



QUANSER
INNOVATE. EDUCATE.

USER MANUAL

AMPAQ-L2/L4 Amplifiers

Set Up and Configuration



CAPTIVATE. MOTIVATE. GRADUATE.

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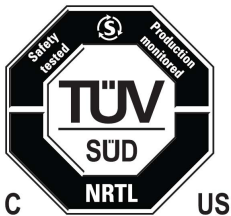


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CE Compliance

This product meets the essential requirements of applicable European Directives as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)



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This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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This Class A digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

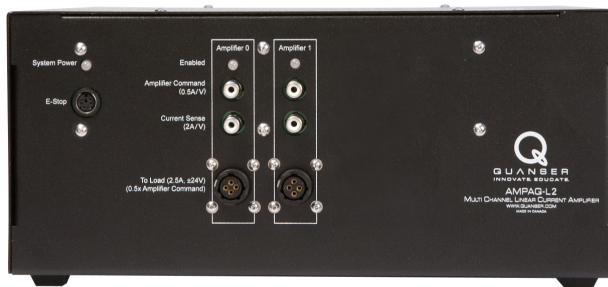
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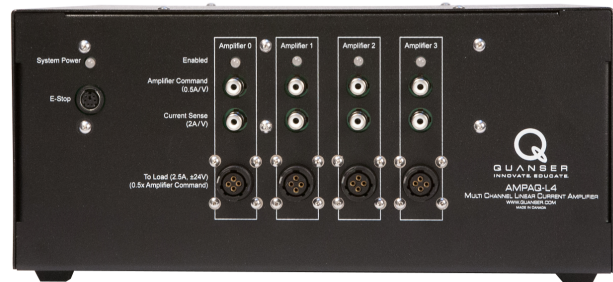
1 PRESENTATION

The Quanser AMPAQ is a high-bandwidth, linear current amplifier. There two AMPAQ models: the two-channel AMPAQ-L2, shown in Figure 1.1a, and the four-channel AMPAQ-L4, shown in Figure 1.1b. The AMPAQ L2/L4 has the following features:

- Power amplifier capable of supplying up to 2.5 A.
- Current sensing capability.
- 10 kHz bandwidth in current mode.
- Emergency stop capability.



(a) AMPAQ-L2



(b) AMPAQ-L4

Figure 1.1: AMPAQ Linear Current Amplifiers



Caution: This equipment is designed to be used for educational and research purposes and is not intended for use by the general public. The user is responsible to ensure that the equipment will be used by technically qualified personnel only.



Caution: If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

2 COMPONENTS

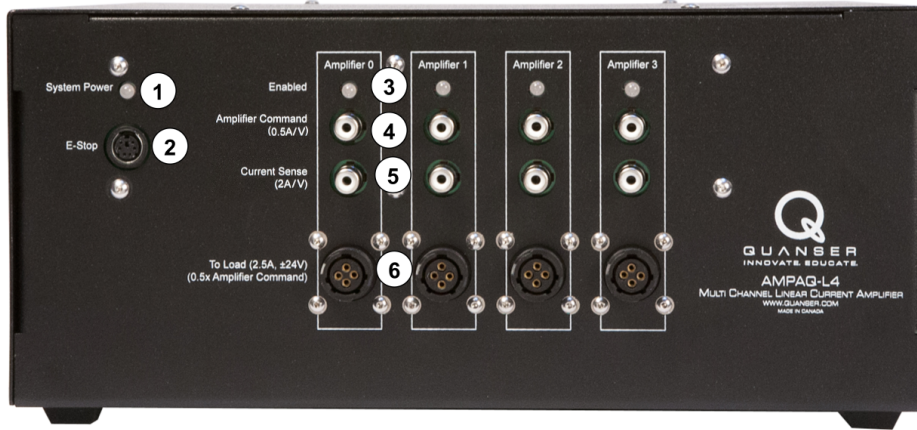
The components on the front and back panels of the AMPAQ are depicted in Figure 2.1. Each component on the AMPAQ has an identification number that corresponds to a short description given in Table 2.1. The pin out information for the RCA and CPC connectors are shown in Figure 2.2.

ID	Name	Description	Electrical range
1	<i>System Power</i> LED	Indicates whether the AMPAQ L2/L4 is powered on.	
2	<i>E-Stop</i> 6-pin mini-DIN connector	The Emergency Stop Switch connects to the E-Stop socket. If the E-Stop is not connected, the AMPAQ L2/L4 is enabled by default. If the E-Stop is connected, then the state of the amplifier depends on the E-Stop.	
3	<i>Enabled</i> LED	The light corresponding to each linear current amplifier channel turns on whenever that amplifier is enabled.	
4	<i>Amplifier Command</i> RCA connector	Use this channel to apply the analog voltage command to be amplified from the data acquisition device.	± 10 V
5	<i>Current Sense</i> RCA connector	Use this channel to measure the current output of the amplifier channel.	± 10 V
6	<i>To Load</i> CPC connector	Connects the amplifier output to the DC motors in the plant. This signal is the control command to motors which has been amplified by the unit. The Table 2.2 outlines the pin description for this connector.	± 24 V
7	Power switch	Power the AMPAQ L2/L4 system on.	
8	Power connector	Connect a 100-120V or 200-240V AC voltage source.	
9	Fuse holder	Contains the fuse.	

Table 2.1: AMPAQ L2/L4 components

Pin Number	Connection
1	Load (+)
2	Load (-)
3	Ground
4	Ground

Table 2.2: *To Load* Connector Pin Description



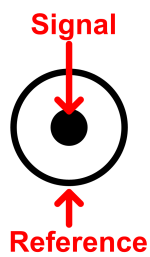
(a) Front



(b) Back

Figure 2.1: AMPAQ-L4 components

RCA Connector



CPC Connector

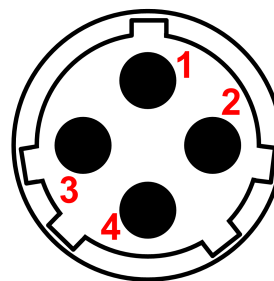


Figure 2.2: AMPAQ L2/L4 connector pin-outs

3 SPECIFICATIONS

Table 3.1 summarizes the specifications of the AMPAQ L2/L4 linear current amplifier system.

Specification	AMPAQ-L2	AMPAQ-L4
Mass	5.2kg	6.8kg
Dimension	0.31m × 0.30m × 0.13m	
Minimum Continuous Voltage Output	No load: ±23V 2.5A load: ±20V	
Maximum Continuous Voltage Output	±24 V	
Maximum Continuous Current Output	2.5 A	
Peak Power Output	280 W	
Amplifier Gain	0.5 A/V	
Current Sense	2 A/V	
Amplifier Command Range	±10 V	
Bandwidth in Current Mode	10 kHz	
Input Impedance	$1 \times 10^6 \Omega$	
Output Impedance	< 0.2 Ω	
Environmental	<ul style="list-style-type: none"> • Standard rating • Indoor use only • Altitude up to 2000m • Maximum relative humidity of 80% up to 31°C decreasing linearly to 50% relative humidity at 40°C • Pollution Degree 2 • Mains supply voltage fluctuations up to ±10% of the nominal voltage • Maximum transient overvoltage 2500V • Marked degree of protection to IEC 60529: Ordinary Equipment (IPX0) 	
Protection Class	Class I	
Fuse	5A, 250V, 3AG Slow Blow	
AC Voltage Rating	100-120V / 220-240V	
Frequency Rating	50/60 Hz	
AC Current Rating	2.0 A	4.1 A

Table 3.1: AMPAQ L2/L4 specifications



Caution: Precaution must be taken during the connection of this equipment to the AC outlet to make sure the grounding (earthing) is in place and the ground wire is not disconnected.



Caution: Avoid covering the fan during operation to prevent premature thermal shutdown of the amplifier.



Caution: Do not position the equipment so that it is difficult to operate the on/off switch.



Caution: The AMPAQ L2/L4 devices are made to be used with Quanser designed experiment kits that have particular actuators. Use caution if the AMPAQ L2/L4 is being used with your own actuator. Any load to be used with the AMPAQ L2/L4 should have a minimum inductance of 0.1 mH.



Caution: Do not use the cables provided with the AMPAQ L2/L4 to wire it to experiments that use a different amplifier module, such as the Quanser Rotary (SRV02) or Linear (IP02) products, as this will result in burning the motors. The AMPAQ L2/L4 can be used with such experiments only if plant specific cables are available.

4 FUSE INSTALLATION

The AMPAQ L2/L4 has a single 3AG, 250V, 5A fuse that protect the amplifier from overcurrent through the main power connector.



Caution: Make sure the power to the amplifier is disconnected before changing the fuse!

Follow this procedure to install or replace the fuses in the AMPAQ:

1. The fuse holder is located at the rear of the unit, as shown in Figure 2.1.
2. Make sure the amplifier power cable is disconnected.
3. Remove the fuse holder. To do this, push and twist the knob counter-clockwise (CCW) and pull the fuse holder out as illustrated in Figure 4.1.

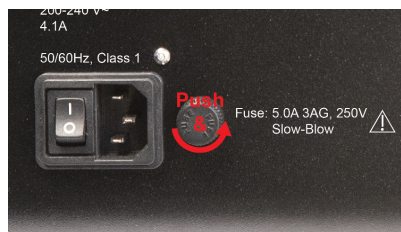


Figure 4.1: Remove fuse holders

4. As shown in Figure 4.2, remove the old fuse from the holder and insert the new one.

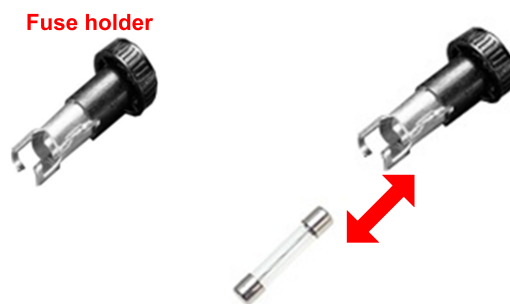


Figure 4.2: Replacing fuse in the fuse holder

5. Install the fuse holders back into the amplifier. Push the fuse holder back into panel and twist the knob clockwise until secure.



Caution: Installing the wrong fuse rating may result in damage to your amplifier.

6. Connect the power cable to the back of the amplifier.

5 CABLE NOMENCLATURE

Table 5.1 provides a description of the standard cables used with the AMPAQ L2/L4.




Cable	Type	Description
 <p>(a) Motor cable</p>	5-pin-DIN to CPC male cable	This cable connects the amplifier to the load. To apply the amplified signal to the actuator, connect this from the <i>To Load</i> socket on the AMPAQ L2/L4 to the system actuator.
 <p>(b) 2xRCA to 2xRCA cable</p>	2xRCA to 2xRCA cable	This cable is used to connect the amplifier to the data acquisition (DAQ) device. To apply the reference signal to the amplifier, connect an analog output channel on the DAQ device to the <i>Amplifier Command</i> socket on the AMPAQ L2/L4. To measure the current in the load, connect an analog input channel on the DAQ device to the <i>Current Sense</i> socket on the AMPAQ L2/L4.
 <p>(c) Emergency Stop Switch</p>	Emergency Stop Switch (E-Stop)	Enables/disables the amplifier. Connect this cable to the AMPAQ <i>E-Stop</i> connector. The amplifier is deactivated when the knob is in the pressed DOWN position. It is enabled when the knob is in the upright, released position. If the E-Stop cable is not connected, the amplifier is always enabled.

Table 5.1: Standard cables used with the AMPAQ L2/L4 system

6 TROUBLESHOOTING

Follow the steps given below based on your issue with the AMPAQ L2/L4.

Amplifier does not power up.

- Make sure the power cable is firmly connected to the power connector on the back of the amplifier
- Verify that the fuse is not burnt. If the fuse is burnt, see Section 4 for fuser rating and replacement information.

Motor/load is not being driven.

- Verify that the fuse is not burnt. If the fuse is burnt, see Section 4 for fuser rating and replacement information.
- If the AMPAQ L2/L4 is being used with a Quanser system, verify that all the connections illustrated in the User Manual for that Quanser product have been made correctly.
- If the Emergency stop switch is connected to the amplifier, make sure the red button is in the upper position to enable the amplifier. The amplifier cannot be enabled when the button is in the lower position. The *Enabled* LED on each channel should be lit. Twist to release the red button into the enabled position.

7 TECHNICAL SUPPORT

To obtain support from Quanser, go to <http://www.quanser.com/> and click on the Tech Support link. Fill in the form with all the requested software and hardware information as well as a description of the problem encountered. Also, make sure your e-mail address and telephone number are included. Submit the form and a technical support person will contact you.

Mix and match components and peripherals to suit your education or research needs



Quanser's range of control peripherals includes amplifiers and data acquisition boards. They can be purchased separately to control educational or research-grade plants. Mix and match these peripherals with Quanser plants and control design software to accelerate control system design and implementation.

To find the right peripherals for your teaching or research needs, please email info@quanser.com.

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