

OP8620 Connection Box User Guide

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SYMBOL DEFINITIONS

The following table lists the symbols used in this document to denote certain conditions:

Symbol	Definition
	ATTENTION: Identifies information that requires special consideration
	TIP: Identifies advice or hints for the user, often in terms of performing a task
	REFERENCE _ INTERNAL: Identifies an additional source of information within the bookset.
CAUTION	Indicates a situation which, if not avoided, may result in equipment or work (data) on the system being damaged or lost, or may result in the inability to properly operate the process.
	Indicates a situation where users must observe precautions for handling electrostatic sensitive devices.
	CAUTION: Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.
	WARNING: Indicates a potentially hazardous situation which, if not avoided, could result in serious injury or death.

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OP8620 CONNECTION BOX

INTRODUCTION

The OP8620 is an interconnection box designed to be used with the complete OP5600 complete simulation system to provide a supplementary pre-conditioning interface. It is designed to be used either as a desktop (or shelf top) or as a more traditional rack mount. It contains spaces for four (4) signal conditioning boards and uses standard connectors (DB37, Phoenix contacts and BNC) without the need for input/output adaptors and allows quick connections for monitoring.

The rear of the chassis provides the connectors that link the OP8620 to the OP5600 simulator, while the top of the chassis provides connectors (Phoenix contacts or BNC) for client-side applications.

The top surface is divided into 4 sections. Each section can accept a any of 3 conditioning boards or blanks.

FEATURES

- Conditioning boards, available in several types:
 - OP8621, 16 analog outputs
 - OP8622, 16 analog inputs
 - OP8623, 16 digital inputs/16 digital outputs
- DB37F connectors for quick connections to the OP5600 HILbox (all DB37F share common pin assignments)
- Available high or low voltage connectors
- Variable voltage settings (attenuation)
- User selectable modes (Current or Voltage)

CONNECTION BOX ARCHITECTURE

CONFIGURATION OPTIONS

The OP8620 is available in a number of different configurations that make it easier to integrate into your environment. You can select any combination of four from the following conditioning boards:

Board Name	Order number	Description
OP8621	126-0356	16 analog inputs
OP8622	126-0357	16 analog outputs
OP8623	126-0360	16 digital inputs and 16 digital outputs
	126-0367	Blank faceplate
	126-0364	Faceplate for OP8623
	126-0365	Faceplate for OP8622
	126-0366	Faceplate for OP8621

Table 1: OP8620 compatible boards

RECEIVING AND VERIFICATION

After opening the package, remove the equipment and components. Make sure that all the items described in “standard hardware” are actually in the box and are undamaged.

STANDARD HARDWARE

The OP8620 Real-Time Simulator includes the following basic hardware:

Item	Description	Part Number
OP8620 connection box		N/A
System Integration binder	RT-LAB software CD O/S CD (Redhat or QNX) Documentation CD	N/A



Opal-RT strongly recommends the use of anti-static wrist straps whenever handling any electronic device provided by Opal-RT. Damage resulting from electrostatic charges will not be covered by the manufacturers warranty.

INSTALLATION AND CONFIGURATION

The top of the chassis is divided into four sections (one for each board), which can be removed to access the signal conditioning boards. The layout and configuration of the boards depends on the selected platform. The conditioning boards (OP8621, OP8622 and OP8623) must be inserted into the Opal-RT OP8620 housing using great care:

REMOVING BOARDS

1. Remove the screws (1) that affix the cover panel (2) to the board and gently lift the panel away.
2. Remove the screws (5) on the bottom of the chassis and the screws (5) on each side to detach the front panel of the chassis to provide access to the boards.
3. Unscrew the (3) standoffs that affix the board (4) to the chassis.
4. Gently slide the board forward to free it from the chassis.

INSTALLING BOARDS

1. Gently slide the board into the chassis (making sure the connector slides into its proper place).
2. Screw the (3) standoffs that affix the board (4) to the chassis.
3. Put the front panel in place and attach to the chassis using the screws (5) on the bottom of the chassis and the screws (5) on each side.
4. Gently place the cover panel (2) over the board, making sure to align the holes on the board with the standoffs.
5. Insert the screws (1) that affix the cover panel to the board.

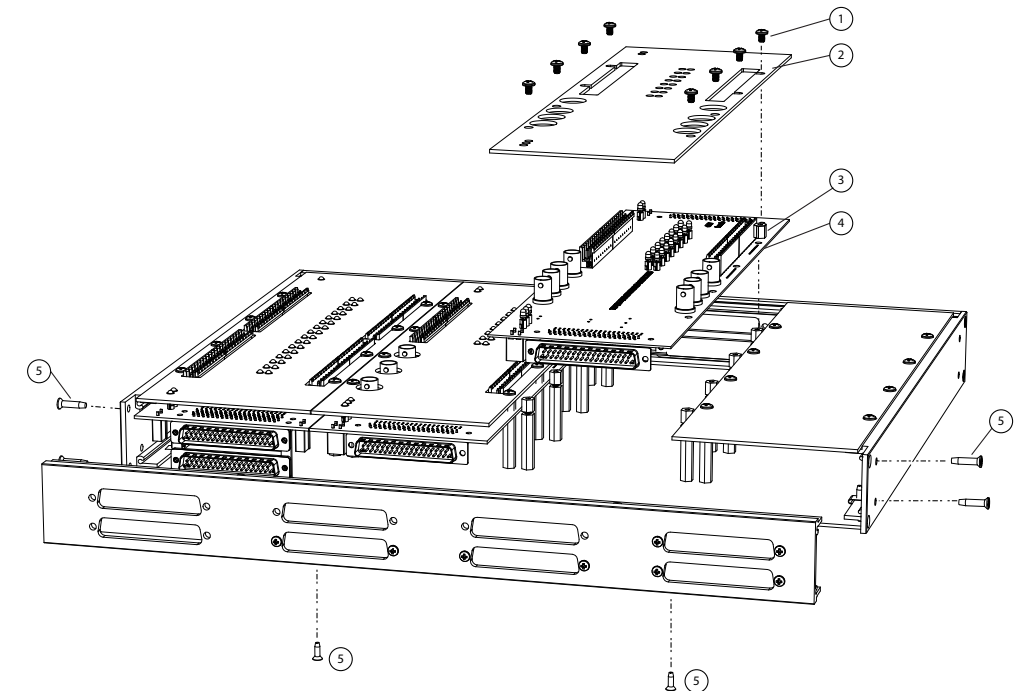


Figure 1: OP8620 conditioning board placement

CAUTION

The system must be powered down before changing boards. Failure to do so may damage the equipment.

HARDWARE CONFIGURATION

The interfaces provided on the OP8620 simulator may vary depending on the configuration (Phoenix contacts or BNC connectors).

Connectors

Both the front and back of the unit feature DB37 connectors (DB37M at the front and DB37F at the rear). The DB37F connectors at the rear of the OP8620 let you quickly connect the OP8620 to the OP5600 HILbox simulator. The rear of the connection box also provides a 3 pin conn socket power connector, to connect the connection box to the OP5600 HILbox.



NOTE: DB37M connectors are inactive and are strictly reserved for Opal-RT technicians or their qualified representatives.

Top Connectors

The top of the OP8620 provides access to connect client side applications. Connectors can be either Phoenix contacts (either high or low voltage) or BNC connectors (low voltage).

The configuration depends on the type of board selected.

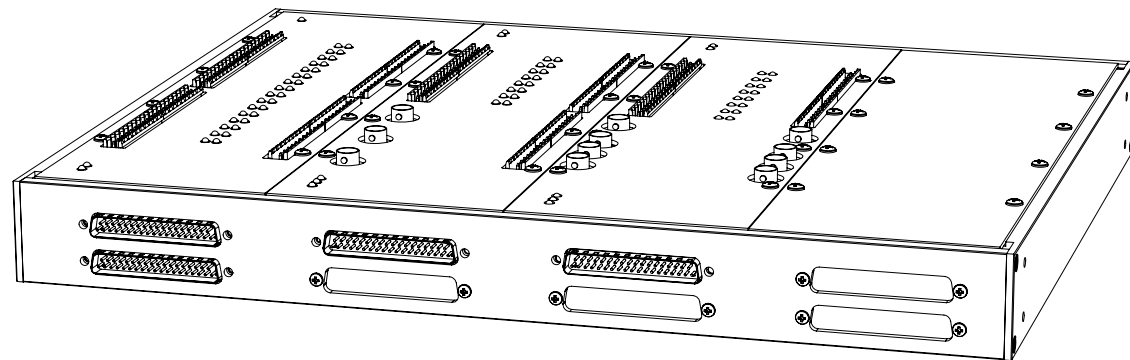


Figure 2: OP8620 top view, configured with OP8621, OP8622 and OP8623

OP8621 - 16 ANALOG OUTPUTS

DESCRIPTION

The OP8621 features 16 analog output channels and is a part of the OP8600 series of conditioning modules intended for use with Opal-RT's OP8620 Connection Box.

The OP8621 output channels use a differential operational amplifier to provide a 200v isolation between the simulator ground and the user ground, the analog post-conditioning consists of an attenuation within a differential operational amplifier followed with a gain operational amplifier. Thus, the isolation is provided by the input series resistor of the differential operational amplifier.

To accommodate interface connections, 8 low voltage output channels are also available on BNC connectors.

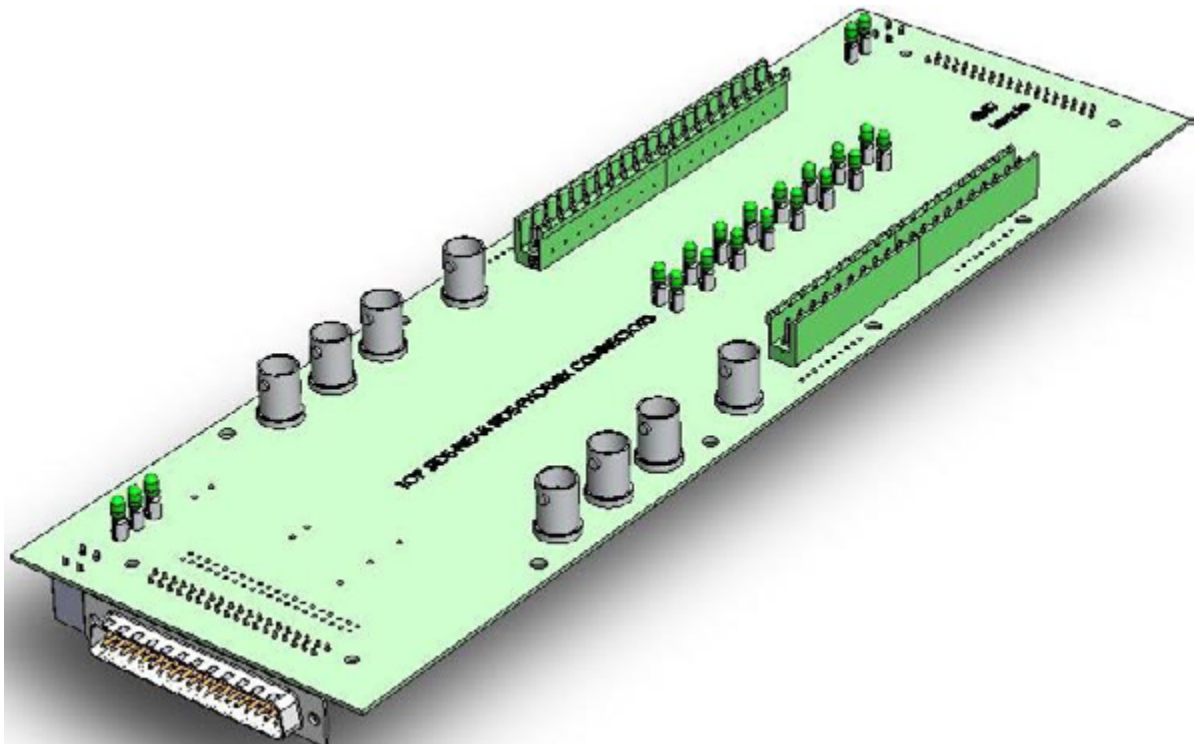


Figure 3: OP8621 board

FEATURES

- 16 analog output channels
- User configurable current or voltage mode
- 6 high voltage channels
- 8 low voltage BNC connectors (for current probe or low voltage sensor +/-2v).
- ± 20 V input voltage range
- ± 25 mA input current range.

DIAGRAMS AND CONFIGURATION

The OP8621 analog output module must be inserted into the Opal-RT OP8620 housing using great care. If you must exchange or remove a board for any reason, please follow the directions provided in “Installation and Configuration”.

CIRCUIT LAYOUT DIAGRAMS

When the OP8621 is installed, only the top of the circuit board is visible, as shown in Figure 5. The DB37 connectors fit through the appropriate slots in the chassis while the connectors on top of the board fit through the custom holes in the cover panel.

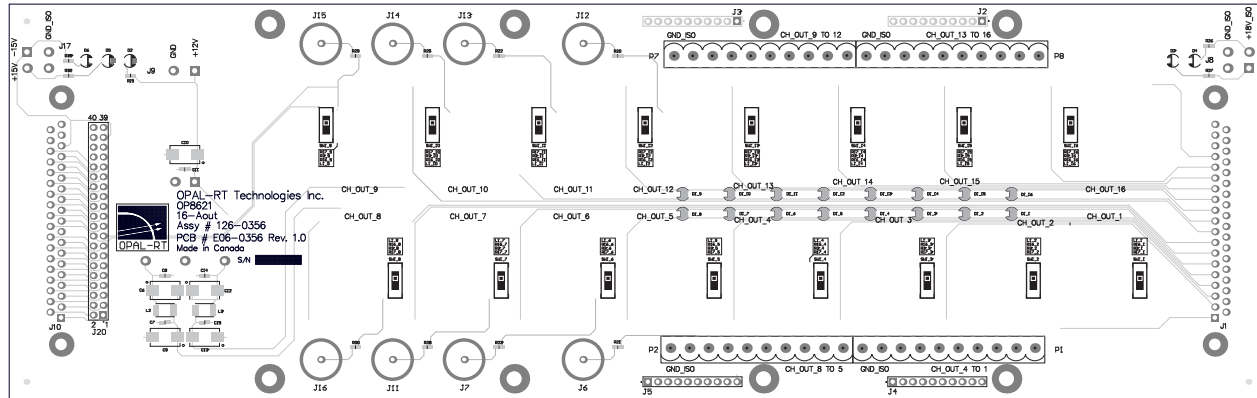


Figure 4: OP8621 module (top view)

SELECTING OPERATING MODE

Each channel on the OP8621 is user-configurable to operate either in voltage mode or current mode. By default, the board is factory configured for voltage mode. Simply slide the switch to the position that corresponds to the channel to convert to current mode.



These jumpers can only be used for LOW VOLTAGE inputs.

SPECIFICATIONS

Product name	OP8621
Part Number	126-0356
Number of channels	16 analog output
I/O connector	1 DB37M (reserved for Opal-RT technicians' use only) 1 DB37F (out to simulator) 4 Phoenix with screw terminals (high voltage in from client side) 8 BNC (low voltage in from client side)
Output voltage range	±25 mA
Output current range	
Dimensions	10.16 x 33.02 cm (4 in x 13 in)
Operating temperature	10 to 40 °C (50 to 104°F)
Storage temperature	-55 to 85°C (-67 to 185°F)
Relative humidity	10 to 90%, non condensing
Maximum altitude	2,000 m (6562 ft.)



OP8622 16 ANALOG INPUTS

DESCRIPTION

The OP8622 contains 16 analog inputs and is a part of the OP8600 series of conditioning modules intended for use with Opal-RT's OP8620 Connection Box.

All 16 channels can accept an input voltage range of $\pm 20\text{V}$ (no jumper on the attenuation circuit, no jumper on the current mode).

All 16 channels can accept an input current range of $\pm 25\text{ mA}$ and convert it to a voltage of $\pm 15\text{V}$ (resistor of 600 Ohms), jumper on the current mode.

Furthermore, 6 channels (and only these 6 channels) can accept an input voltage range of $\pm 100\text{V}$, $\pm 200\text{V}$, $\pm 400\text{V}$ and $\pm 500\text{V}$, depending of the jumper selectable input attenuation. This 6 channels connector is the 18 position PHOENIX connector at the bottom right.

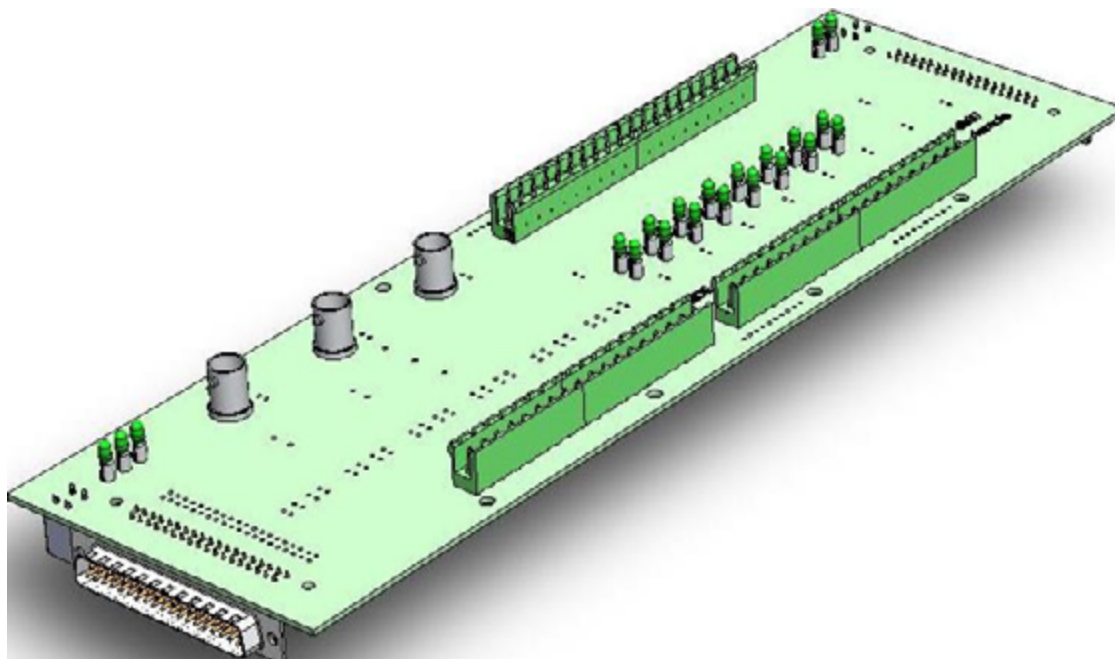


Figure 5: OP8622 board

FEATURES

- 16 analog input channels
- User configurable current or voltage mode
- 6 high voltage channels
- 3 low voltage BNC connectors (for current probe or low voltage sensor $\pm 2\text{V}$).
- User configurable input attenuation
- $\pm 20\text{ V}$ input voltage range
- $\pm 25\text{ mA}$ input current range.

DIAGRAMS AND CONFIGURATION

The OP8622 analog input module must be inserted into the Opal-RT OP8620 housing using great care. If you must exchange or remove a board for any reason, please follow the directions provided in “Installation and Configuration”.

CIRCUIT LAYOUT DIAGRAMS

When the OP8622 is installed, only the top of the circuit board is visible, as shown in Figure 6. The side connectors fit through the appropriate slots in the chassis while the connectors on top of the board fit through the custom holes on the cover panel.

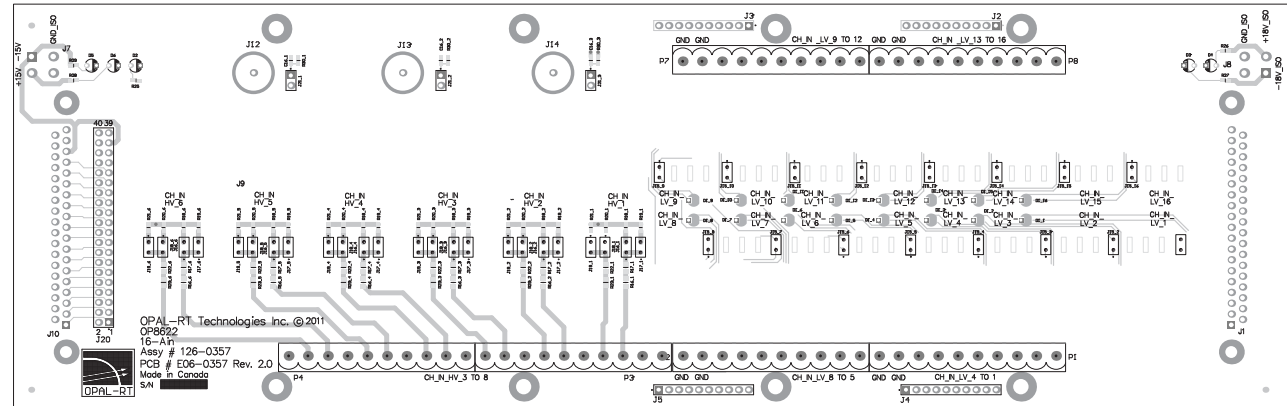


Figure 6: OP8622 module

This module contains a series of jumpers that allow you to set certain parameters. Connectors P1, P2, P7 and P8 are linked to jumpers (J15_1 to J15_16) that let you specify whether the channel will be in current or voltage mode. Connectors P3 and P4 are linked to voltage attenuation selection jumpers (see “voltage selection” for details).

SELECTING OPERATING MODE

Each channel on the OP8622 is user-configurable to operate either in voltage mode or current mode. By default, the board is factory configured for voltage mode (no jumper installed on pins). Simply place a jumper over the pins that correspond to the channel to convert to current mode.



These jumpers can only be used for LOW VOLTAGE inputs.

CONFIGURATION OPTIONS

Figure 7 represents a simplified view of the OP8622 channel voltage selection jumpers. Each channel has a series of 4 jumpers with 2 pins allow you to select voltage attenuation. See “voltage selection” for details.

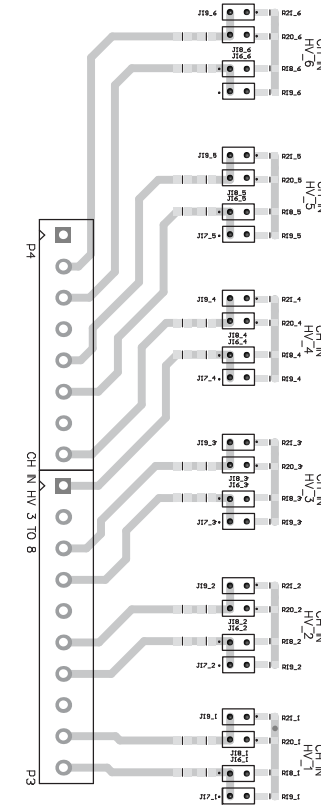


Figure 7: Voltage selection jumpers

VOLTAGE SELECTION

The OP8622 module has 6 channels that support user selectable input attenuation. These channels are on connectors P3 and P4. Place the jumper over the appropriate pins to obtain desired voltage. Please refer to the table, below, for the exact relationship between channels and resistors.

Range	Jumper
± 100 V	No jumper
± 200 V	J17 and J19
± 400 V	J16 and J18
± 500 V	J17, J19, J16, J18

Table 2: Voltage selection jumper settings

SPECIFICATIONS

Product Name	OP8622
Part Number	126-0357
Number of channels	16 analog inputs
Output voltage range	± 20 Volts (no jumper on attenuation circuit or current mode)
Output current range	±25 mA (converted to ±15 V (600Ω) with jumper on current mode)
Dimensions	10.16 x 33.02 cm (4 in x 13 in)
I/O connector:	1 DB37F (out to simulator) 6 Phoenix with screw terminals (high voltage in from client side) 3 BNC (low voltage in from client side) 1 DB37M (reserved for Opal-RT technicians' use only)
Operating temperature	10 to 40 °C (50 to 104°F)
Storage temperature	-55 to 85°C (-67 to 185°F)
Relative humidity	10 to 90%, non condensing
Maximum altitude	2,000 m (6562 ft.)

OP8623 16 DIGITAL INPUTS - 16 DIGITAL OUTPUTS

DESCRIPTION

The OP8623 features sixteen digital inputs and outputs (32 channels in total). It is designed to be used with the OP8620 connection box that adds a supplemental pre-conditioning interface for the OP5600. Connection from the OP8620 to the OP5600 is achieved through the DB37F connectors and the connections from the user side are achieved through the Phoenix contacts on the top of the unit.

The digital input is, essentially, a direct through pair. The only additional circuit is the status LED circuit, which uses only 3.6 mA.

The digital output signals feature three different configuration modes, which can be user-defined using both jumpers and switches (see “configuration schematics” for details):

1. Push-Pull, directly passes the simulator signal (Push-Pull signal from the mezzanine on the OP5600).
2. Provides an Open-Drain output (jumper selection on the board).
3. Provides 2 dry contacts of a 2A maximum relay (jumper selection on the board).

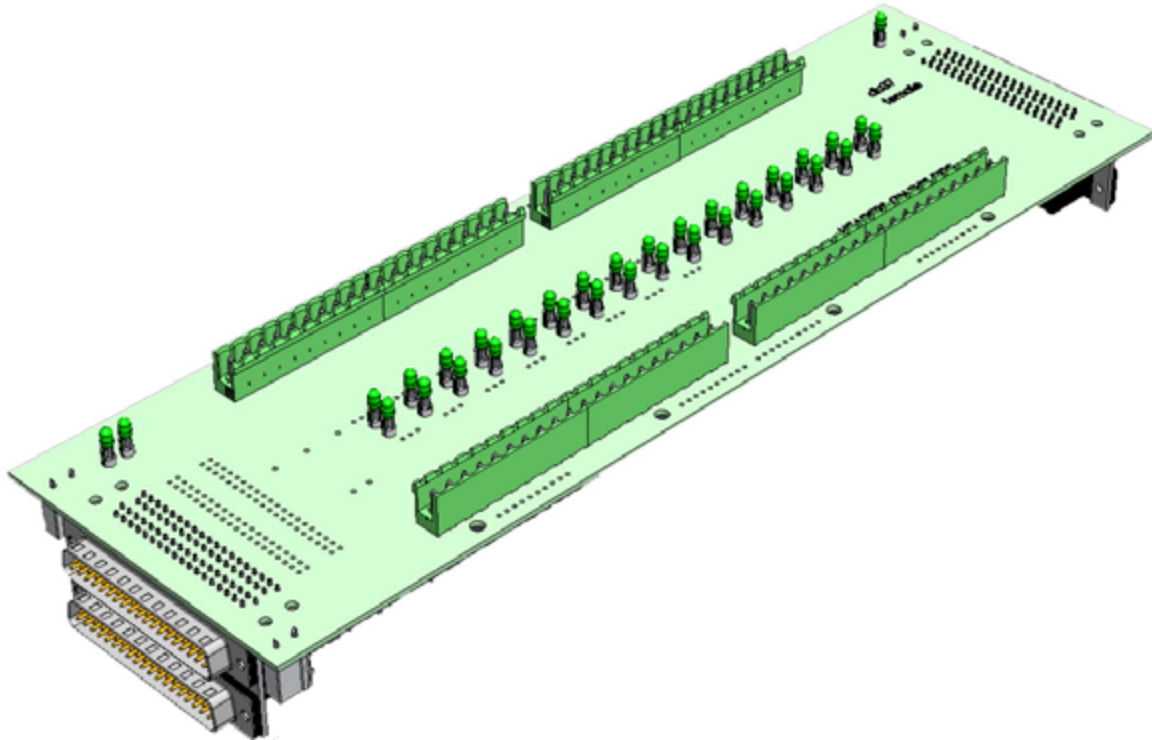


Figure 8: OP8623 board

DIAGRAMS AND CONFIGURATION

CIRCUIT LAYOUT DIAGRAMS

When the OP8623 is installed, only the top of the circuit board is visible, as shown in Figure 9. The side connectors fit through the appropriate slots in the chassis while the components on top of the board fit through the custom holes on the cover panel.

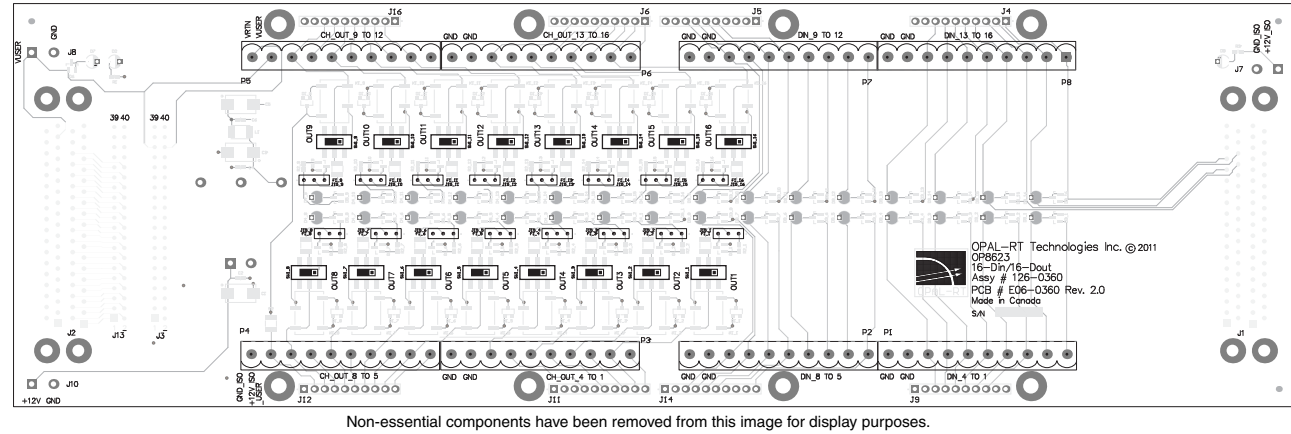


Figure 9: OP8623 module (top view)

CONFIGURATION SCHEMATICS

The following schematics show the various configurations available through jumper and switch settings.

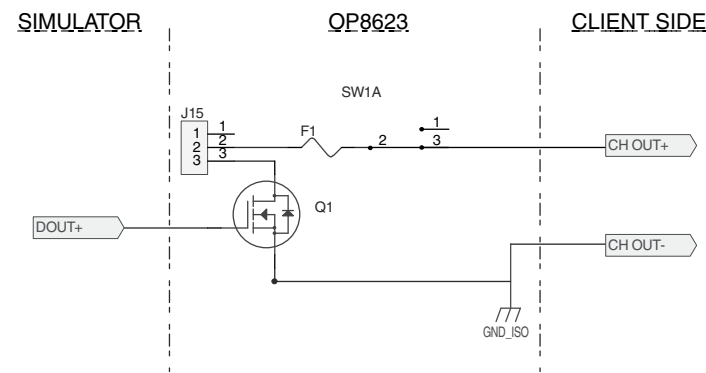
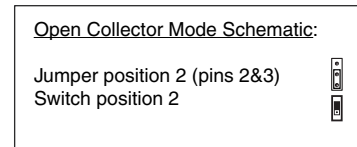


Figure 10: Open collector configuration

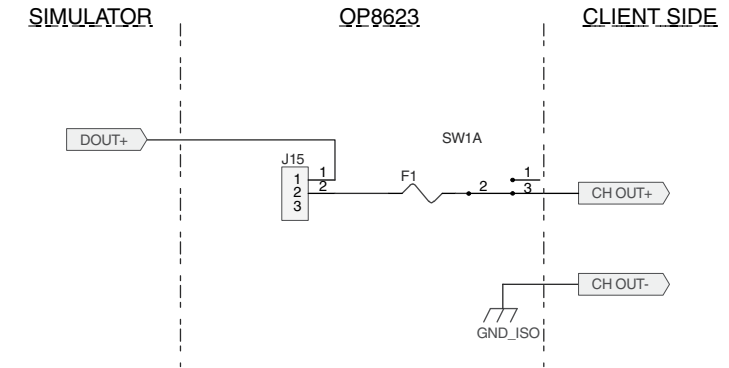
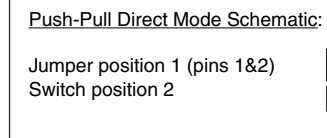


Figure 11: Push-pull direct configuration

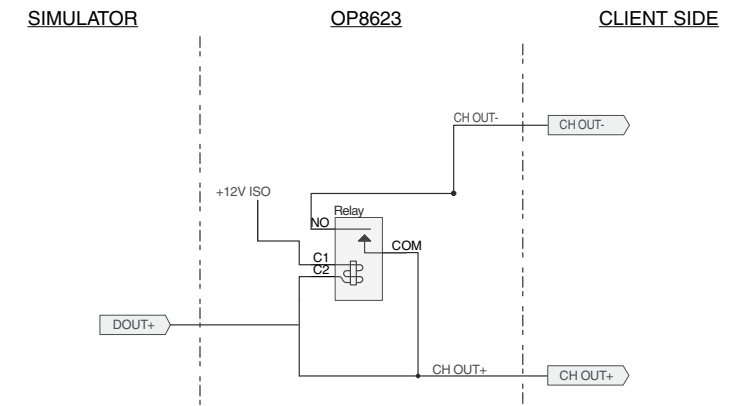
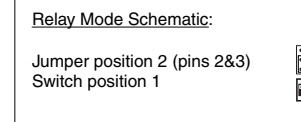


Figure 12: Relay mode configuration

SPECIFICATIONS

Product name	OP8623
Part number	126-0360
Number of channels	16 digital inputs 16 digital outputs
Nominal voltage input	± 20V
Nominal current input	± 25mA
Dimensions	10.16 x 33.02 cm (4 in x 13 in)
I/O connector	2 DB37F (out to simulator) 8 Pheonix with screw terminals (high voltage in from client side) 2 DB37M (reserved for Opal-RT technicians' use only)
Operating temperature	10 to 40 °C (50 to 104°F)
Storage temperature	-55 to 85°C (-67 to 185°F)
Relative humidity	10 to 90%, non condensing
Maximum altitude	2000 m (6562 ft.)

OP8620 I/O BOARD PIN ASSIGNMENTS

OP8621 ANALOG OUT PIN ASSIGNMENTS

Phoenix Connector	Channel		Phoenix Connector	Channel	
P8	1	+OUT15	P1	1	+OUT00
	2	-OUT15		2	-OUT00
	3	+OUT14		3	+OUT01
	4	-OUT14		4	-OUT01
	5	+OUT13		5	+OUT02
	6	-OUT13		6	-OUT02
	7	+OUT12		7	+OUT03
	8	-OUT12		8	-OUT03
	9	GND		9	GND
	10	SHIELD		10	SHIELD
P7	1	+OUT11	P2	1	+OUT04
	2	-OUT11		2	-OUT04
	3	+OUT10		3	+OUT05
	4	-OUT10		4	-OUT05
	5	+OUT09		5	+OUT06
	6	-OUT09		6	-OUT06
	7	+OUT08		7	+OUT07
	8	-OUT08		8	-OUT07
	9	GND		9	GND
	10	SHIELD		10	SHIELD
BNC connector					
J12	OUT11		J6	OUT04	
J13	OUT10		J7	OUT05	
J14	OUT09		J11	OUT06	
J15	OUT08		J17	OUT07	

Table 3: OP8621 pin assignments

OP8622 16 ANALOG IN PIN ASSIGNMENTS

Phoenix Connector	Channel		Phoenix Connector	Channel	
P8	1	+IN15	P1	1	+IN00
	2	-IN15		2	-IN00
	3	+IN14		3	+IN01
	4	-IN14		4	-IN01
	5	+IN13		5	+IN02
	6	-IN13		6	-IN02
	7	+IN12		7	+IN03
	8	-IN12		8	-IN03
	9	GND		9	GND
	10	SHIELD		10	SHIELD
P7	1	+IN11	P2	1	+IN04
	2	-IN11		2	-IN04
	3	+IN10		3	+IN05
	4	-IN10		4	-IN05
	5	+IN09		5	+IN06
	6	-IN09		6	-IN06
	7	+IN08		7	+IN07
	8	-IN08		8	-IN07
	9	GND		9	GND
	10	SHIELD		10	SHIELD

BNC connector			Phoenix Connector		
J14		IN10	P3	1	+IN02
J13		IN09		2	-IN02
J12		IN08		3	Neutral
				4	-IN03
				5	+IN03
				6	Neutral
				7	+IN04
				8	-IN04
				9	Neutral
				10	+IN05
			P4	1	-IN05
				2	Neutral
				3	+IN06
				4	-IN06
				5	Neutral
				6	+IN07
				7	-IN07
				8	Neutral
				9	
				10	

Table 4: OP8622 pin assignments

OP8623 16 DIGITAL IN/16 DIGITAL OUT PIN ASSIGNMENTS

Phoenix Connector	Channel		Phoenix Connector	Channel	
P8	1	+IN15	P1	1	+IN00
	2	-IN15		2	-IN00
	3	+IN14		3	+IN01
	4	-IN14		4	-IN01
	5	+IN13		5	+IN02
	6	-IN13		6	-IN02
	7	+IN12		7	+IN03
	8	-IN12		8	-IN03
	9	GND		9	GND
	10	SHIELD		10	SHIELD
P7	1	+IN11	P2	1	+IN04
	2	-IN11		2	-IN04
	3	+IN10		3	+IN05
	4	-IN10		4	-IN05
	5	+IN09		5	+IN06
	6	-IN09		6	-IN06
	7	+IN08		7	+IN07
	8	-IN08		8	-IN07
	9	GND		9	GND
	10	SHIELD		10	SHIELD

Phoenix Connector	Channel		Phoenix Connector	Channel	
P6	1	+OUT15	P3	1	+OUT00
	2	-OUT15		2	-OUT00
	3	+OUT14		3	+OUT01
	4	-OUT14		4	-OUT01
	5	+OUT13		5	+OUT02
	6	-OUT13		6	-OUT02
	7	+OUT12		7	+OUT03
	8	-OUT12		8	-OUT03
	9	GND		9	GND
	10	SHIELD		10	SHIELD
P5	1	+OUT11	P4	1	+OUT04
	2	-OUT11		2	-OUT04
	3	+OUT10		3	+OUT05
	4	-OUT10		4	-OUT05
	5	+OUT09		5	+OUT06
	6	-OUT09		6	-OUT06
	7	+OUT08		7	+OUT07
	8	-OUT08		8	-OUT07
	9	Vuser		9	+12V ISO
	10	Vrtn		10	GND ISO

Table 5: OP8623 pin assignments

LIMITED WARRANTY

LIMITED WARRANTY

Opal-RT Technologies Inc. warrants to the original purchaser and/or ultimate customer (“Purchaser”) of Opal-RT products (“Product”) that if any part thereof proves to be defective in material or workmanship within one (1) year, such defective part will be repaired or replaced, free of charge, at Opal-RT Technologies’ discretion, if shipped prepaid to Opal-RT Technologies Inc. at 1751 Richardson, suite 2525, Montreal, Quebec, Canada, H3K 3G6, in a package equal to or in the original container. The Product will be returned freight prepaid and repaired or replaced if it is determined by Opal-RT Technologies Inc. that the part failed due to defective materials or workmanship. Otherwise, the fees will be charged to the client (see article “Warranty Limitation and Exclusion”). The repair or replacement of any such defective part shall be Opal-RT Technologies’ sole and exclusive responsibility and liability under this limited warranty.

Purchaser must request an RMA number before shipping any Product for repair:

1. Access the Opal-RT website (www.opal-rt.com/support/return-merchandise-authorization-rma-request), click on support and select Return Merchandise (RMA).
2. Fill out the online form and submit. You will receive a notification with a thread-ID that will be used for further exchange with support.
3. Opal-RT’s Support department will evaluate the return and either issue an RMA number via email using the same thread-ID.
 - If the Product is returned for repair more than 12 months after purchase, the Purchaser is responsible for the cost of repair. Opal-RT will assess the repair and prepare a quote. The RMA number will be sent with the quote.
4. Only when the Purchaser receives the RMA number, may they ship the Product, prepaid, to Opal-RT.

RETURN POLICY

The following fees will apply when customers return products for credit:

A full credit, less a 15% fee and less return fee will only be issued if the product is in perfect working condition and if the product is returned within 1 month following the shipping date. If repairs are required on the returned product, the cost of these repairs will be deducted from the credit to be issued.

No credits will be issued beyond the one month period.

EXCLUSIONS

If third party products are part of the Product, Opal-RT will honor the original manufacturer’s warranty.

This limited warranty does not cover consumable items, such as batteries, or items subject to wear or periodic replacement, including lamps, fuses or filter elements.

WARRANTY LIMITATION AND EXCLUSION

Opal-RT Technologies will have no further obligation under this limited warranty. All warranty obligations of Opal-RT Technologies are void if the Product has been subject to abuse, misuse, negligence, or accident or if the Purchaser fails to perform any of the duties set forth in this limited warranty or if the Product has not been operated in accordance with instructions, or if the Product serial number has been removed or altered.

DISCLAIMER OF UNSTATED WARRANTIES

The warranty printed above is the only warranty applicable to this purchase. All other warranties, express or implied, including, but not limited to, the implied warranties of merchantability or fitness for a particular purpose are hereby disclaimed.

LIMITATION OF LIABILITY

It is understood and agreed that Opal-RT Technologies' liability, whether in contract, in tort, under any warranty, in negligence or otherwise shall not exceed the amount of the purchase price paid by the purchaser for the product and under no circumstances shall Opal-RT Technologies be liable for special, indirect, or consequential damages. The price stated for the product is a consideration limiting Opal-RT Technologies' liability. No action, regardless of form, arising out of the transactions under this warranty may be brought by the purchaser more than one year after the cause of actions has occurred.

CONTACT

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www.opal-rt.com/support

Note:

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