

**Version 2.2**  
September 1999

# **LA 24**

## **OWNERS MANUAL**



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## INTRODUCTION

Thank you for purchasing the L-ACOUSTICS LA 24 power amplifier. The amplifier you have chosen is the culmination of many years of research and development and makes amplification more controllable instead of the traditional "boring black box" that you have become accustomed to.

Please take some time to read this manual and familiarize yourself with the advanced features of this amplifier.

- **UNPACKING**

Carefully open the shipping carton and check for any noticeable damage. Every L-ACOUSTICS amplifier is tested and inspected before leaving the factory and should arrive in perfect condition. If found to be damaged, notify the shipping company immediately. Only the consignee may institute a claim with the carrier for damage incurred during shipping. Be sure to save the carton and packing materials for the carrier's inspection. It is also advisable to save the carton and packing material even if the amplifier is undamaged. Should you ever need to ship the amplifier always use the original packing.

- **WARNINGS**

Read this before operating your amplifier:

Do not use the amplifier if the power cord is broken or frayed.

Always operate the unit with the chassis ground wire connected to the electrical safety earth.

Do not parallel or series connect an amplifier output with any other amplifier output. Do not connect the amplifier output to any other voltage source, such as a battery, mains source or power supply, regardless of whether the amplifier is turned on or off.

Do not run the output of any amplifier back into another channel's input.

Do not block the air intake or exhaust ports. Do not operate the amplifier near heat producing devices such as radiators, stoves etc.

Do not spill water or other liquids into or on the unit. Do not operate the amplifier if you or the amplifier are standing in liquid.

Do not remove top or bottom covers. Removal of the cover will expose hazardous voltages. There are no user serviceable parts inside and removal may void warranty.

Keep this manual for future reference.

## • USER RESPONSIBILITY

### **Speaker damage**

Your amplifier is very powerful and can be potentially dangerous to both loudspeakers and humans alike. Loudspeakers can be damaged or destroyed by overpowering, especially with the high power available from a bridged amplifier. Always check the speaker's continuous and peak power capabilities.

Even if the gain is reduced by using the amplifier's front panel attenuator, it is still possible to reach full output power if the input signal level is high enough.

### **Speaker output hazard**

Power amplifiers are capable of producing hazardous output voltages. To avoid electrical shock, do not touch any exposed speaker wiring while the amplifier is operating. See page 10 for information concerning proper connection of speakers.

### **Radio interference**

This product has been tested and complies with the limits of the European Electro Magnetic Compatibility (EMC) directive. These limits are designed to provide reasonable protection against harmful interference between electrical equipment. This product uses radio frequency energy and if not used or installed in accordance with the operating instructions may cause interference to other equipment such as radio receivers. There is no guarantee against interference even though the amplifier is EMC approved. If the amplifier causes interference, the problem can be corrected by following one or more of the following steps:

- a) Increase the proximity between the amplifier and the affected unit.
- b) Connect the AC cord of the amplifier to an outlet that is on a different circuit from that which the affected unit is connected to.
- c) If a radio receiver is interfered with (normally amplitude modulation type) reorient the antenna.
- d) Check whether the affected unit complies with the EMC limits for immunity (CE-labelled). If not, address the problem with the manufacturer or supplier. All electrical products sold in the EC must be approved for immunity against electromagnetic fields, high voltage flashes, and radio interference.

## • FRONT PANEL

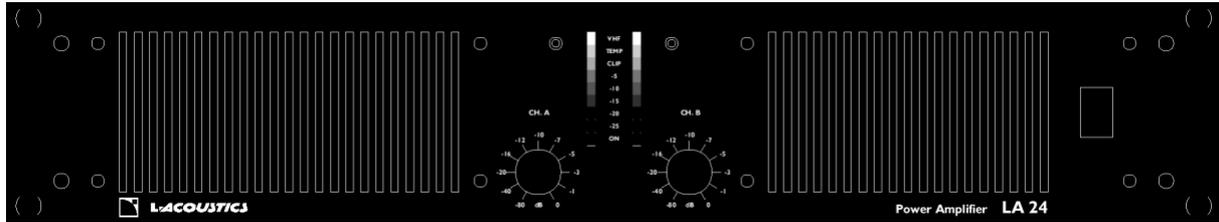


Figure 1. Front panel

### 1. Carry/protection handle

Both handles can be used to carry the amplifier and they also act as protection for the front panel. If desired, they can be removed by removing the screws located behind the front panel.

### 2. Input level attenuators

These controls are used to alter the signal level entering the amplifier. They are calibrated in dB to help set up active loudspeaker systems or to cut down on unwanted noise from the input signal (see page 14).

### 3. TEMP indicator

This indicator is lit if the amplifier tries to operate above its maximum operating temperature (90°C). The indicator first comes on as a warning to either turn down the input level or check the cooling arrangements after which point the amplifier will mute the input signal. When the cooling fans have returned the output heat sinks to the normal operating temperature the input signal is unmuted.

### 4. VHF protect indicator

This indicator lights when high level, high frequency signals (above 12 kHz at full power) are present at the output terminals. When this happens the input signal is muted and the process cycles until the VHF signal is no longer present (see page 16-17).

### 5. CLIP indicator

This indicator shows when the amplifier output is clipping or limiting. LED dynamics under clip conditions depend on whether the Clip Limiter is engaged or bypassed (see page 16):

- When the clip limiter is engaged, the clip indicator flickers briefly (limiting)
- When the clip limiter is not engaged, the indicator lights for a longer period (clipping).

### 6. Fan grill filter

Two removeable grilles with foam filters are located on the front panel to prevent dust from entering the amplifier.

### 7. Power switch

This is used to turn on/off the amplifier (see page 14).

## • REAR PANEL

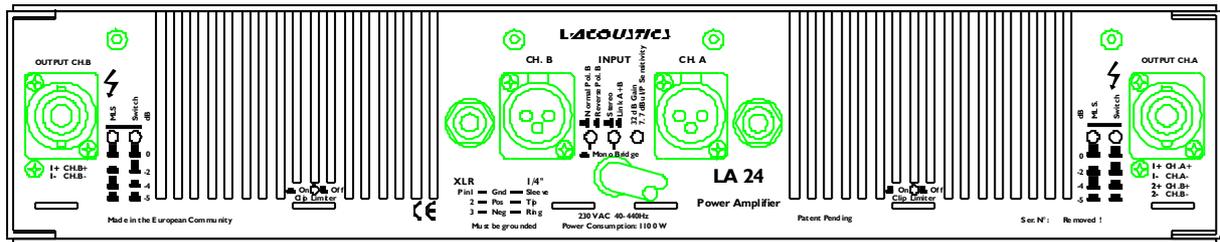


Figure 2. Rear panel

### 1. Speaker connector

Neutrik NL4FC Speakon Connectors. A full description of pin assignments is found in the operation section (see page 10).

### 2. MLS™ switches

Minimum Load Select (MLS) switches. Used to select the maximum output power (see pages 10-11).

### 3. Clip limiter switch

Turns the clip limiter on (switch depressed - in position) or off (switch not depressed - out position) (see page 16).

### 4. Input signal TRS jack

Alternative to using XLRs for signal input or for linking inputs with other amplifiers (see page 9).

### 5. Input signal XLR (see page 8).

### 6. Phase reverse switch for channel B

For reversing the input signal phase of channel B or used in conjunction with the Link Switch to allow bridged operation (see page 12).

### 7. Link switch

Allows a single input to drive both channels simultaneously or used in conjunction with the Phase Reverse Switch to allow bridged operation (see page 12).

### 8. AC line cord

## • INSTALLATION

### Mounting

The amplifier is two rack units high (2U) and will mount in a standard EIA 19 inch rack. Amplifiers may be stacked directly on top of each other and there is no need for spacing between units. If you intend to fill a rack with amplifiers, we recommend racking is started from the bottom of the rack. It is also recommended that rear supports are used for amplifiers mounted in the middle of the rack, especially if used as part of a portable system.

### Cooling

The LA 24 uses a forced air cooling system to maintain a low and even operating temperature. All L-ACOUSTICS amplifiers are fan ventilated and have front to rear cooling (generally there is usually cooler air outside the rack than inside). Never try to reverse the air flow since the Intercooler® needs a pressure chamber between the fans and heat sink and this only works for the normal front to rear direction of air flow (see Design Features on page 18).

Should a heat sink get too hot, its sensing circuit will mute the hot channel. If the power supply overheats another sensing circuit will mute all output channels until it cools down to a safe operating temperature.

Make sure that there is an adequate air supply in front of the amplifier and that the rear of the amplifier has sufficient space to allow the exhaust to escape. If the amplifier is rack mounted, do not use covers or doors on the front or rear of the rack.

For fixed installations with a central cooling system (usually found in fixed installations with a dedicated rack room) it may be necessary to calculate the maximum heat emission. Refer to the section on Power Consumption on page 7.

### Operating voltage

A label just below the mains cable on the rear of the amplifier indicates the AC mains voltage that your amplifier is configured for. Connect the power cable only to the AC source referred to on this label. The warranty will not cover damage caused by connecting to the wrong type of AC mains.

L-ACOUSTICS switch mode amplifiers use primary switching, i.e. the mains is rectified directly before the transformer, which means that the power supply is insensitive to the mains frequency and will operate from DC to 400 Hz.

The amplifier is supplied with an approved European AC line connector. If this connector is not appropriate for your country, it can be cut off and wired to a suitable connector in the following way :

<b>BROWN</b>	<b>LIVE</b>
<b>BLUE</b>	<b>NEUTRAL</b>
<b>GREEN/YELLOW</b>	<b>EARTH</b>

Once the AC connector is connected to a suitable AC supply, the amplifier can be started by pressing the AC power switch. When you power up the amplifier it takes a couple of seconds to check its circuits (this is known as the "soft start" or "slow start" sequence), the fans then blow at high speed before going into "idle" and the 2 bottom green LED's come on to show the output circuits are receiving the correct rail voltage.

## Grounding

There is no ground lift switch or terminal on this amplifier. The signal ground is always floating via a resistor to chassis and the grounding system is automatic. If a potential above 0.6 V presents itself between signal ground and chassis ground, a short circuit is introduced between the two, thereby enabling electrical protection. If a unit in the system is faulty, its mains fuse will blow due to this automatic ground system.

If you want to tie the signal ground to chassis, connect the XLR-connector's shell lug to pin 1. In the interest of safety never disconnect the earth pin on the AC cord.

For all units that are EMC approved for radio interference there is an AC mains filter. This filter needs the chassis ground for reference, otherwise a current loop is formed via the signal ground.

Use the balanced input to avoid hum and interference.

## Power consumption

There are three ways to determine the power/current consumption of the amplifier:

First, the peak current draw at full output power. Under this condition the power will trip the wall breaker within 30 seconds and the amplifier will operate for less than 2 minutes before thermally limiting. During this time, the temperature of the power supply will be stabilized at a temperature that will have no effect on the insulation rating of the AC line cord.

Secondly, the maximum expected average current under worst case program material is 1/3 of full power according to the FTC standard. At this level the music will be in a state of constant clip and this is therefore the highest power level one can obtain without completely obliterating the program.

Finally, the "normal operating power", as measured according to safety standard IEC 65 and used by a majority of safety agencies. The normal operating power is measured using pink noise, with an average output power equal to 1/8 of full power. One eighth of the total power is as loud as you can play music while making some attempt to avoid obvious clipping. It also corresponds to a headroom of 9 dB, which is very low for audio program.

For 2 ohm operation, the AFS-protection of the amplifier circuit will not permit long term current draw and the component temperature rise will stabilize well below the rating.

MAXIMUM OUTPUT POWER			MAINS INPUT POWER			
Load	# of Ch	Power (watts)	Full Power (sine wave)	1/3 Power (see note 1)	1/8 Power (see note 2)	Idle
8 ohms	2X	1000	2900	1200	600	130
4 ohms	2X	1400	4300	1700	900	130
2 ohms	2X	1400	6000	2200	1100	130

**note 1** Mean power with music as program source (amplifier driven to clip level)

**note 2** Normal music power with 9 dB headroom (IEC standard power rating)

*Table 1*

**The current draw** can be calculated by dividing the mains input power by the mains voltage.

We recommend you design your power distribution system to ensure sufficient current for at least 1/8 power operation and to upgrade service to meet 1/3 power requirements for heavy duty demands like discos etc.

**The heat power** can be calculated according to the following example:

Consider a headroom of at least 9 dB and a 4 ohm load on an amplifier producing 1400 watts per channel. The 1/8 power per channel is then:  $1400 / 8 = 175$  watts; total output:  $2 \times 175 = 350$  watts.

The power consumption according to Table 1 is 900 watts.

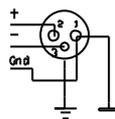
**The heat power produced** is the difference between the power consumption and output power :

$900 - 350 = 550$  watts per amplifier.

## Input connections

XLR Input connectors are balanced and wired according to **IEC 268** (pin 2 hot):

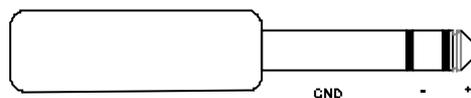
PIN 1	GROUND/SHIELD
PIN 2	HOT (+ve)
PIN 3	COLD (-ve)



*Figure 3. XLR input connector pinout*

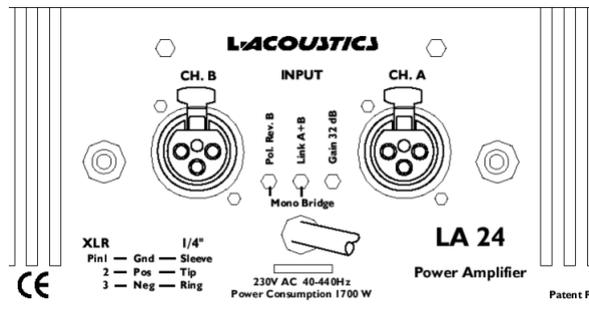
There are also TRS jacks for linking etc. They are wired as follows:

TIP	HOT (+ve)
RING	COLD (-ve)
SLEEVE	GROUND/SHIELD



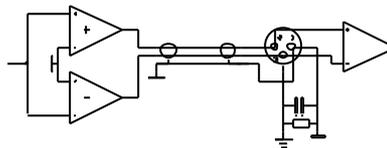
*Figure 4. TRS phone plug*

The input impedance is high enough (20 kohms balanced) to allow "daisy-chaining" or multiple parallel input connections. To daisy chain, use the TRS jacks provided on each channel. The input circuits have high enough headroom to accept the maximum output level from virtually any low level signal source.



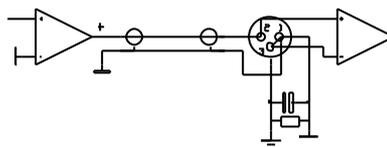
**Figure 5. Rear panel connectors**

**Do not use XLR and TRS jacks on the same channel simultaneously for mixing or for other purposes.**



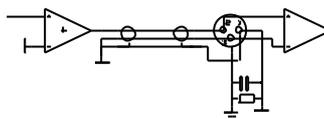
**Figure 6. Balanced line**

To connect an unbalanced source, tie pin 3 (ring on TRS jack) to the shield of the connector. If you leave one pin disconnected, you will lose 6 dB in gain.



**Figure 7. Unbalanced line connection**

A more optimal method for handling unbalanced sources is shown in Figure 8. This is similar to the connection for balanced lines, except pin 3 is tied to the shield at the source side instead. The hum and noise rejection for the cable is equivalent to that for a balanced line. To minimize hum, always use balanced inputs whenever possible.

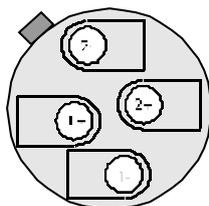


**Figure 8. Balanced line with unbalanced equipment**

## Connecting speakers

Speaker connections are made via the two **Neutrik NL4FC Speakon** connectors (1). Speakons are wired in the following manner:

	<b>Channel A</b>	<b>Channel B</b>
<b>Pin +1</b>	<b>Channel A+</b>	<b>Channel B+</b>
<b>Pin H1</b>	<b>Channel AH</b>	<b>Channel BH</b>
<b>Pin +2</b>	<b>Channel B+</b>	
<b>Pin H2</b>	<b>Channel BH</b>	



*Speakon Connector Pin Out Diagram*

**Never connect either output terminal to ground or to another output or input terminal (see warning on page 2).**

For normal two-channel operation, connect each speaker load across the output terminals (positive and ground). **Pay attention to speaker polarity: loudspeakers connected out of polarity degrade sound quality and may be damaged as a consequence.**

Keep the speaker cable wires as short as possible and use good quality stranded speaker cable. Do not use shielded wire, such as microphone or guitar cable. Remember that the speaker cable robs the power of the amplifiers by increasing the load impedance and introducing resistive power losses, so called  $I^2R$  losses.

### Load matching (MLS-switches)

Minimum Load Select (MLS) switches are located on the rear panel. The MLS switches provide load matching capability so that you can drive the LA 24 into 2 ohms without increased heat losses.

Please refer to Table 2 to determine the power delivered into a specific load for various MLS switch settings.

As you can see from Table 2 the LA 24 can produce in excess of 1000 watts into any impedance between 1.5 and 8 ohms. The fixed positions shown in Table 2 guarantee 1000 watts but higher powers can be achieved utilising higher **MLS™** positions when connected to lower speaker impedances.



## L-ACOUSTICS LA 24 POWER MATRIX

LOAD	CONFIGURATION	MLS SWITCH SETTING			
		-5 dB	-4 dB	-2 dB	0 dB
16 ohms	Stereo (2 channel)	160 W	180 W	340 W	520 W
8 ohms	Stereo (2 channel)	300 W	350 W	650 W	1000 W
4 ohms	Stereo (2 channel)	570 W	680 W	1100 W	1400 W
2 ohms	Stereo (2 channel)	1040 W	1200 W	1200 W	1400 W
16 ohms	Mono Bridged	600 W	700 W	1300 W	2000 W
8 ohms	Mono Bridged	1140 W	1360 W	2200 W	2800 W
4 ohms	Mono Bridged	2080 W	2400 W	2400 W	2800 W

Power in watts (EIA 1 kHz, 1% THD)

Table 2.

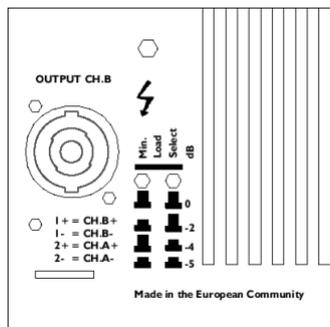


Figure 10. MLS switches on rear panel

**MLS™** positions can be set differently for each channel and a variety of combinations can be selected to suit different applications (see Table 3).

Channel	Impedance	MLS	Power	Comments
A	8	-2 dB	650W	Power reduction
B	8	-2 dB	650W	
A	4	0 dB	1400W	High peak power
B	4	0 dB	1400W	
A	8	0 dB	1000W	Power matching
B	2	-4 dB	1200W	
A	8	-2 dB	650W	Power sharing
B	4	0 dB	1400W	

Table 3.

The way to find the best **MLS™** position for your application is by experimentation. The amplifier is very well protected (even down to 0.3 ohms) but when time is of the essence, stick to the fixed positions.

The thing to remember with the LA 24 that it is a power converter and when you select **MLS™** positions you are allocating a portion of the total power available.

## • OPERATING MODES

### Stereo operation

For stereo (dual channel) operation, leave the Link and Phase reverse switches in the undepressed position (OUT). Both channels operate independently of each other and their individual level attenuators control their respective levels.

**Never connect either output terminal to ground or in parallel.** The recommended minimum nominal impedance, for stereo or tandem operation, is 2 ohms per channel.

### Tandem mono

For tandem (dual channel-single input) operation, depress the Link switch (IN position). Both channels are now driven by the same signal which can be applied at either input connector.

The output connection is the same as for stereo mode and both level attenuators are active, allowing you to set different levels for each channel. You can use either of the two TRS connectors for linking the signal to other amplifiers (daisy chaining). **Do not use the remaining XLR and TRS connectors for mixing or other purposes. Never connect either output terminal to ground or in parallel.**

### Bridged mono

To bridge the amplifier, depress the Link Switch (7) and Phase Reverse Switch (6). Both channels are then driven by a single signal which can be applied at either input A or B. You can use any remaining input connectors for linking etc. Do not use the remaining XLR and TRS as input jacks simultaneously for mixing or other purposes.

**Connect the speaker leads to pin +1 on the Channel A Speakon (positive speaker terminal) and pin +1 on the Channel B Speakon (negative speaker negative). Alternatively, connect the positive speaker terminal to +1 and the negative speaker terminal to +2 of the Channel A Speakon. Do not connect either of the -1 (negative) pins of the Speakons. Do not connect speakers to channel A or B in the normal manner in bridged mode, as this can cause serious damage.**

The recommended minimum nominal impedance for bridged mono is 4 ohms (equivalent to driving both channels at 2 ohms). Driving bridged loads of less than 4 ohms may cause thermal overload.

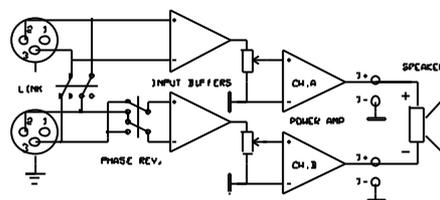


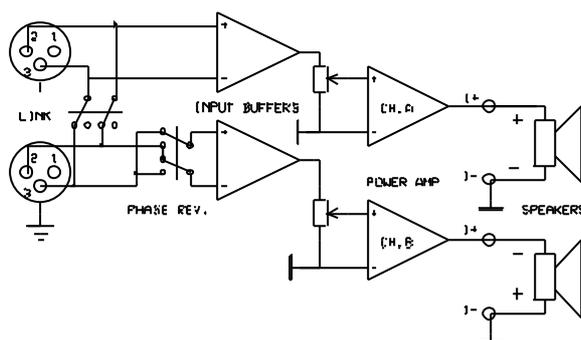
Figure 11. Bridged mono connection

For bridged mono operation, both level attenuators must be in the same position. We recommend you leave them in the 0 dB (fully open) position.

## Stereo reverse

This mode is similar to the Tandem mono mode except that by operating channel A and B in opposite polarity the energy storage in the power supply is more efficient. This means that the amplifier can deliver up to 10% more power than in tandem mono mode (a significant advantage for signals below 100 Hz such as sub bass etc).

For stereo reverse operation, depress the Phase reverse switch so that Channel B is phase reversed. To compensate, **connect pin +1 on the Channel B Speakon to the speaker's negative terminal and pin -1 on Channel B to the speaker's positive terminal. Alternatively, connect pin +2 on the channel A Speakon to the negative speaker terminal and pin -2 on Channel A to the positive speaker terminal.**



*Figure 12. Stereo reverse mode*

Channel A output is connected as in the normal stereo mode.

## • OPERATION

### Operating precautions

- Make sure that the power switch is off before making any input or output connections or operating the switches on rear panel. See pages 6-7 regarding installation.
- Make sure that the AC mains is correct and is the same as what is printed on the rear panel of the amplifier. See page 6 regarding operating voltage and power consumption.
- Make sure that the switches on the rear panel related to operating modes, clip limiters, and MLS™ are set in the correct position. See page 12 (operating modes), page 16 (clip limiters) and pages 10-11 (MLS switches) for further information.
- It is always a good idea to turn down the gain controls before powering up in order to prevent speaker damage if there is a high signal level at the input.

### Powering up - Soft start

When you power up the amplifier it takes a few seconds to check its circuits (this is known as the "soft start" or "slow start" sequence), the fans blow at high speed before going into "idle" then the two bottom green LED's come on to show that the output circuits are receiving the correct rail voltage.

### Input attenuators

The two input level attenuators on the front panel alter the signal level for their respective amplifier channels in all modes. They are calibrated in dB to help in setting up active loudspeaker systems or for cutting down unwanted noise from the input signal. In bridged mode, both controls must be in the same position so that the speaker load will be shared equally between the channels.

### Gain

The LA 24 is configured for 32 dB gain as standard. Most professional mixing consoles operate at a nominal level of +4dBu therefore 32 dB gain gives you plenty of fader movement.

INPUT SENSITIVITY			
GAIN	Vrms	dBV	dBu
32 dB	1.88	5.5	7.7

## Indicators

The two bottom green "ON" LEDs indicate that the output circuits are receiving the correct rail voltage.

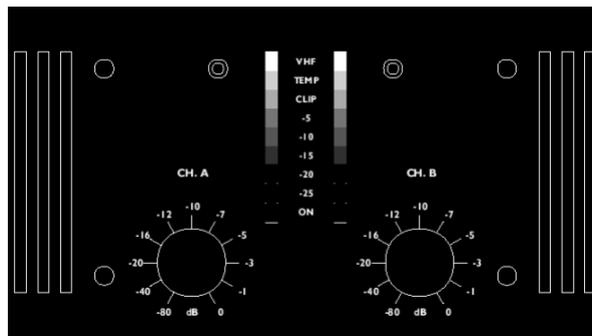
The "-25 dB" LEDs glow when the output signal is greater than -25 dB (0 dB is referenced to the full output power as selected using MLS switches). These LEDs also act as signal present indicators.

The rest of the green LEDs form a bar for output levels from -20 dB to -5 dB.

The **CLIP indicator** shows when the amplifier output is clipping or limiting. Clip indicator LED dynamics under clipping conditions depend on whether the clip limiter is engaged.

- When the clip limiter is engaged, the clip indicator flickers briefly (limiting)
- When the clip limiter is not engaged the clip indicator lights for a longer period (clipping)

The remaining yellow LEDs indicate if any protection circuits are activate. These are described below.



*Figure 13. Front indicators*

## • PROTECTION FEATURES

Each L-ACOUSTICS amplifier has many advanced protection features that will protect both the amplifier and the speakers connected to it should a fault condition arise. All protection circuits are independent and under normal use these features are inaudible. When the amplifier comes out of a protect condition, the output level has a slow rise time - the effect is like turning the gain up slowly.

### Clip limiter

The clip limiter is included to prevent dangerously clipped signals from reaching the speaker and damaging it. Limiting circuitry works by monitoring the output and comparing the distortion produced between the input and output of the amplifier. If the distortion exceeds 1%THD for any reason (voltage or current clipping), the limiter reduces the input signal proportionally. Note that if the signal is distorted or clipped before it reaches the amplifier, the clip limiter will not be activated.

Under normal operation, clip limiting is inaudible. The limiter can be turned On or Off by depressing the clip limit switch (2).

Clip Limiter ON = switch depressed (IN position)

Clip Limiter OFF = switch not depressed (OUT position)

L-ACOUSTICS recommends leaving the clip limiters switched "on" (button depressed) at all times.

### Thermal protection

When the amplifier is driven very hard into low impedances, the cooling fans go into high speed. If the conditions that cause this continue, the TEMP indicator(s) will light as an indication that the amplifier will soon thermal out.

After five seconds the amplifier will go into thermal protect, muting the input signal. After 15-20 seconds the amplifier will cool the **Intercooler**<sup>®</sup> and the cycle will begin again.

Thermal protection starts when the **Intercooler**<sup>®</sup> reaches a temperature above 90° C.

### VHF protection

When a signal of more than 12kHz at full output power is present at the output connectors for more than five seconds, the VHF protection circuit mutes the input signal and the VHF LED will light. This is a useful feature since there are currently no commercially available compression drivers that can take 1000 watts of continuous power at 12 kHz!! This circuit is inaudible under normal use, however it can be turned off.

*If the VHF protection is required to be turned off, e.g., for studio monitors, please consult the factory, as this is a non-user adjustment.*

## **Short circuit protection**

All L-ACOUSTICS amplifiers are completely short circuit protected. The protection circuit permits very high peak currents, but still holds the output devices within their safe operation area. If a short circuit is maintained, the channel affected will eventually go into thermal protection and the cycle will repeat.

## **AC mains voltage protection**

If the AC mains voltage is outside the 20% range of allowed operation voltage (over or under voltage), the power supply will shut itself down. When the mains voltage is above the minimum start voltage and below its maximum operating voltage the amplifier will restart again.

It takes a couple of seconds for the amplifier to check its circuits (this is known as the "soft start" or "slow start" sequence), then the gain will slowly and gradually be raised back to normal and the fans then blow at high speed before going into "idle". The two green "ON" LEDs indicate when the power supply is operating properly.

## **DC protection**

There are two types of DC protection:

Fuses on the supply branches of each channel (this is an **IEC 65** requirement) and Crowbar type protection that shorts the output. Both of these circuits come into effect once a DC level of 10 volts or more is detected on either channel.

## • DESIGN FEATURES

### Cooling

**L-ACOUSTICS amplifiers** run very cool due to a patented heat sink device called the **Intercooler™**. First, bipolar output devices are mounted directly on a copper heat sink thereby avoiding thermal losses normally found when using mica washers. The heat sink is then mounted horizontally in front of a pressure chamber where the air flow is constant along the entire length of the heat sink due to a horizontal pressure chamber that is created in front of it (by comparison, for a conventional tunnel design the end of the heat sink opposite the fan invariably gets hotter than that directly in front of the fan). When cool air in the pressure chamber hits the geometric fins of the **Intercooler™**, turbulence is produced thereby enabling efficient cooling.

### Light weight

The LA 24 has an excellent power to weight ratio, (280 W/Kg) making it one of the most powerful 2U amplifiers available. The light weight is achieved not only through use of the switch mode power supply - the **Intercooler™** and 9 piece anodized alloy chassis also contribute greatly, making rear rack supports unnecessary in many applications.

### Switch mode power supply (SMPS)

Switch mode power supplies are the modern solution to the problems of size and weight. However, early examples of SMPS used for power amplification in audio applications were less than impressive and literally adopted the type of supply found in many computers today. The L-ACOUSTICS SMPS is different in that it is regulated. How is this achieved?

In contrast to other designs that use push pull converters we have managed to produce a SMPS that has the same characteristics as a conventional power supply. We have avoided the pitfalls of push-pull converters by eliminating the need for limiting on the secondary side of the switch transformer. This is achieved by using sense windings and injecting a magnetic pulse from the AC line during a pulse time segment which is separate from the output charge current pulse.

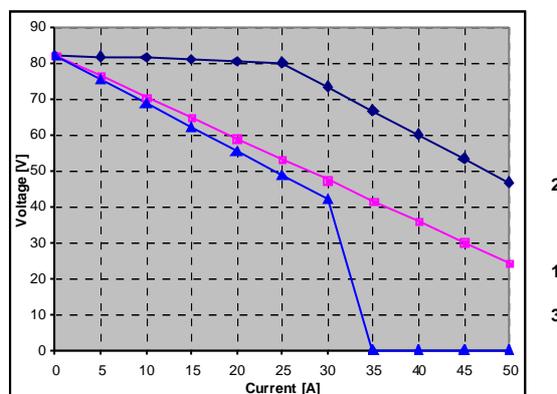


Figure 14. Current-voltage characteristic of different power supply topologies.

- 1) Conventional power supply shows voltage drop due to internal resistance
- 2) Regulated power supply used by L-ACOUSTICS
- 3) Unregulated switch mode power supply with current limiting

While the SMPS might sound complex it is actually very straight forward and has high reliability. The net performance result is good bass and fast transient response. Because the supply is regulated, the LA 24 will produce the same power output even if the AC line voltage falls by up to 20% ! Efficiency is also assured, and in the case of the LA 24 this is especially apparent - its power supply draws only 4 kW while producing 2 x 1400 W. For a conventional amplifier, typically only 2 x 650 W would be produced and nearly 3 kW wasted as heat.

Traditional PSUs can also behave erratically at certain frequencies - particularly at low frequencies under clip conditions where their output impedance rises. This produces uncontrollable speaker cone movement and under these conditions clip states are more audible for the case of conventional PSUs.

By comparison, the L-ACOUSTICS SMPS produces its rated power output at all frequencies regardless of speaker demands and AC line conditions.

### **MLS™-switches**

Thanks to the regulated SMPS, the maximum power available from the output stages can be adjusted without increased heat dissipation or efficiency loss. This allows users to match the output power to the loudspeaker load impedance.

The LED bargraph is also adjusted to give a correct reading relative to the selected output power. Because the amount of power delivered into a load is dictated by its impedance (at 2 ohms you use the least voltage but require the most current), you can cheat with the MLS switches thereby enabling powers in excess of the normal power rating.

## • SAFETY APPROVALS

L-ACOUSTICS amplifiers are designed to meet **IEC65**, a stringent electrical safety approval from the **International Electro-technical Commission**. The **IEC65** standard is recognized world-wide with most countries having an equivalent.

## EMC approvals

EMC stands for Electro Magnetic Compatibility. This implies that the equipment should have low emission of radio frequencies, directly radiated as electromagnetic fields in the air and as conducted from the cables connected to the unit. The amplifier should also be able to handle electromagnetic fields, high voltage flashes, and radio interference coming into the unit via the air or cables.

## Emission

The regulations now cover the frequency range from 150 kHz to 300 MHz. The maximum level radiated from a unit has to be below 100  $\mu$ V, ( 0.0001 V ).

## Immunity

The equipment should be able to handle three different types of interference:

- Electrostatic discharges of up to 8 kV, hitting the chassis or cables.
- Transients and bursts up to 1 kV, conducted through the cables to the unit.

Electromagnetic fields up to 3 V/m, radiated on the unit and cables in the frequency range of 27 - 500 MHz.

We have extended the tests in two cases and chosen a standard used for heavy industrial situations. First, we have tested conducted disturbances in the frequency range 150 kHz - 80 MHz, by injecting 3V amplitude modulated (80%) signals into all the cables (inputs, outputs and mains). This covers noise from AM transmitters, which are still in use in some areas. Secondly, we have extended the range for electromagnetic fields to 26 - 1000 MHz, with a level of 6 V/m and 80% AM modulated.

In the range 895 - 905 MHz, we test with a field strength of 35 V/m and 100% pulse modulation. This emulates the signals from a mobile phone close to the unit. In all cases the noise plus distortion is below 1% at normal operating level (normal operating level is 1/8 of full power or -9 dB under clip point according to IEC 65).

## EMC-declaration

This audio power amplifier conforms with the EMC-directive 89/336/EEC and relates to the following standards:

- EN 55013:1990
- EN 50 082-1
- IEC 801-2, ed.1(1984)
- IEC 801-3, ed.1(1988)
- IEC 801-4, ed.1(1984)
- SS-ENV 50 141 ed.1 (1994)

## • APPENDIX A

### Mains voltage selection

The LA 24 is normally shipped for 230 volt AC operation but can be configured for 115 volt AC option. To check if the amplifier is equipped with the 115/230 V option, please follow these steps:

1. Make sure that the LA 24 is unplugged from the mains voltage.
2. Remove the top and bottom cover.
3. If the four electrolytic capacitors close to the front are rated 1500uF 200VDC, the amplifier is for 230 volt operation only
4. If the four electrolytic capacitors close to the front are rated 2200uF 200VDC, the amplifier has the 115/230 volt option.
5. Locate the jumper(s) on the solder side of the circuit board close to the mains switch.
6. To select the desired mains voltage, install the jumpers as shown in Figure 15.
7. For 230 volt operation; use a T 15A fuse (slow blow), for 115 volt change to a T 30 A fuse (slow blow).
8. Replace the amplifier top and bottom cover.
9. For 115 volt operation; stick a "115 VAC" label on top of the 230 VAC label on the rear panel.

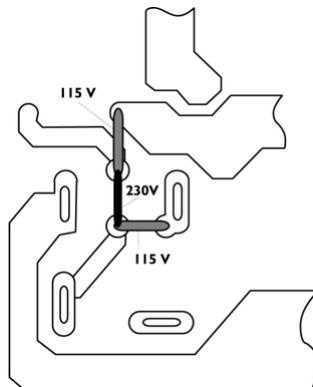


Figure 15. 230 VAC or 115 VAC selection

**Warning:** This modification should only be made by an experienced service technician.

## • MAINTENANCE

Under normal use the LA 24 amplifier should give years of trouble free service. The only user maintenance required is to remove and vacuum the front grill periodically.

In some extreme cases it may be necessary to clean the inside of the amplifier. This is usually necessary after prolonged use in environments where "cracked-oil" smoke machines are present.

If you are using your amplifier for heavy duty use i.e., concert touring, it is recommended that you have your amplifier serviced every 3 years, purely as a preventative measure.

## • TROUBLESHOOTING

These are typical things to check if you think your amplifier is faulty:

**Fault:** No output.

If the output bargraph is functioning there is nothing wrong with the amplifier and the likely cause is an unsecured Speakon.

Check that the VHF protection is not activated. If it is, remove possible high frequency oscillations from the relevant input.

**Fault:** The amplifier goes into thermal protection when driven at low level.

Check that your loudspeaker does not have a short circuit in its windings (this can occur when the speaker's voice coil gets hot).

**Fault:** The amplifier goes into protect with power indicators off.

Check that the AC line voltage is not outside the amplifier's operating range (130-260 volts). Over/under-voltage protection may have occurred.

If the amplifier is connected by mistake to a 3 phase supply (415v), an internal non-resettable fuse or resistor may have blown (return the amplifier for service).

**Fault:** The amplifier does not respond even after checking the above items.

In the unlikely event that there is a non-user rectifiable fault, return the amplifier to L-Acoustics or an approved service centre.

**L-ACOUSTICS cannot be held responsible for damage or injury as a result of the top cover being removed.**

## • WARRANTY AND DISCLAIMERS

### General

This product is warranted to be free from defects in components and factory workmanship under normal use and service for a period of 3 years from the date of original purchase.

During the warranty period, L-ACOUSTICS or its nominated agents will undertake to repair, or at its option, replace this product at no charge to its owner when it fails to perform as specified, provided that the unit is returned undamaged and shipped pre-paid to the factory or an authorised service facility.

No other warranty is expressed or implied.

This warranty shall be null and void, if the product is subjected to:

- 1) Repair work or alteration by persons other than those authorised by L-ACOUSTICS or its agents.
- 2) Shipping accidents, war, civil insurrection, misuse, abuse, operation with incorrect AC voltage, operation with faulty associated equipment and normal wear and tear. Units on which the serial number has been removed or defaced will not be eligible for warranty service.
- 3) L-ACOUSTICS shall not be responsible for any incidental or consequential damages with respect to the products warranted.

L-ACOUSTICS reserves the right to make changes or improvements in the design or manufacturing without assuming any obligation to change or improve products previously manufactured.

### International

Please contact your supplier for this information, as rights and disclaimers may vary from country to country.

## • TECHNICAL ASSISTANCE

### **International**

If your L-ACOUSTICS product needs repair then contact your L-ACOUSTICS dealer or distributor directly (or contact L-ACOUSTICS by fax to obtain the location of the nearest authorised service centre).

### **Factory service**

In the event that your L-ACOUSTICS product needs factory service, you should contact the L-ACOUSTICS service department for return instructions and a Return Authorisation number.

### **Please note on product return:**

1. Use the original packing
2. Include a copy of the sales receipt, your name, return address, phone number, fax number and defect description.
3. Mark the Return Authorisation number on the outside of the packing.
4. Ship the product prepaid to:

**L-Acoustics**  
**Les Taillis Bourdrie**  
**Route des Molières**  
**91400 Gometz-la-Ville**  
**France**

**Telephone:** +33 (0)1 60 12 74 74  
**Fax:** +33 (0)1 60 12 55 18  
**e-mail:** lacoustics@aol.com