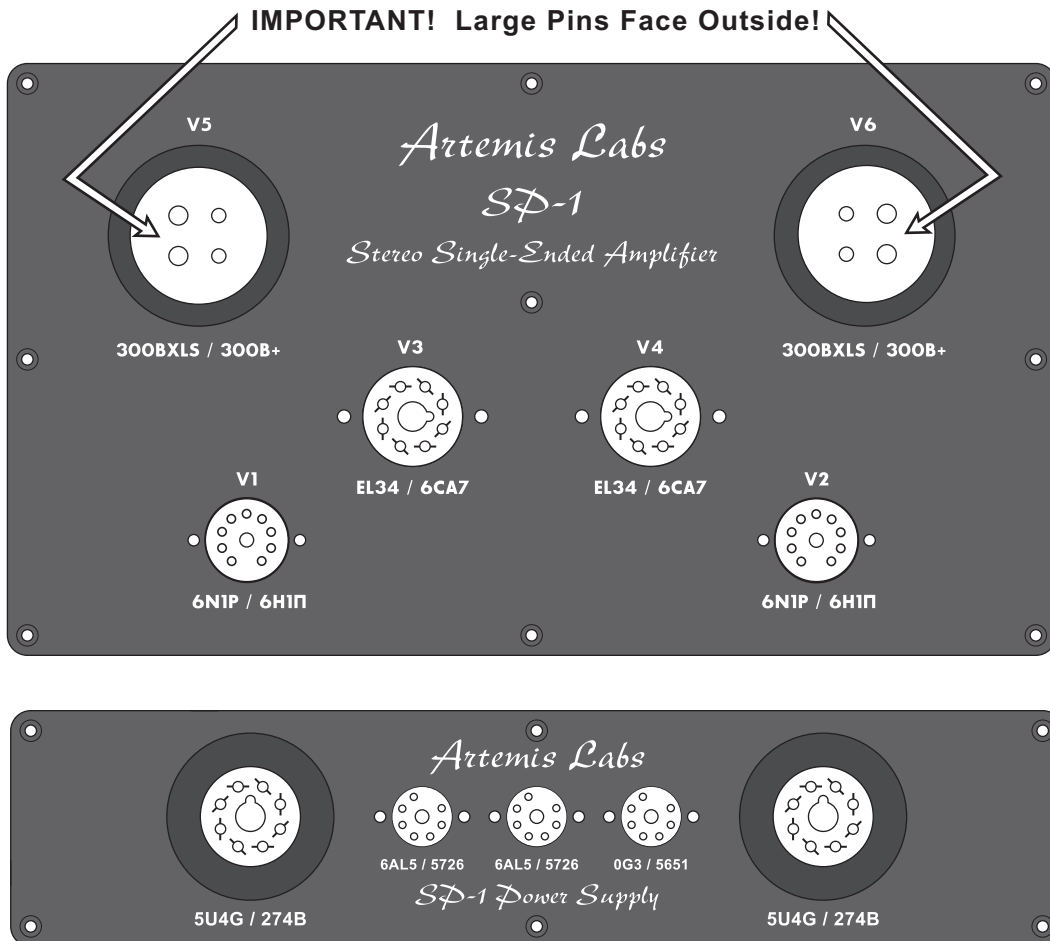
The 6AL5 type tubes should last a long time, but when worn-out, will fail to produce enough bias voltage. This will not initially affect the bias circuits, since they are regulated, but if the unregulated bias falls too much, a protective circuit will prevent the high-voltage from turning on.

**0G3/5651** - This is an 85 volt gas reference tube, which regulates the bias for the driver stage and

voltage regulator. This type is very reliable, and should last longer than any of the other tubes in the amplifier. If the tube no longer glows or the driver and output tubes can no longer be biased, the 0G3/5651 may be bad. If replacement is needed, it is available as N.O.S. from tube dealers.

## TUBE LOCATIONS

The two drawings below show the location and orientation of the tubes. Note that the 4-pin super-300B tubes are indexed by the position of the two larger pins. These large pins must be inserted as shown below - facing the outside edge of the chassis.



# EQUA-BIAS™ ADJUSTMENT



**Bias Adjustment holes**

The **Bias Switch** has five positions, one for each of the driver and output tubes and a center-off position. Normally the Bias Switch is kept off. To adjust the bias for a particular tube, switch the Bias Switch to the tube to be adjusted and insert a small flat-blade screwdriver into the matching **Bias Adjustment Hole**. Make sure the screwdriver is perpendicular to the panel. You may have to rotate the screwdriver carefully to find the slot. Adjust for identical brightness on the two yellow LEDs just below the “OFF” position

Note that the Bias Adjustment Holes are in the same relative positions as the tubes they control on the chassis.

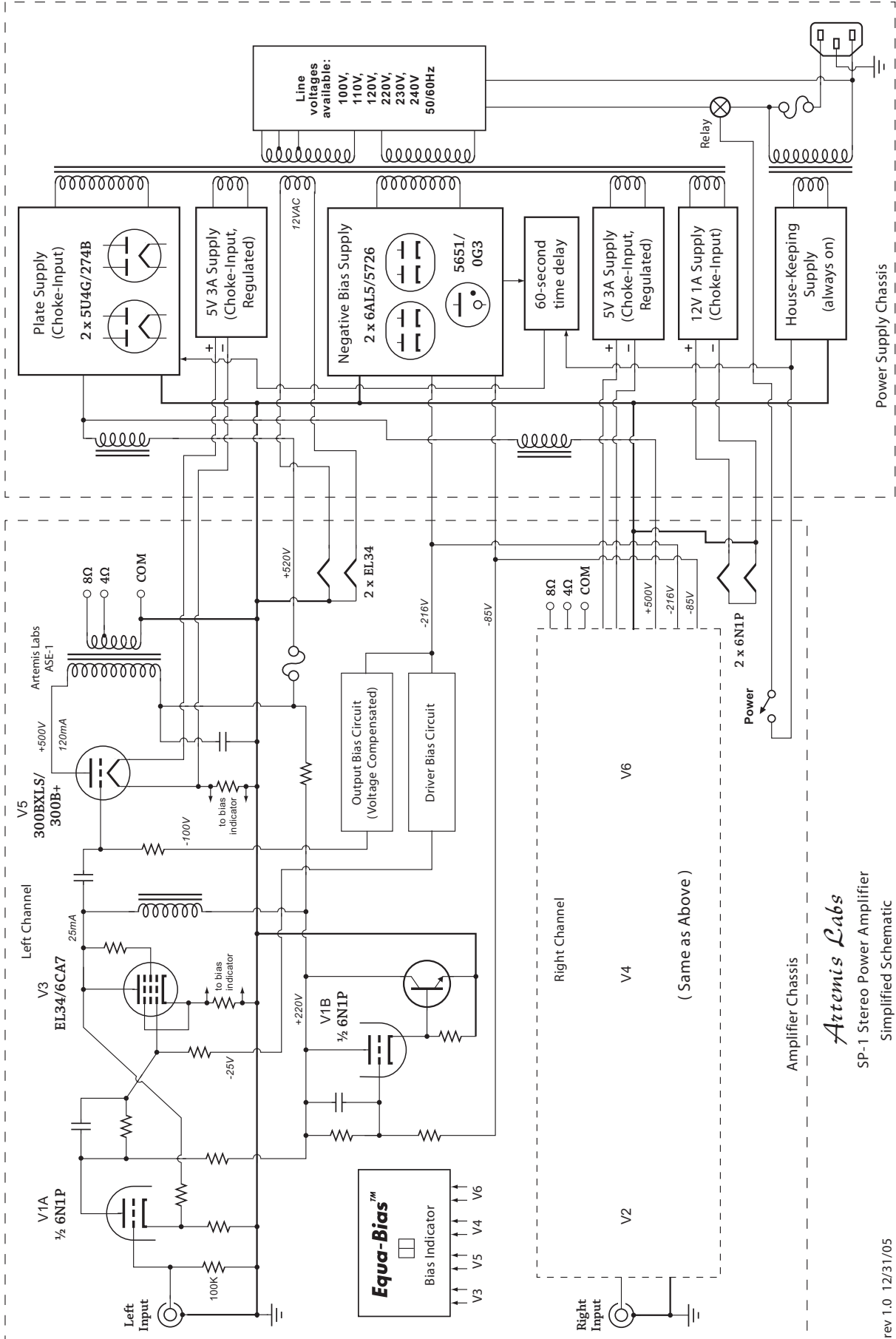
The bias should be adjusted immediately after new tubes are installed. If used tubes are exchanged in their sockets, the bias should also be re-adjusted.

If selected while operating, it is normal for the LEDs to flicker as music is played, especially on the output tubes V5 and V6.

The bias can slowly drift during the first 15 minutes of operation, so the final bias adjustment should be done after the amplifier has been operating at least this long. Once set this way, the bias is quite stable, and should not have to be checked for at least another 100 hours of operation, unless trouble is suspected.

If the bias LEDs cannot be balanced for a particular tube, then it is likely that the tube is bad or inserted incorrectly. Check the orientation of the tube. Also check the High-Voltage fuses on the rear of the amplifier chassis. If the LEDs still cannot be balanced after a known good tube is inserted, then contact your dealer or AYDN for service.

# SIMPLIFIED SCHEMATIC



*Artemis Labs*

SP-1 Stereo Power Amplifier  
Simplified Schematic

# TECHNICAL FEATURES

## **High-power directly-heated triode output with no feedback**

Directly-heated triodes have the lowest distortion of all power tubes. The high-power versions used in the SP-1 are premium quality for low distortion and long life. There is no feedback around the output stage, giving absolute stability with any load.

## **Custom output transformer**

The single-ended output transformer, key to the performance of a no-feedback amplifier like the SP-1, is a custom design with a large core for good low-frequency performance without saturation, and carefully interleaved windings for good high-frequency response. The high-frequency response of the 4-ohm output is virtually identical to the 8-ohm output, something rarely found in most output transformers. High-quality Microsil laminations are used for low distortion.

## **Modest feedback stabilizes driver gain without hurting sonic quality**

About 2dB of feedback is used across the two driver stages. This helps stabilize the gain while improving the drive to the output stage. This low amount of feedback does not alter the distortion characteristics the way a high amount of feedback does.

## **Two-stage driver gives low distortion with low impedance.**

The two-stage driver allows each driver tube to be optimized for its role: a low-noise 6N1P for the first stage and a high-current triode-connected EL34 for the second stage. The EL34 may seem like overkill for a driver, but it is quite linear and its low impedance is a perfect match for driving the highly capacitive load of the output tube grid.

## **Choke-loaded driver tube**

A key factor to the low distortion and wide dynamics of the SP-1 the use of a choke plate load for the EL34 driver stage. An inductor (choke) is an energy-storage device that allows the plate of the tube to swing to twice the plate supply voltage. This effectively doubles the headroom of the driver - the same as doubling the B+ voltage, without the

power loss of a resistor load. It also presents the driver tube with essentially an infinite load impedance, giving the maximum gain and best linearity.

## **Driver stages shunt regulated**

The high-voltage supply for each channel's driver stages are regulated by a low-gain hybrid shunt regulator. This regulation ensures a rock-solid power supply, free from low-frequency surges and instability inherent in conventional R-C or L-C filters.

Shunt regulators have the nice characteristic of keeping the current draw from the power supply constant - thus not polluting the power "upstream" of the regulator. This reduces cross-talk and keeps interactions between the driver and output stages to a minimum. The hybrid design, using one half of a 6N1P and a high-voltage bipolar transistor give good linearity and high reliability. The low gain of the regulator ensures good sonics, without the "transistor sound" of high-gain regulators.

## **Fixed bias on both output and driver tubes**

Fixed bias is used on both the EL34 driver stage and the output stage. This means that the tube bias is absolutely constant with changes in the signal. Transient and overload performance are therefore excellent. There are no electrolytic capacitors required, which would be necessary with conventional cathode bias.

## **Bias compensation used in output stage**

A compensation network is used to bias the output tube. This keeps the bias current constant over wide changes in mains voltage, reducing the need to re-bias the output tubes. Bias compensation is not needed on the driver, since its supply voltage is regulated by the shunt regulator.

## **Equa-Bias™**

Fixed bias requires the user to periodically check and possibly re-bias tubes, due to tube aging and when tubes are changed. This requirement is made very simple by the Equa-Bias method. The tube to be biased is selected by a rotary switch, and the bias is adjusted by a small screwdriver in the hole selected

# TECHNICAL FEATURES

by the switch. When the two yellow LEDs are equal in intensity, the bias is correct. This method is accurate to well within 2% of optimum bias.

## **Separate power supply filtering for each channel**

While using a common power transformer and rectifier, the SP-1 splits the filtering for each channel. This reduces cross-talk between channels.

## **DC heater supplies for input and output tubes**

A well-filtered DC heater supply keeps hum low in the 6N1P input and regulator tube. Separate regulated DC filament supplies are used for the output tubes. DC eliminates hum from the output tube filaments. Regulation allows output tubes with varying current draws (1.5A for the 300B-XLS to 3.0A for the 300B+) to have an accurate filament voltage of 5.0V.

## **Delayed high-voltage relay**

The high voltage plate supply is applied to the tubes after a delay of about 60 seconds. This gives the tubes ample chance to warm-up without the chance of “cathode stripping” (degradation of the cathode by bombardment by positive ions before it is hot enough to build-up a protective space charge around the cathode.) This helps extend tube life.

## **Critical audio circuits point-to-point wired with military-style terminal boards**

Conventional fiber-glass PC boards are used for the power supply and for the bias monitoring circuits. All critical circuits in the audio path use point-to-point wiring on military-style terminal boards using silver-plated turrets. This technique minimizes the sonic effects of PC boards and allows easy component replacement.

## **High-quality, high temperature capacitors**

All electrolytic capacitors are high-quality 105°C-rated Panasonic® types for best reliability. All capacitors in the signal path are either polypropylene or silvered-mica types.

## **Choke-input filtering on all major power supplies**

Choke input filters are used on the high-voltage supply and all three of the DC filament supplies. Compared to conventional capacitor-input filters, choke-input filters have a better “power-factor” which reduces heating of the power transformer and is more friendly to the power mains.

## **Electrostatically-shielded power transformer and tube/solid-state rectification**

Power supply noise is kept to a minimum by the use of a custom power transformer with electrostatic shielding between the primary and secondaries. Both the high-voltage and bias supplies use a combination tube/solid-state bridge rectifier. The tube section gives a slow turn-on while the solid-state half of the bridge reduces the peak voltage on the tubes, ensuring long-life. High-speed rectifiers are used where feasible. Tuned snubbing circuits are used to reduce rectifier switching noise.

## **Available mains voltages (wired at factory): 100V, 110V, 120V, 220V, 230V, 240V, 50 or 60Hz**

Virtually all the power systems of the world can be accommodated by the SP-1 transformer connections. These are set at the factory or can be re-wired by a qualified technician.

---

Artemis Labs products  
are distributed by:

AYDN Vacuum Tube Audio  
679 Easy Street, Unit E  
Simi Valley, California 93065 USA

[www.aydn.com](http://www.aydn.com)  
Tel: +1 818 216-7882  
email: [info@aydn.com](mailto:info@aydn.com)