

# **Quick Start Guide**

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# ***Pre-Installation***


This section describes safety conventions used within this document and provides essential information about the **Model LVC 5051RLY** amplifier. Review this material before installing or operating the amplifier.

**AE TECHRON** is committed to continuous product improvement. Technical progress may result in minor variations between this manual and a particular unit. Any significant changes or customizations will be reflected in revisions of this manual. Customers are encouraged to promptly add any additional information about their particular unit to this manual.


## Safety Conventions

The LVC 5051RLY amplifier is a highly sophisticated instrument. Special hazard alert instructions appear throughout this guide. Note the following examples:




 <b>DANGER</b>
DANGER represents the most severe hazard alert. Extreme bodily harm or death will occur if these guidelines are not followed. Note the explanation of the hazard and instructions for avoiding it.



 <b>WARNING</b>
WARNING alerts you to hazards which could result in severe injury or death. Note the explanation of the hazard and the instructions for avoiding it.



 <b>CAUTION</b>
CAUTION indicates hazards which could result in potential personal injury or equipment or property damage. Once again, note the explanation of the hazard and the instructions for avoiding it.



**NOTE:** A Note represents information which needs special emphasis, but does not represent a hazard.

## **General Description**

The **AE TECHRON Model LVC 5051RLY** is a dual channel power supply amplifier designed for use in high power Simulation and Protection Relay test systems. It can deliver short term power of up to 50 amps peak per channel into 2-ohm or lower impedance loads. It accomplishes this with extremely low harmonic and intermodulation distortion and low noise.

All this power is concentrated into a 5-inch rack mount package. From the front panel, you can control and monitor the input signals.

- A push button power switch activates an **AMBER “ON”** indicator.
- Dual brightness indicator—dim indicates signal presence, bright indicates amplifier is in OVERLOAD.
- Dual color (**RED** and **GREEN**) LED indicators show current limit and load current.

### **On the back panel:**

- Input is connected using bare wires.
- Loads connect to a unique output block, which uses heavy duty binding posts.

### **Other features include the ability to:**

- Switch from Dual mode to Bridge-Mono (not recommended) or Parallel-Mono mode with a 3-position slide switch.

## **Specifications**

Specifications are for units in Dual mode driving both channels into 8-ohm loads, (26 dB = 20 times voltage gain) and operating from 120 VAC, unless otherwise specified.

“Standard 1 kHz Power” refers to maximum average power in watts at 1 kHz with 0.1% THD.

“Full Bandwidth Power” refers to maximum average power in watts from 20 Hz to 20 kHz with 0.1% THD.

## **Performance**

**Input to Output Phase Delay:**  $0.4^\circ$  at 60 Hz

**Channel to Channel Phase Error:**  $<0.1^\circ$  at 60Hz

**Signal to Noise Ratio:** At gain of 20, better than 105 dB (A-weighted) below full output.

**Total Harmonic Distortion (THD):**  $<0.05\%$  from 20 Hz to 1 kHz, increasing linearly to 0.1% at 10 kHz at full output.

**Residual Noise (20Hz to 1kHz):**  $<0.8\text{mAmp}$ .

**Load Impedance:** Rated for use into 2 ohms or less. Safe with all types of loads, even reactive ones.

**Required AC Mains:** 60 Hz, 120VAC with 30A service. Convertible to 100/ 200/208/230/240VAC at 50/60 Hz.

**Maximum Current:** 70Arms / 98A peak

**Maximum Voltage:** 120Vrms no load

## Controls

**Front Panel:** A push “On/Off” power switch; also, a signal level control for each channel. The level controls are wired to the PIP card and may be enabled or disabled.

**Back Panel:** A 3-position switch selects Dual, Bridge-Mono, or Parallel-Mono mode.

**Internal:** Switches behind the front grill allow selection of normal VZ operation, lock to low voltage only, lock to high voltage only, and lock to low voltage under ODEP conditions.

## Indicators

**Amber Enable Indicator** shows on/off status of low-voltage power supply.

**A Green OVERLOAD** indicator for each channel flashes dim green to show a signal is present at the input, and flashes brightly in the rare event distortion of any kind exceeds 0.05%, including input overload.

**A bi-color (Green/Red)  $I_{LOAD}/I_{LIMIT}$  indicator** for each channel flashes green with the output signal (when under a current load) and flashes red in the event of current limiting.

## Input/Output

**Input Impedance:** Greater than 10 K ohms, balanced, and 5 K ohms, unbalanced.

**Output Impedance:** Less than 510 milliohms in series with less than 2 microhenries.

## Connectors

**Inputs:** Euro-style screw terminals will accept up to 16 gauge bare wire.

**Outputs:** Unique output bus with high current binding post.

**AC Line:** "TT" style, 3 wire, 30A grounded connector (for 120 VAC units).

## Construction

Black splatter-coat steel chassis with specially designed flow-through front to rear ventilation system with computer-controlled forced air-cooling.

**Dimensions:** 19 inch (48.3 cm) wide, 5.25 inch (13.3 cm) high, 16 inch (40.3 cm) deep behind front mounting surface, and 2.875 inches (7.3 cm) in front of the mounting surface.

**NOTE: Allow 4 inches in back for adequate airflow.**

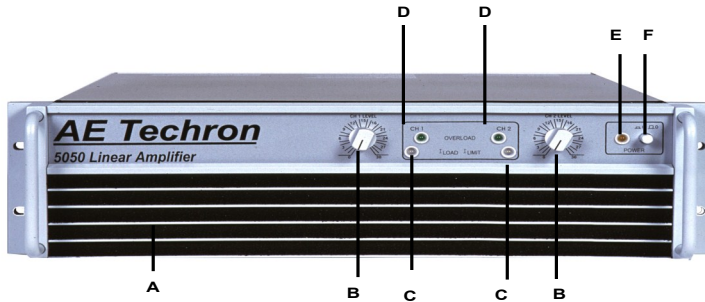


**Weight:** 77 lbs. (35.2 kg) net, 88 lbs. (40.2 kg) shipping weight.

**Mounting:** Standard EIA 310 front-panel rack mount with supports for supplemental rear corner mounting.

## Front Panel Functions

The following illustration, with captioned call-outs, provides a visual location of the **LVC 5051RLY** front panel functions.



### A. Dust Filters

The dust filters remove large particles from the air drawn in by the cooling fans. Check the filters regularly to prevent clogging. The filter elements can be easily removed for cleaning by gently pulling them away from the front panel.

### B. Level Control

The output level for each channel is set with these controls. Each control has 31 detents for precise adjustment.

### C. $I_{Load}/I_{Limit}$ Indicators

The flow of current to the load and the maximum current limit of the amplifier are monitored by these two-color indicators. The  $I_{Load}/I_{Limit}$  indicators glow green to show that load current is flowing and turn off when there is no significant load current. The  $I_{Load}/I_{Limit}$  indicators turn red if the amplifier has reached its maximum output current capacity.

### D. Overload Indicators

When a large input signal causes an input overload or output clipping, these green indicators flash *brightly* with a 0.1 second hold, otherwise, they indicate the presence of a distortion-free signal.



### E. Power Indicator

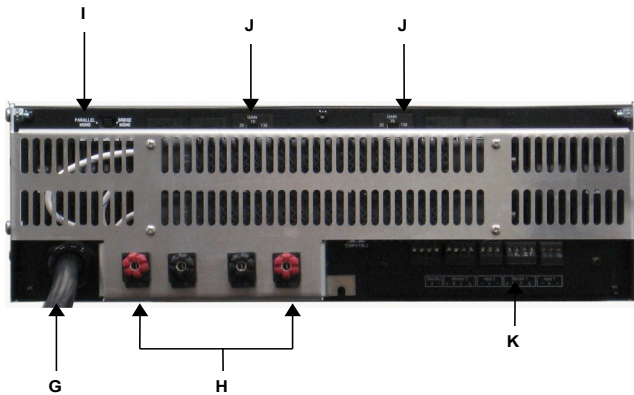
This amber indicator lights when the amplifier is connected to AC power and turned “ON”.

### F. Power Switch

This push button is used to turn the amplifier “ON” and “OFF”. When turned on, the output is muted for about four seconds to protect your system from start-up transients.

## ***Back Panel Functions***

The following illustration, with captioned call-outs, provides a visual location of the LVC 5051RLY back panel functions.



### G. Power Cord

Units set up for 100 to 120 VAC have a 10 AWG, 30 amp line cord, while units set up for 200 to 240 VAC have a 12 AWG, 20 amp line cord. North American units set up for 120 VAC, 60 Hz power are shipped with a grounded 125 volt, 30 amp NEMA TT30P plug; units shipped outside North America are provided without a plug.

## H. Output Connectors

This high-current output block is provided for output connection. Its connectors use high current binding posts.

## I. Dual/Parallel-Mono/Bridge-Mono

This switch is used to select one of three output modes; Parallel-Mono, Dual or Bridge-Mono. Dual is the recommended setting for this switch.

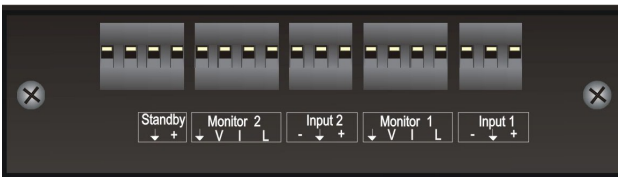


## J. Gain Switches

These three-position switches are used to select a voltage gain of 20,70 or 130 times for each channel.

## K. Input Plug-in Module

The versatility of plug-in modules make it easy to customize the input, and other functions of the amplifier, to your needs.



# Installation

This section describes general guidelines for installing the **Model LVC 5051RLY** amplifier with special emphasis on system installations.

## Unpacking

Every **AE TECHRON Model LVC 5051RLY** is carefully inspected and tested prior to leaving the factory. Carefully unpack and inspect the unit for damage in shipment. Besides the amplifier, you should find this manual and mounting hardware in the package.

- 1) Inspect the crating for **ANY** signs of damage.
  - a. Make written notes of any damage for future reference.
  - b. If damage is found notify the transportation company immediately
  - c. Save the shipping carton and packing materials as evidence of damage for the shipper's inspection.
  - d. If severe damage is apparent, **DO NOT** proceed until a representative of the shipping company is present.
- 2) Uncrate/unpack the amplifier
- 3) Save the packing materials for later use in transporting **or** shipping the unit.

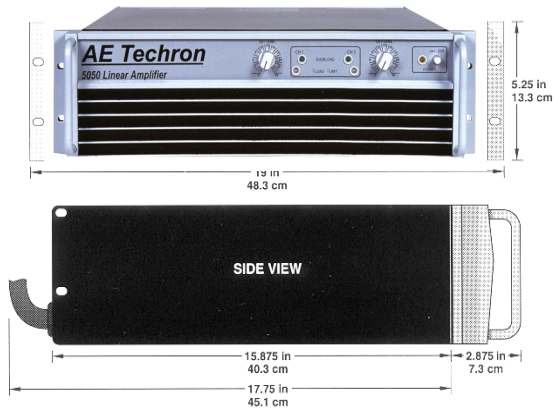
**AE TECHRON** will cooperate fully in the case of any shipping damage investigation. In any event, replacement-packing materials are available from **AE TECHRON**.



**NOTE: Never ship this unit without proper packaging.**

## Mounting

The LVC 5051RLY is designed for standard 19-inch (48.3 cm) rack mounting and "stack" mounting without a cabinet. For optimum cooling and rack support, multiple units should be stacked directly on top of each other.



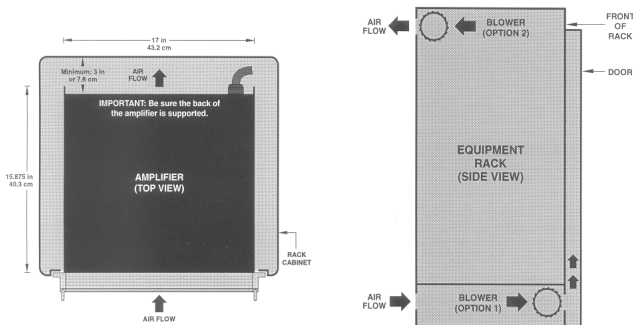
**Mounting Dimensions**

## Cooling

**NEVER** block the air vents in the front or back of the amplifier. These amplifiers **DO NOT** need to be mounted with space between them. If you must leave open spaces in a rack for any reason, close them with blank panels or poor airflow will result. Allow for airflow of at least 75 cubic feet (2.1 cubic meters) per minute per unit. Additional airflow may be required when driving low-impedance loads at consistently high output levels.

**NOTE:** Refer to Section 3 Applications for detailed information on thermal dissipation.

When mounting the amplifier in a rack cabinet, the back wall of the rack should be at least 3 inches (7.6 cm) away from the back of the amplifier chassis as shown below.



Rack Cabinet Cooling

If your rack has a door, provide adequate airflow by installing a grille in the door or by pressurizing the air behind the door. Wire grilles are recommended over perforated panels. A good choice for pressurizing the air behind the rack cabinet door is to mount a "squirrel cage" blower inside the rack (Option 1 above). Mount the blower so it blows outside air into the space between the door and front of the amplifiers, pressurizing the "chimney" behind the door. This blower should not

## ***Making Connections***

Before beginning the installation of your amplifier, check the following:

- ✓ Remove all power from the unit. Do not have the AC cord plugged in.
- ✓ Turn input level control down (fully counter clockwise).


The input and output jacks are located on the back panel. Use care in making connections, selecting signal sources, and matching loads. During hookup take the following precautions:

1. **Use only shielded cable on inputs.** The higher the density of the shield (the outer conductor), the better the cable. Spiral wrapped shield is not recommended.
2. **The output wire and connectors should be heavy enough** to carry the intended current to the load.
3. **Use good quality connectors** with proper strain relief.
  - Do not use connectors that have any tendency to short circuit.
  - Do not use connectors that can be plugged into AC power receptacles.
4. **Keep unbalanced input cables as short as possible.** Avoid lengths greater than 10 feet.
5. **Do not run signal (input) cables together with high level wiring** such as load (output) wires or AC cords (lowers most hum and noise).
6. **Do not short the ground lead of an output cable to the input signal ground.** Oscillations may result.
7. **Operate the amplifier from proper AC current.** Supply voltage must be 50 to 60 Hz and no more than 10% above or below the selected line voltage. Failure to comply with these frequency limits may damage the unit and result in unreliable operation.

8. **Never connect the output to a power supply output, battery, or power main.** These connections will cause serious damage to the amplifier.

9. **Do not permit unqualified personnel to tamper with circuitry.** Do not make unauthorized circuit modifications. Serious damage to the amplifier and/or safety hazards may result.



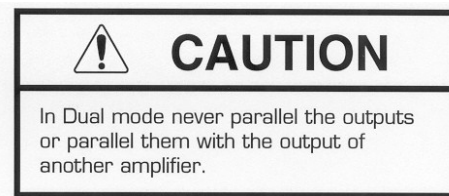
	<b>DANGER</b>
The OUTPUTS can give you a lethal <i>ELECTRIC SHOCK!</i> Wait 10 seconds after shutdown before touching.	

## ***Dual Channel Hookup***

In Dual Mode, installation is very intuitive: input Channel 1 feeds output Channel 1, and input Channel 2 feeds output Channel 2. To activate Dual mode:

- 1. Turn off the amplifier**
- 2. Wait 10 seconds for the power supply to discharge**
- 3. Slide the Dual/Mono switch to the center position**
- 4. Connect the output wiring as shown below.**

The high-current output block has three sets of output connectors per channel so multiple loads can be easily connected. Two sets accept banana plugs, while the third set accepts spade lugs or bare wire. Observe correct load polarity and be very careful not to short the two outputs.





## ***Bridge-Mono Hookup (Not recommended)***

Bridge-Mono mode is intended for driving loads with a total impedance of 4 ohms or more (see Section 2.4.3 if the load is less than 4 ohms). Installing the amplifier in Bridge-Mono mode is very different from the other modes and requires special attention.

To activate Bridge-Mono mode:

- 1. Turn the amplifier off**
- 2. Wait at least 10 seconds**
- 3. Slide the Dual/Mono switch to the right (as you face the back of the amplifier).**



**NOTE: Both outputs receive the signal from the channel 1 input with the output of channel 2 inverted so it can be bridged with the channel 1 output.**

*AND*



**NOTE: The channel 2 input and level control are disconnected in Bridge Mono mode. A signal-feeding channel 2 will have no effect on the output.**

- 1. Connect the load across the channel 1 and 2 positive (+) terminals**
- 2. Attach the positive lead from the load to channel 1.**
- 3. Attach the negative lead from the load to channel 2. (This cannot be connected to ground, chassis or amplifier, or it will damage the amplifier.)**

The negative (-) terminals are not used and should not be shorted. This cannot be connected to ground, chassis or amplifier, it will damage the amplifier.

## ***Parallel-Mono Hookup***

Parallel-Mono mode is intended for driving loads with a total impedance of less than 4 ohms (see Section 2.4.2 if the load is 4 ohms or greater). Installing the amplifier in Parallel-Mono mode is very different from the other modes and requires special attention.

To activate Parallel-Mono mode:

- 1. Turn off the amplifier**
- 2. Wait at least 10 seconds**
- 3. Slide the Dual/Mono switch to the left (as you face the back panel).**
- 4. Connect the input signal to channel 1, and do not use the channel 2 input**

Both outputs will now receive the signal from the channel 1 input.



**NOTE: The channel 2 input and level control are disconnected in Parallel-Mono mode. A signal-feeding channel 2 will have no effect on the output.**

To complete connections:

- 1. Install a jumper wire between the positive (+) outputs of channel 1 and 2 that is at least 14 gauge in size.**
- 2. Connect the load to the output of channel 1 as shown below.**
- 3. Connect positive (+) lead from the load to the positive (+) channel 1 terminal**
- 4. Connect the negative (-) lead from the load to the negative (-) channel 1 terminal.**

**Channel 2's Green LED will be bright—this is normal.**



**NOTE: Remember to remove the jumper between the positive output terminals before changing to Bridge-Mono or Dual modes—Amplifier damage may result.**

## Connecting Power

The **LVC 5051RLY** uses a 3-wire (grounded) AC line system. At times, the third wire ground may introduce a ground loop into the system.

Each **LVC 5051RLY** is supplied from the factory with an appropriate AC cord.

- Units set up for 100 to 120 VAC operation are shipped with 10 AWG, 30 amp line cords.
- Units set up for 200 to 240 VAC operation are shipped with 12 AWG, 20 amp line cords.
- North American units set up for 120 VAC, 60 Hz operation are provided with a 125 volt, 30 amp NEMA TT30P plug.
- Units destined for other parts of the world are provided without a plug.

Whenever possible, connect the power cord to an isolated power circuit with adequate current. Excessive line voltages of more than 11% above the amplifier's rated line voltage will activate the overvoltage protection circuitry.

All specifications in this manual were measured using 120 VAC, 60 Hz power mains unless otherwise noted. Specifications are derived using a peak main voltage equal to the true peak of a 120 V RMS sine wave with all available channels fully loaded.

Although this amplifier is rated for operation at 100 and 120 VAC, it is more efficient at 200, 208, 230 or 240 VAC. At these higher voltages, less power is converted to thermal energy in the AC cord and slightly



## **Notes**