

Artemis Labs LA-1



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 (including amplifiers).
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 LA-1 Line Amplifier combines the clean, accurate sound of a purist single-triode line amplifier with the convenience and reliability of a solid, well-built product. Special care is taken with all parts in the audio path, from the Goldpoint™ stepped attenuator to the Swedish output chokes by Lundahl. All aspects of the design were done by John Atwood of One Electron™.

The LA-1 is conservatively designed and is built to last for many years. The only maintenance needed is the occasional replacement of tubes, and even this has been reduced by the use of Cool-Swap™ technology. Please read this entire user's manual so that you can understand all the features and get the most from the LA-1. The Warranty is on a separate card. Read it and send it in to get full warranty coverage.

SPECIFICATIONS:

Maximum Gain (47K load, 1KHz): 12dB +/- 1.5dB

Frequency Response & Distortion:

Worst-case Loading (8K ohms, 1000pF):

Worst-case settings (Input Attenuator and Balance both at -6dB):

Frequency Response: < 10Hz – 32KHz +/- 0.5dB

Average settings (Input Attenuator at -16dB, Balance at -1.5dB):

Frequency Response: < 10Hz – 40KHz +/- 0.5dB

THD+N at 1KHz, 2Vrms output: < 0.12%

Average Loading (47K ohms, 250pF):

Worst-case settings (Input Attenuator and Balance both at -6dB):

Frequency Response: < 10Hz – 45KHz +/- 0.5dB

Average settings (Input Attenuator at -16dB, Balance at -1.5dB):

Frequency Response: < 10Hz – 60KHz +/- 0.5dB

THD+N at 1KHz, 2Vrms output: < 0.05%

Maximum output voltage (47K load, 1KHz, 0.5% THD): 40Vrms

Output Noise (grounded input, 47K load, rms detector):

22Hz - 30KHz: < -82dB below 2Vrms output

“A-weighted”: < -85dB below 2Vrms output

Crosstalk:

1KHz: < -75dB

20KHz: < -45dB

Effective Output Impedance: approx. 750 ohms (1KHz)

Input Impedance: 30K to 50K ohms, depending on Input Attenuator and Balance control settings.

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

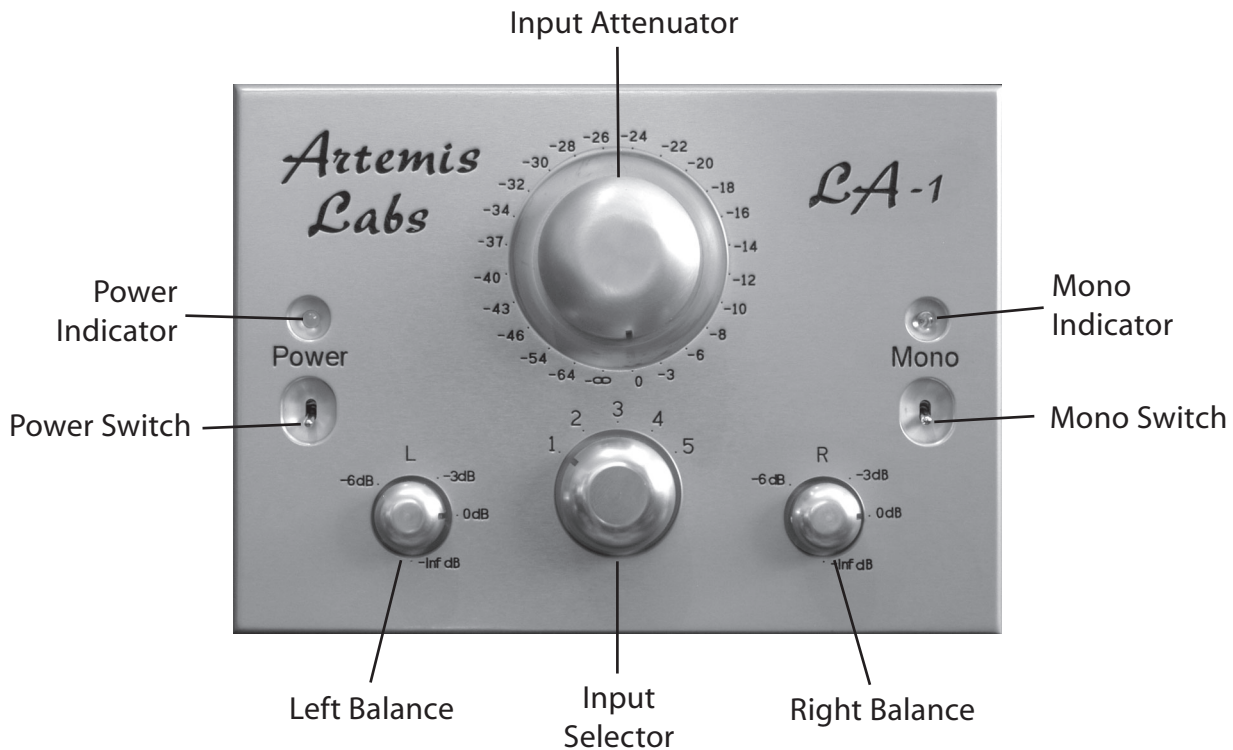
Power Consumption (rms): 30 Watts nominal, 38 Watts maximum.

Size: 6 ½" (165 mm) Height, 8 ½" (216 mm) Width, 14 ⅝" (371 mm) Depth

Mass: 22 lbs. (10Kg)

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

FRONT PANEL



The **Power Switch** applies power when flipped up. The **Power Indicator** will glow red while the tubes warm up, then after approximately 40 seconds, will glow green. About 4 second after that a faint click will be heard, indicating the muting relay turning off. The LA-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.

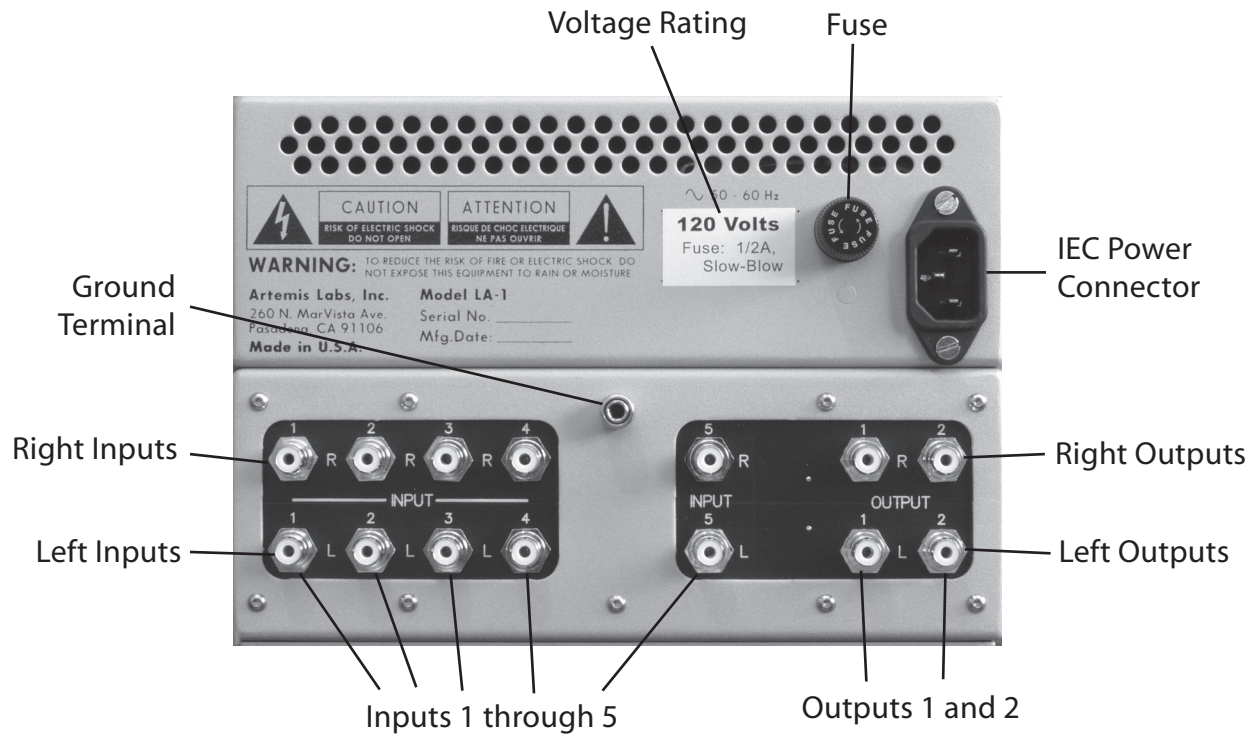
The **Input Attenuator** serves as the “Volume Control”. In the full clockwise position, the output of the LA-1 is at a maximum. Each step counter-clockwise reduces the level to the amount (in decibels) marked on the front panel. At the full counter-clockwise position, the output is reduced to zero.

The **Input Selector** chooses which of the five stereo inputs on the rear panel is used.

The **Right Balance** and **Left Balance** controls provide an infinite-resolution adjustment of the right and left channels, respectively. *They should normally be set in their fully clockwise position.* If signal level balancing is required, the louder channel can be reduced by turning its balance control counter-clockwise.

The **Mono Switch**, when flipped up, merges the two channels after the Input Attenuator but before the balance controls. The **Mono Indicator** glows yellow when the Mono Switch is on.

REAR PANEL



Make sure that the **Voltage Rating** of your LA-1 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 **Ground Terminal** is used to connect the chassis of the LA-1 to other equipment in your system to help minimize hum and noise. Experiment with different connections for the best results.

Signals are brought into the LA-1 through **Inputs 1 through 5**. The **Right Inputs** are on the top and the **Left Inputs** are on the bottom. The input number corresponds to the number on the Input Selector on the front panel.

There are two pairs of outputs: **Outputs 1 and 2**. These are essentially in parallel, separated by low-value resistors. This allows the preamp outputs to drive another device in addition to the power amplifier, such as a digital processor, subwoofer, etc. The **Right Outputs** are on top and the **Left Outputs** are on the bottom.

TUBES

The LA-1 uses Cool-Swap™ technology to let the tubes run cooler and provide a built-in spare.

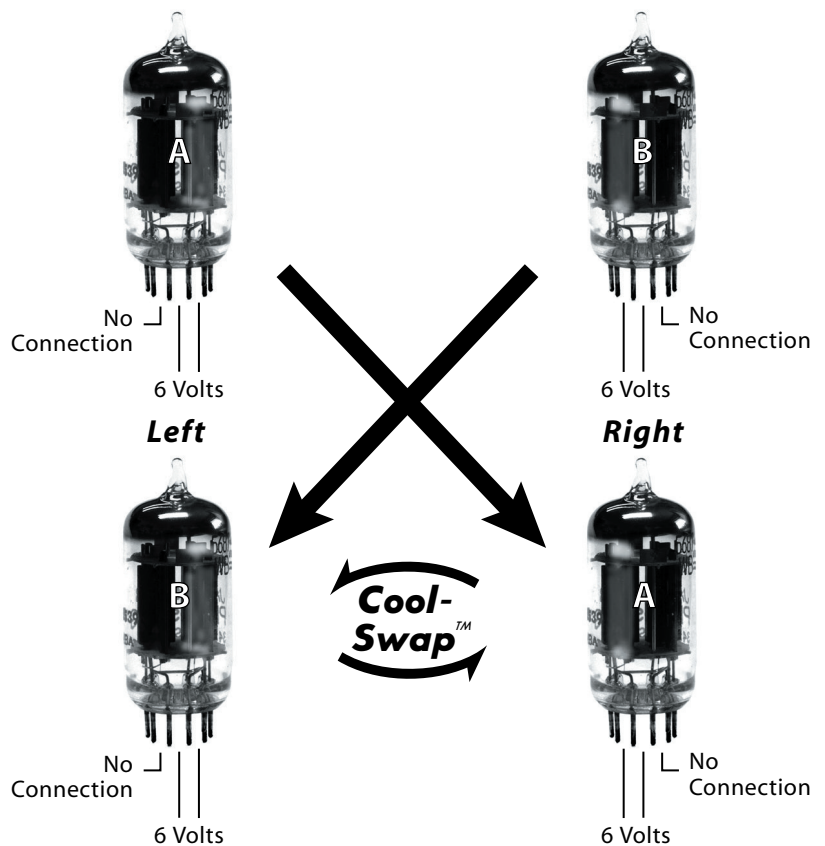
Many dual triodes, including the 5687, have split heaters, allowing them to run from either 6.3V or 12.6V. This heater set-up allows only one of the two triodes to be heated. In the Cool-swap configuration, one tube is used for each channel, each with one half heated. The right channel uses triode #1 and the left channel uses triode #2. Since the main failure mode in modern tubes is cathode wear-out, the unused triode in each tube is essentially a spare. By swapping the two tubes, the unused spare is brought into use. Thus Cool-Swap effectively doubles tube life, and since only half the tube is heated, the tube runs cooler, an important factor in the normally hot-running 5687. A side benefit is reduced cross-talk between channels, since each channel has its own tube.

One effect of the Cool-Swap technology is that only one half of each tube will be “lit-up”. This is normal in the LA-1.

How often you have to swap tubes, or replace them with new tubes if already swapped, depends on how you use the LA-1. The 5687WB tubes supplied with the LA-1 should last several thousand hours of active use. Signs that the tubes are weak include: less gain than usual, a “flabby” sound, excess noise, and a weak reading on a tube tester.

Since the LA-1 uses a soft heater turn-on and delayed application of high voltage, tube life-time is not degraded by power cycling. Thus, it is recommended that the LA-1 not be left on all the time, but only be turned-on when needed, with perhaps a one-half hour warm-up time, if desired.

Tube Types: The tube manufacturer and tube type will have an effect on the sound of audio equipment. The LA-1 was designed for the

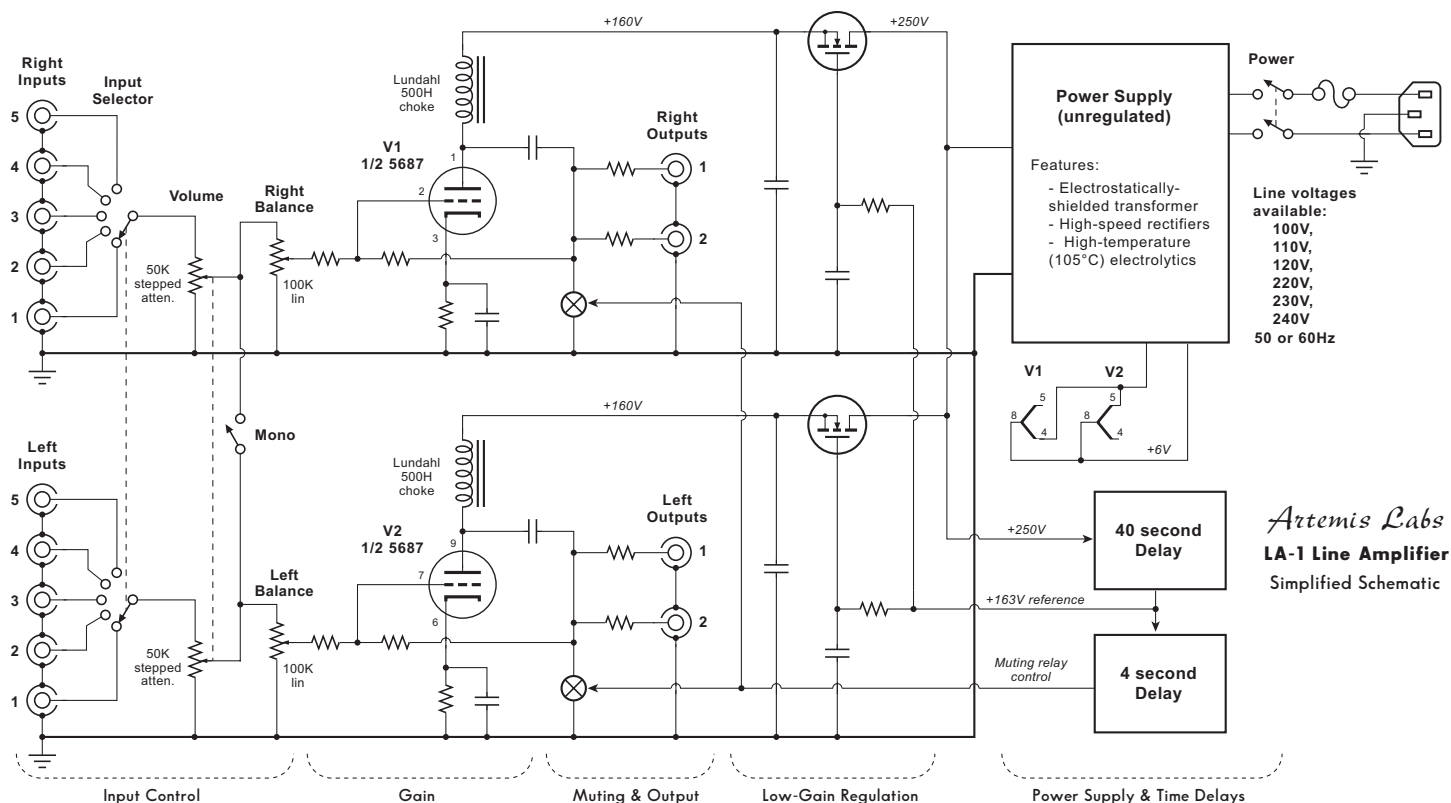


American 5687 tube, originally developed by Tung-Sol (the same manufacturer that developed the 5881 and 6550). This tube is no longer manufactured, but large quantities are still available as “N.O.S.” (New Old Stock). The 5687 was used in industrial and military equipment and as a result, nearly all tubes available are built to higher quality and reliability standards than tubes for consumer equipment. The 5687WA and 5687WB are later versions with tighter control of their characteristics.

Although not identical in characteristics to the 5687, the following tubes can also be used in the LA-1: 6900, 7044, 7119, and E182CC. If you try these, listen carefully to the sound, and only use the types that sound the best. The LA-1 was optimized for the 5687, however.

Warning: Do not use any other types of dual triodes. The pin connections of all other dual triodes are different and damage to both the tube and the LA-1 will occur if used. **Artemis Labs is not responsible for damage caused by using incorrect tubes!**

TECHNICAL FEATURES



Artemis Labs
LA-1 Line Amplifier
Simplified Schematic

Single-triode gain stage with choke loading

Experience has shown that the best audio quality is achieved with the minimum number of active devices in the signal path. Each amplifying device has its own “transfer characteristic” and when these are multiplied together in a complex design, the result is an overall transfer characteristic with high-order distortion products - the worst-sounding ones. The Artemis Labs LA-1 uses a single 5687 medium-mu, low resistance triode as the amplifying device for each channel. The 5687 has excellent linearity. Its low plate resistance allows it to drive heavy loads without the use of a cathode follower stage.

The use of an inductor (choke) load instead of a conventional plate resistor offers several significant advantages to the LA-1 design. A good-quality audio choke is essentially a perfect current source, allowing the triode to operate into an infinite-resistance load, giving the lowest distortion. Unlike semiconductor constant-current devices, an inductor is an energy-storage device. This

allows the plate voltage to swing 100% above the B+ plate supply voltage, doubling the “head-room” and allowing a lower B+ supply voltage to be used, reducing power consumption. This large headroom permits output of over 40 volts rms before clipping.

The audio chokes used in the LA-1 are made by Lundahl, a Swedish firm that uses a proprietary core material that has low distortion. Two windings are used on a common “C-core”, which reduces pick-up of hum and noise.

Modest feedback stabilizes gain without hurting sonic quality

About 4dB of feedback is used across the single-triode amplifying stage. This stabilizes the gain and makes the frequency response less sensitive to loading. The inherent distortion of the 5687 with choke loading is already very low, so the high-order harmonics that can be generated by excessive feedback are minimal.

Can drive 8K ohm (aggregate) or higher loads

Despite the lack of a cathode-follower output stage,

the LA-1 can drive loads as low as 8K while still meeting specifications. This is important when driving certain solid-state amplifiers or pro audio equipment which can have input impedances as low as 10 or 15K ohms.

High-Quality Conductive-Plastic Balance pots

Since a stepped attenuator allows only discrete level steps, the balance controls are conductive plastic pots by Spectrol®, which have a minimum impact on the sound. By using a separate pot for each channel, the default position (fully clockwise) permits full gain from the preamp.

Each channel individually voltage regulated

Each channel has its own MOSFET source-follower low-gain regulator. This insures there is no coupling between the two channels through the power supply. The source follower regulator gives good regulation without the “transistor sound” typical of high gain regulators using op-amps. Protection resistors and diodes help prevent burn-out of the MOSFETs.

True voltage regulation minimizes noises and changed operating conditions due to power line shifts. Since the impedance of the power supply, as seen by the amplifier, is low and flat, the bass response is even and solid.

DC heater supply

A well-filtered DC heater supply helps keep hum low and allows the use of tubes that would otherwise have too much hum in AC-heated systems.

Delayed high-voltage with delayed muting relay

The high voltage plate supply is applied to the tubes after a delay of about 40 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. A muting relay shorts the audio outputs until about 4 seconds after the high voltage is applied. This allows start-up transients to die away.

No troublesome integrated circuits

All time delay and regulation circuits use time-proven, simple discrete semiconductor devices.

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 rear panel jacks and switching. 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 film capacitors in the signal path are either polypropylene or silvered-mica types.

High-speed rectifiers and electrostatically-shielded power transformer

Power supply noise is kept to a minimum by the use of a custom power transformer with electrostatic shielding between the primary and secondaries. High speed rectifiers are used for both the plate and heater supplies.

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 LA-1 transformer connections. These are set at the factory or can be re-wired by a qualified technician.