



QUANSER
INNOVATE. EDUCATE.

USER MANUAL

VoltPAQ-X2/X4 Amplifiers

Set Up and Configuration



CAPTIVATE. MOTIVATE. GRADUATE.

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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)



FCC NOTICE

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.

Industry Canada Notice

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 VoltPAQ-X2 and VoltPAQ-X4 are multi-channel, linear voltage-based power amplifiers. The VoltPAQ-X2 is a two-channel amplifier and the VoltPAQ-X4 is a four-channel system. They have the following features:

- Supply up to ± 24 V and 4A continuous.
- Separate power supply delivering ± 12 V and 1.5 A for sensors and accessories.
- Analog sensor inputs.
- Current sensing capability.
- Thermal shut-down.
- Overheating / Over-current fault indication indicator.
- Emergency Stop capability.



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



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.

2 COMPONENTS

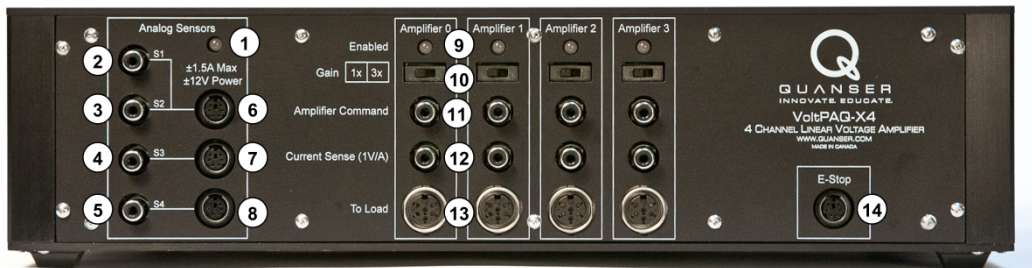
The components on the front panel of the VoltPAQ-X2 and -X4 are depicted in Figure 2.1. Each component on the amplifier has an identification number that corresponds to a short description given in Table 2.1.

ID	Name	Description	Electrical Range
1	Power LED	Indicates if the VoltPAQ-X2 and -X4 is powered and the $\pm 12V$ Analog Sensors is available.	
2	S1 RCA connector	Outputs the channel #1 (S1) voltage measured by the sensor connected to the S1&S2 connector.	Output $\pm 10 V$
3	S2 RCA connector	Outputs the channel #2 (S2) voltage measured by the sensor connected to the S1&S2 connector.	Output $\pm 10 V$
4	S3 RCA connector	Outputs the voltage measured by the sensor connected to the S3 connector.	Output $\pm 10 V$
5	S4 RCA connector	Outputs the voltage measured by the sensor connected to the S4 connector.	Output $\pm 10 V$
6	S1&S2 6-pin mini-DIN connector	This channel reads the output of up to two external analog sensors. It also provides $\pm 12V$ to power the attached sensor(s).	Input $\pm 10 V$
7	S3 6-pin mini-DIN connector	This channel reads the output of an external analog sensor. It also provides $\pm 12 V$ to power the attached sensor.	Input $\pm 10 V$
8	S4 6-pin mini-DIN connector	This channel reads the output of an external analog sensor. It also provides $\pm 12 V$ to power the attached sensor.	Input $\pm 10 V$
9	Enabled LED	LED Red = Over-heated / Amplifier disabled (i.e., E-Stop engaged). LED Green = Amplifier powered and operational	
10	Gain Switch	Setting the toggle switch to the left position selects a gain of 1 for the amplifier. Setting to right implies a gain of 3.	
11	Amplifier Command RCA connector	This channel receives the analog command voltage from the DAQ device to be amplified.	Input $\pm 10 V$
12	Current Sense RCA connector	Outputs the current being drawn by the load.	Output $\pm 10 V$
9	To Load 6-pin DIN connector	This channel outputs the amplified control voltage. To Load Voltage = Gain x Amplifier Command.	See Table 3.1
10	E-Stop 6-pin mini-DIN connector	If the Emergency Stop (E-Stop) switch is not connected, the VoltPAQ-X2 and -X4 is enabled by default. If the E-Stop is connected, then the state of the VoltPAQ-X2 and -X4 depends on the E-Stop.	

Table 2.1: VoltPAQ-X2 and -X4 components



Caution: On some VoltPAQ-X2 and -X4 units, the *Gain* switch may have three positions. Make sure the switch is the *leftmost* position to select a gain of 1 and the *rightmost* position to select a gain of 3.



(a) Front panel



(b) Back panel

Figure 2.1: VoltPAQ-X4 components

3 SPECIFICATIONS

The specifications for the VoltPAQ-X2 and -X4 systems are given in Table 3.1 below.

Specification	VoltPAQ-X2	VoltPAQ-X4
Mass	4.4 kg	5.4 kg
Dimension	0.39m × 0.33m × 0.10m	0.39m × 0.33m × 0.10m
Minimum Amplifier Specifications	No load: -23.3 V to +21.8 V 2A load: -22.3 V to +20.8 V 4A load: -21.3 V to +20.3 V	
Load Continuous Current Output	± 4 A	
Amplifier Gain	1 or 3 V/V (Gain selectable)	
Current Sense	1 V/A	
Amplifier Command	±10 V	
Analog Sensors	Output voltage ±12V Output current ±1.5A (25% minimum cross loading required for negative supply)	
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 over-voltage 2500V • Marked degree of protection to IEC 60529: Ordinary Equipment (IPX0) 	
Protection Class	Class I	
Analog Sensors Adapter Fuse	3A, 250V, 3AG Slow Blow	
Amplifier Fuse	3A, 250V, 3AG Slow Blow	
Voltage Rating	100-120V / 200-240V	
Frequency Rating	50-60 Hz	
AC Current Rating	4.6A	8.3A

Table 3.1: VoltPAQ-X2 and -X4 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: If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

4 FUSE INSTALLATION

The VoltPAQ-X2 has two 3.0A fuses and the VoltPAQ-X4 has four 3.0A fuses. The fuses protect the amplifier from over-current through the main power connector. The recommended fuse for this unit is the Cooper Bussmann MDL-3-R, which is rated for 3A and 250V.



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

Follow this procedure to install or replace the fuses in the VoltPAQ-X2 and -X4:

1. The fuse holders are 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. There are three fuses in the VoltPAQ-X2 and five in the VoltPAQ-X4. To do this, push and twist the knob counter-clockwise and pull the fuse holder out as illustrated in Figure 4.1.



Figure 4.1: Remove fuse holders (VoltPAQ-X4 shown)

4. As shown in Figure 4.2, remove the old fuses from the holders and insert the new ones.

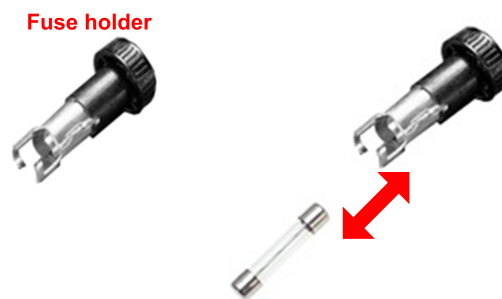


Figure 4.2: Replacing fuse in the fuse holder

5. Install the fuse holders back into the amplifier. Make sure the fuse being installed corresponds to the label at the back of the amplifier, i.e., 3.0A (labels shown in Figure 4.1). 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 in the wiring of the VoltPAQ-X2 and -X4.





Cable	Type	Description
 <p>(a) Motor Cable</p>	4-pin DIN to 6-pin DIN motor cable	This cable connects the amplifier to the load. To apply the amplified signal to the actuator, connect this cable from the <i>To Load</i> socket on the amplifier 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 amplifier. To measure the current or an analog sensor, connect an analog input channel on the DAQ device to the <i>Current Sense</i> or the <i>S1</i> , <i>S2</i> , <i>S3</i> , or <i>S4</i> sockets on the amplifier.
 <p>(c) Analog Cable</p>	6-pin mini-DIN to 6-pin mini-DIN cable	This cable is used to connect an analog sensor on a system (e.g., potentiometer, tachometer) to the amplifier, where the signals can be either monitored and/or used by a controller. The cable also carries a 12VDC line from the amplifier to power a sensor and/or signal conditioning circuitry.
 <p>(d) Emergency Stop Switch</p>	Emergency Stop (E-Stop) Switch [optional]	Enables/disables the amplifier. Connect the Emergency Stop Switch to the <i>E-Stop</i> connector on the VoltPAQ-X2 and -X4. 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. Important: The E-Stop is optional and not typically supplied with the VoltPAQ-X2 and -X4.

Table 5.1: Typical cables used with the VoltPAQ-X2 and -X4 amplifiers

6 TROUBLESHOOTING

Follow the steps given below based on your issue with the VoltPAQ-X2 and -X4.

Amplifier does not power up.

- Make sure the power cable is firmly connected to the power connector on the back of the VoltPAQ-X2 and -X4.
- Verify that the fuse is not burnt. If the fuse is burnt refer to Section 4.

Load not being driven.

- If the Emergency stop switch (optionally purchased through Quanser) 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. Twist the button to ensure it is in the enabled position.
- Verify that the fuses are not burnt.
- Make sure, for the particular channel you are using on the amplifier, that the connections have been made correctly, i.e., the *Amplifier Command* socket on the amplifier is connected to the analog output channel on your data acquisition device and the *To Load* socket on the amplifier is connected to the load. If you are using a Quanser system, refer to the User Manual for that Quanser product for connection details.

Amplifier *Enabled* LED is red.

- If the Emergency stop switch (optionally purchased through Quanser) 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. Twist the button to ensure it is in the enabled position.
- Verify that the fuses are not burnt.
- The amplifier might be in thermal shutdown. Power down the amplifier and let it rest for 5 minutes. Verify all the connections of the experiment and ensure that the load is not damaged.

No analog readings from the amplifier.

- Ensure the 5-pin mini-DIN analog cable is firmly connected from the amplifier socket (e.g., *S1&S2* connector) to the sensor on your device (e.g., tachometer).
- Confirm that the *Analog Sensors* RCA connector on the amplifier is connected to the correct analog input channel on the data acquisition (DAQ) device.
- Check that the fuses are not burnt.
- Ensure the analog input channels on your data acquisition (DAQ) device are working. Refer to your DAQ User Manual for information on how to test it.
- If the sensor is working, then one of the *S1&S2*, *S3*, or *S4* Analog Sensors connectors may be defective. Try using a different Analog Sensor input.

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.

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