



# USER MANUAL

## VoltPAQ-X1 Amplifier

Set Up and Configuration



CAPTIVATE. MOTIVATE. GRADUATE.

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#### **CE Compliance CE**

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-X1 is a single channel, linear voltage-based power amplifier. It includes the following features:

- Power amplifier capable of supplying around  $\pm 24$  V and 4A continuous.
- Separate power supply delivering  $\pm 12$  V and 1.5 A for sensors and accessories.
- Analog sensor inputs.
- Current sensing capability.
- Thermal shut-down.
- Overheating / Overcurrent fault indication indicator.
- Emergency Stop capability.

There are three model of VoltPAQs: VoltPAQ-X1, VoltPAQ-X2, and the VoltPAQ-X4. The VoltPAQ-X1 is a single-channel amplifier. The VoltPAQ-X2 and VoltPAQ-X4 systems have two and four amplifier channels, respectively.



**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-X1 are depicted in Figure 2.1. Each component on the VoltPAQ-X1 has an identification number that corresponds to a the short description given in Table 2.1.

ID	Name	Description	Electrical Range
1	To ADC 5-pin DIN connector	Voltages read through S1, S2, S3 and S4 are output via the To ADC connector to an external data acquisition device.	Output $\pm 10$ V
2	S1&S2 6-pin mini-DIN connector	This channel reads the output of up to two external analog sensors. It also provides $\pm 12$ V to power the attached sensor(s).	Input $\pm 10$ V
3	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
4	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
5	Amplifier Command RCA connector	This channel receives the analog command voltage from the DAQ device to be amplified.	Input $\pm 10$ V
6	Current Sense RCA connector	Use this connector to measure the current being drawn by the load.	Output $\pm 10$ V (1V = 1A)
7	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.	
8	Status LED	<b>LED Off</b> = Over-heated / E-Stop engaged / No power. <b>LED On</b> = Amplifier powered and operational	
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	The E-Stop is an optional component. If the Emergency Stop switch (E-Stop) is not connected, the VoltPAQ-X1 is enabled by default. If the E-Stop is connected, then the state of the VoltPAQ-X1 depends on the E-Stop.	

Table 2.1: VoltPAQ-X1 components



Figure 2.1: VoltPAQ-X1 Components

### 3 SPECIFICATIONS

VoltPAQ-X1 AC specifications are given in Table 3.1 below.

Specification	Value
Mass	1.9 kg
Dimension	0.25m × 0.18m × 0.10m
Minimum Amplifier Specifications	<b>No load:</b> -23.3 V to +21.8 V <b>2A load:</b> -22.3 V to +20.8 V <b>4A load:</b> -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"><li>• Standard rating</li><li>• Indoor use only</li><li>• Altitude up to 2000m</li><li>• Maximum relative humidity of 80% up to 31°C decreasing linearly to 50% relative humidity at 40°C</li><li>• Pollution Degree 2</li><li>• Mains supply voltage fluctuations up to ±10% of the nominal voltage</li><li>• Maximum transient overvoltage 2500V</li><li>• Marked degree of protection to IEC 60529: Ordinary Equipment (IPX0)</li></ul>
Protection Class	Class I
Analog Sensors 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	2.8A

Table 3.1: VoltPAQ-X1 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-X1 has two 3.0A fuses that protect the amplifier from overcurrent 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-X1:

1. The fuse holders are located at the rear of the unit, as shown in Figure 4.1.



Figure 4.1: VoltPAQ-X1 fuse holders

2. Make sure the amplifier power cable is disconnected.
3. Remove both fuse holders. To do this, push and twist the knob counter-clockwise and pull the fuse holder out as illustrated in Figure 4.2.



Figure 4.2: Remove fuse holders

4. As shown in Figure 4.3, remove the old fuses from the holders and insert the new ones.

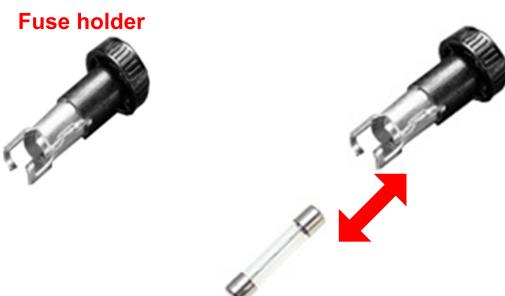


Figure 4.3: Replacing fuse in the fuse holder

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 4.2). 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-x1.

Cable	Type	Description
(a) Motor Cable	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 from the "To Load" socket on the VoltPAQ-X1 to the system actuator.
(b) 2xRCA to 2xRCA cable	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 "Amplifier Command" socket on the VoltPAQ-X1. To measure the current in the load, connect an analog input channel on the DAQ device to the "Current Sense" socket on the VoltPAQ-X1.
(c) 5-pin-DIN to 4xRCA cable	5-pin-DIN to 4xRCA cable	This cable connects the analog signals that are connected to the amplifier, i.e. sensors, to a data acquisition (DAQ) device. Connect the 5-pin-DIN side of the cable to the "To ADC" socket on the VoltPAQ-X1 and the RCA cables to the analog input channels on your data acquisition (DAQ) device. The yellow and white RCA cables carry the signals connected to the "S1&S2" connector. The red RCA carries the "S3" signal and the black RCA carries the "S4" signal.
(d) Analog Cable	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.
(e) 16-pin ribbon cable	Emergency Stop Switch (E-Stop)	Enables/disables the amplifier. Connect this cable to the VoltPAQ-X1 <i>E-Stop</i> socket. 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. <b>Important:</b> The E-Stop cable is optional and not typically supplied with the VoltPAQ-X1.

Table 5.1: Cables often used with the VoltPAQ-X1

# 6 TROUBLESHOOTING

Follow the steps given below based on your issue with the VoltPAQ-X1.

## **Amplifier does not power up.**

- Make sure the power cable is firmly connected to the power connector on the back of the VoltPAQ.
- 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 both 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.

## **LED does not light up.**

- 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 both 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-DIN to 4xRCA cable is firmly connected from the *To ADC* socket on the VoltPAQ-X1 to analog input channels on the DAQ device.
- Make sure the analog input channel you are attempting to read matches how the connections are made. For example, if your sensor is connected to the S3 socket on the VoltPAQ-X1, then the signal is available on the red RCA cable. Verify that the red RCA is connected to the analog input channel you are attempting to read.
- 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 the Analog Sensor Input connector S1&S2, S3, or S4 socket 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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