System Description

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Contents

Overview **5**
SECTION A – SYSTEM SUMMARY **6**
Hardware Target Station information (OP5600 IO System) 6
System Diagrams and Schematics 6
Chassis PCI Slot Configuration 8
PWR OUT connector pinout 8
Signal Conditioning Module Configuration 9
I/O Bitstream Name and Configuration 10
RJ45 Connections – Signal Monitoring 10
SECTION B – MAPPING I/O BLOCKS TO SIGNAL CONDITIONING **12**
OP5000 Series Modules 12
IO Group 1 / Section A: 16 Analog Out 12
IO Group 1 / Section B: 16 Analog In 13
IO Group 2 / Section A: 32 Digital In (Ch 00-15) 14
IO Group 2 / Section A: 32 Digital In (Ch 16-31) 15
IO Group 2 / Section B: 32 Digital Out (Ch 00-15) 16
IO Group 2 / Section B: 32 Digital Out (Ch 16-31) 17

OVERVIEW

PROJECT: PF312-193

CLIENT: NATIONAL RENEWABLE ENERGY LABORATORY (NREL)

SYSTEM S/N: PF312193S01 (OP5600 IO SYSTEM)

Section A	**System summary**
Section B	**Mapping I/O blocks to signal conditioning**

SECTION A – SYSTEM SUMMARY

HARDWARE TARGET STATION INFORMATION (OP5600 IO SYSTEM)

Items	Quantity	Description
Operating System	1	Redhat v2.6.29.6-opalrt-5
Chassis Type	1	OP5600 Chassis
CPU	1	Intel Xeon Six-Core 3.46GHz 12M Cache
Total Core #	6	
Memory	2	1GB
Motherboard		X8DTL-I-O Supermicro Motherboard, Intel® Xeon® processor 5600/5500 series, with QPI up to 6.4 GT/s
IP Address		192.168.10.101 (eth 0) - see Figure 2 for Ethernet port identification
AC Input		100-240V, 60-50Hz

SYSTEM DIAGRAMS AND SCHEMATICS

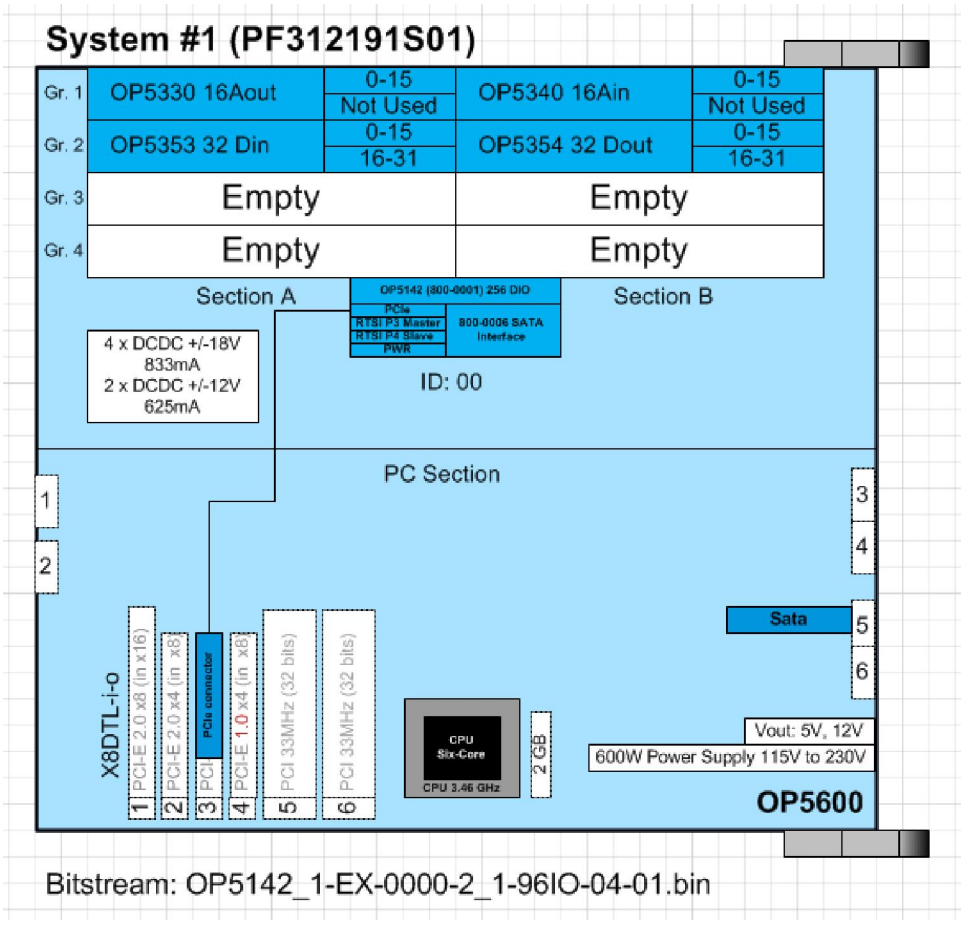


Figure 1: System Hardware Overview

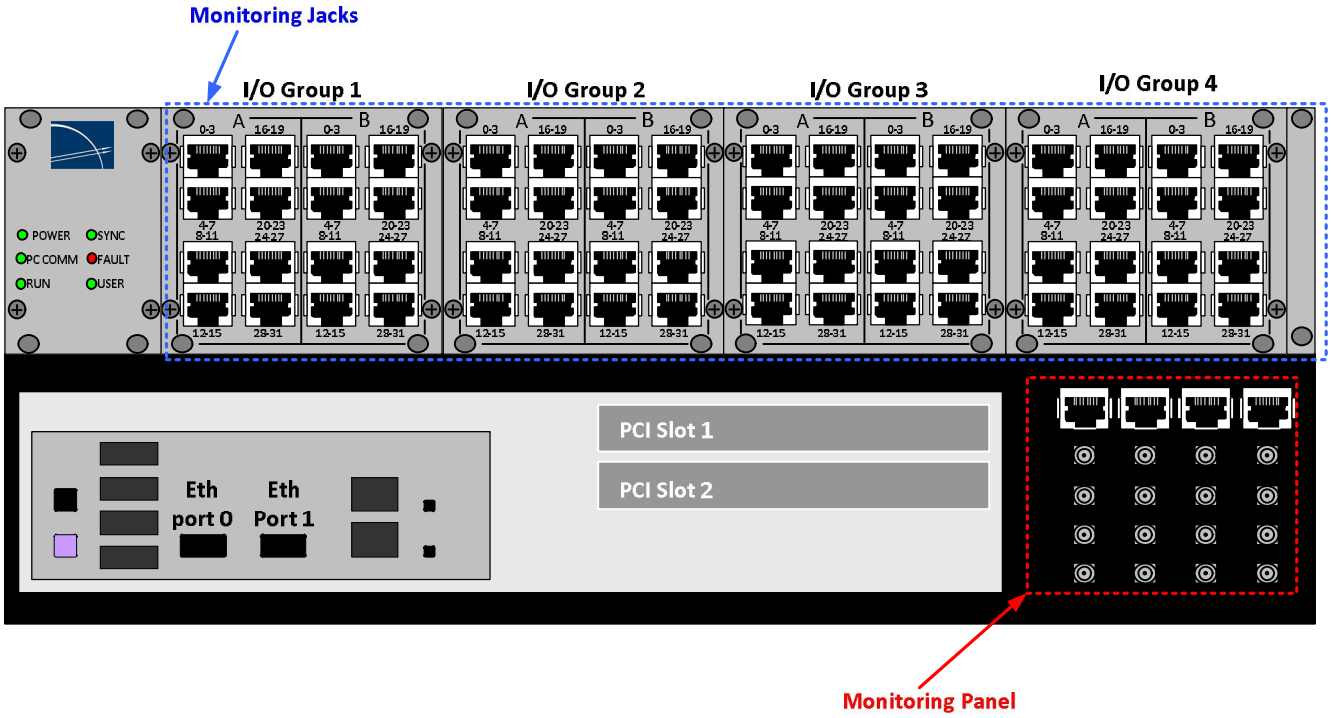


Figure 2: OP5600 chassis front view

Monitoring Panel has a gain of 0.1

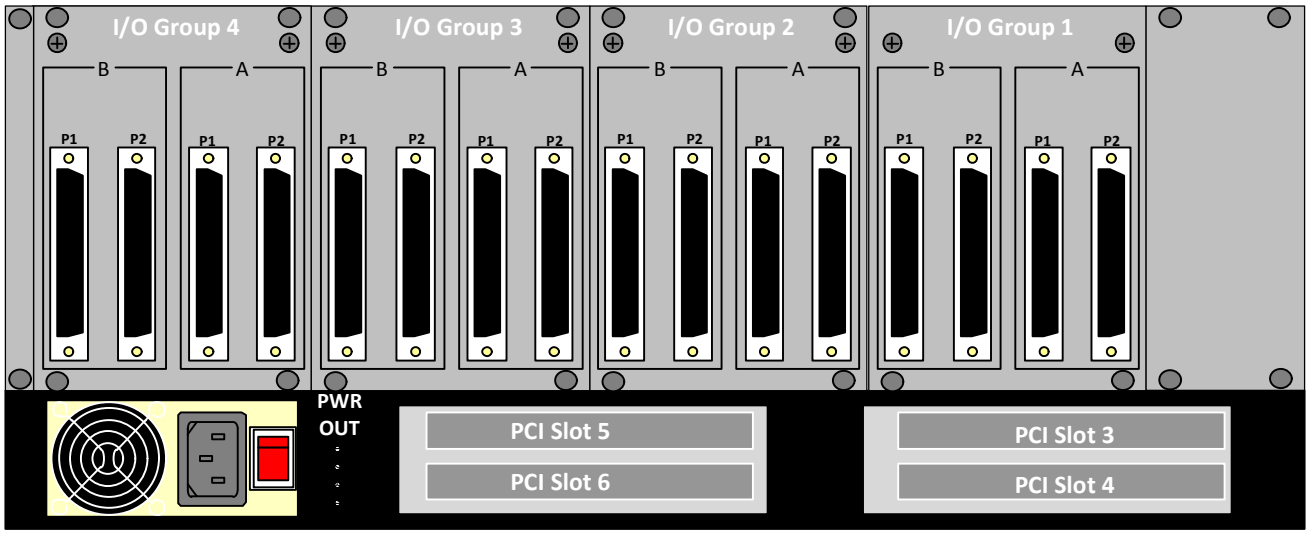
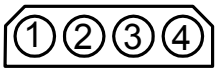


Figure 3: OP5600 Chassis Rear View

CHASSIS PCI SLOT CONFIGURATION

PCI Slot	PCI Card	Notes
1	Empty	
2	Empty	
3	Empty	
4	Empty	
5	SATA port for DVD or CD drive	
6	Empty	

PWR OUT CONNECTOR PINOUT

Pin	Description	Connector Diagram
1	12 V	 Front View, Female
2	GND	
3	GND	
4	5V	

SIGNAL CONDITIONING MODULE CONFIGURATION

I/O Group	Subsection A	Subsection B
1	OP5330 Analog Out	OP5340 Analog In (1 MSPS)
2	OP5353 Digital In	OP5354 Digital Out
3	Empty	Empty
4	Empty	Empty

On the OP5354 Digital Output module, two pins are provided to connect Vuser_RTN. This is a common return used by both 16 Digital Output banks.

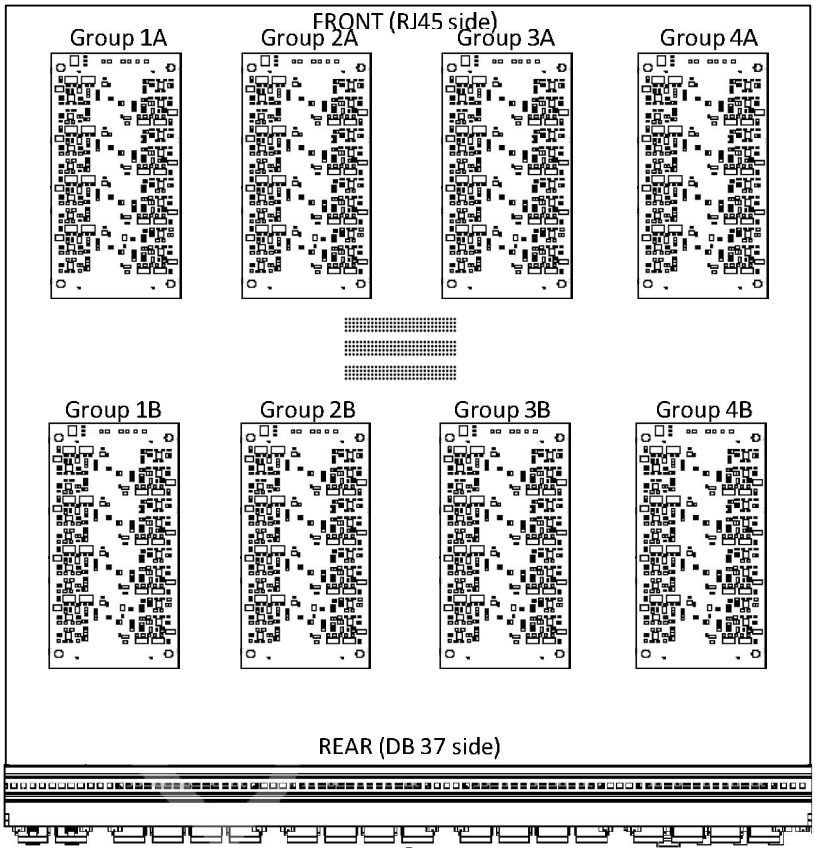


Figure 4: Top View of mezzanines installed on carrier

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

I/O Bitstream Name and Configuration

I/O Bitstream	IO Configuration
OP5142_1-EX-0000-2_1-96IO-04-01.bin	16 Analog Inputs 16 Analog Outputs 16 Time-Stamped Digital Inputs 16 Time-Stamped Digital Outputs 16 Static Digital Inputs 16 Static Digital Outputs

RJ45 Connections – Signal Monitoring

Each RJ45 monitoring Panel on the front of the OP5600 simulator connects to front and back mezzanines. The following images illustrate how the mezzanines are linked to the connectors.

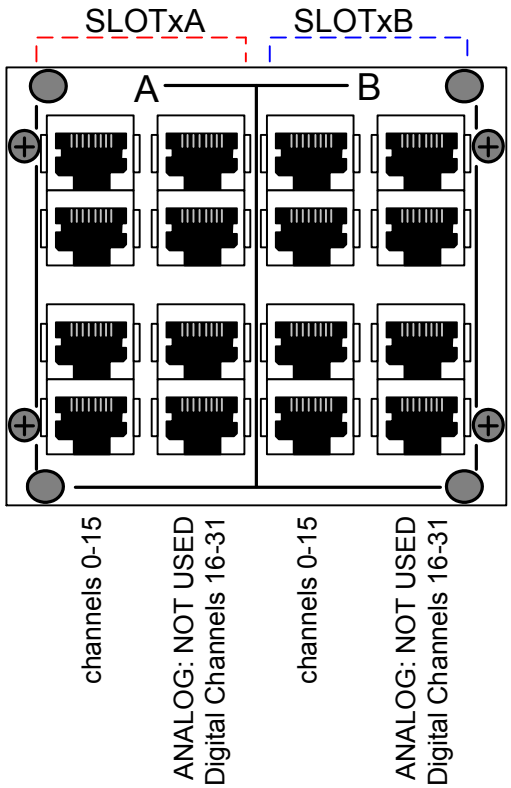


Figure 5: Monitoring jacks - RJ45 to mezzanines relationship

Each mezzanine is assigned two columns of RJ45 connectors. Each column represents a series of channels, divided into 4 channels per RJ45 jack.

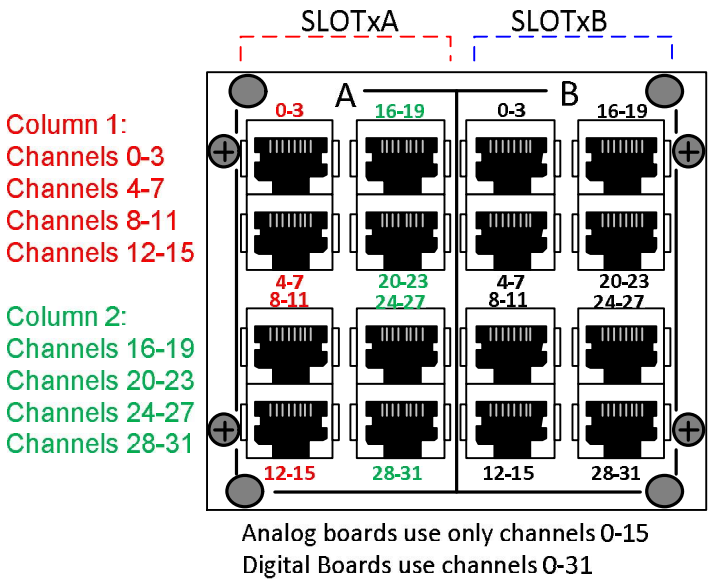


Figure 6: Monitoring jacks - RJ45 channel assignments

The signals from the signal conditioning modules can be monitored through RJ45 and mini BNC connectors to any monitoring device (i.e oscilloscope, etc). The mini BNC jacks let you monitor 4 channels individually. See the OP5600 user guide for connecting monitoring device instructions.

Only connect RJ45 cables from the monitoring jacks to the monitoring panel as indicated in the user manual. Connecting any other cable or device may result in damage to the equipment.

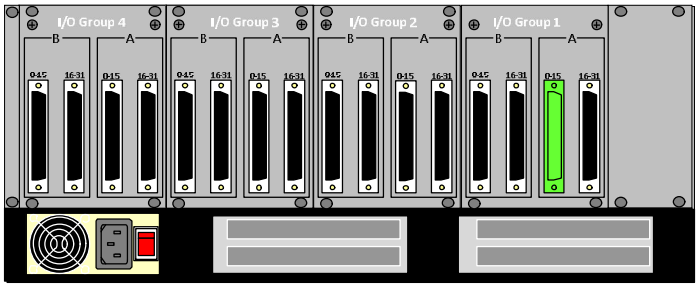
CAUTION The network cable must only be connected to the standard computer connecter network jack. DO NOT connect the network cable in any jack other than the jack intended for that purpose.

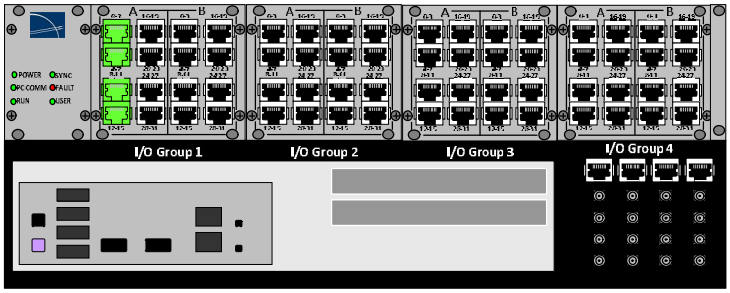
SECTION B – MAPPING I/O BLOCKS TO SIGNAL CONDITIONING

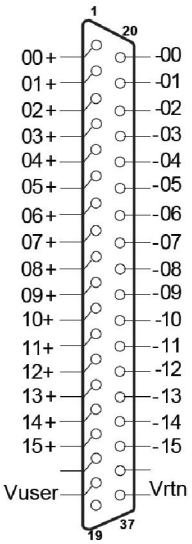
OP5000 SERIES MODULES

The following I/O block mapping is applicable for model *pf312193_hw_test_model.mdl* which is used to validate the hardware functionality.

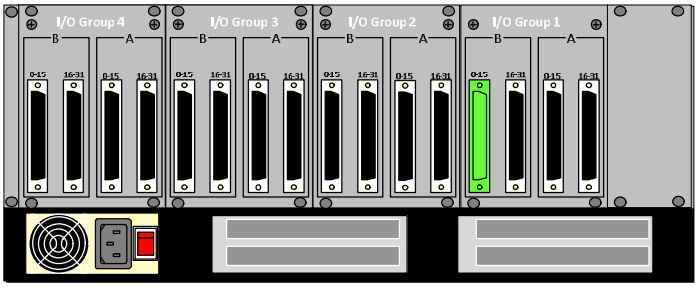
IO GROUP 1 / SECTION A: 16 ANALOG OUT

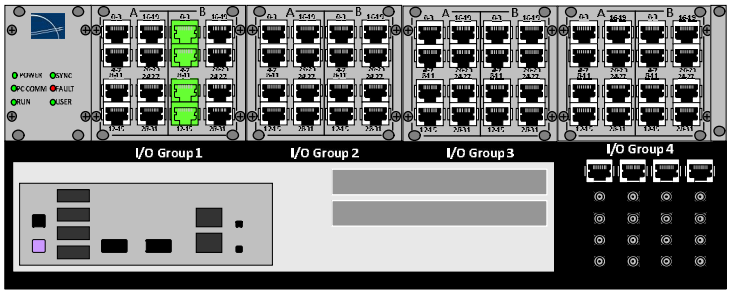


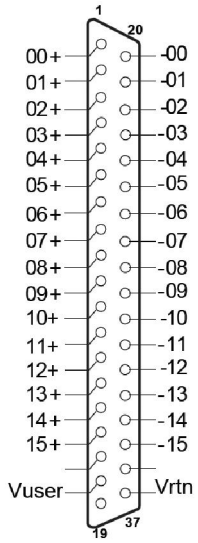


Relation between Simulink blocks and OP5330						
	Simulink block library path: RT-LAB I/O \ Opal-RT \ OP5142 \ OP5142EX1 AnalogOut					
Block #	Description **OP5142EX1 AnalogOut**	Ch	Pinout **Pin # DB37 Connector P1 ch. 0-15**	Name	Comments	
1	**OP5142EX1 AnalogOut Parameters** Controller Name 'OP5142EX1 Ctrl' DataIn port number 1 Number of channels 8	0	1	+OUT00		
			20	-OUT00		
		1	2	+OUT01		
			21	-OUT01		
		2	3	+OUT02		
			22	-OUT02		
		3	4	+OUT03		
			23	-OUT03		
		4	5	+OUT04		
			24	-OUT04		
		5	6	+OUT05		
			25	-OUT05		
		6	7	+OUT06		
			26	-OUT06		
		7	8	+OUT07		
			27	-OUT07		
2	**OP5142EX1 AnalogOut Parameters** Controller Name 'OP5142EX1 Ctrl' DataIn port number 2 Number of channels 8	8	9	+OUT08		
			28	-OUT08		
		9	10	+OUT09		
			29	-OUT09		
		10	11	+OUT10		
			30	-OUT10		
		11	12	+OUT11		
			31	-OUT11		
		12	13	+OUT12		
			32	-OUT12		
		13	14	+OUT13		
			33	-OUT13		
		14	15	+OUT14		
			34	-OUT14		
		15	16	+OUT15		
			35	-OUT15		

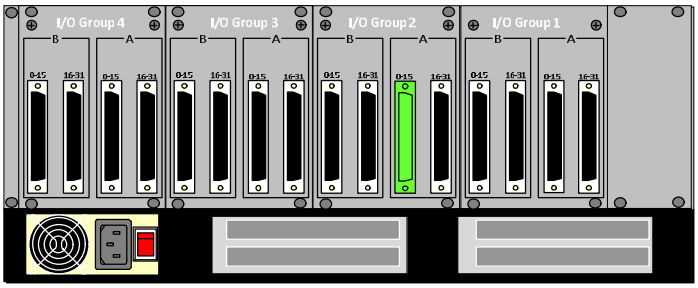
IO GROUP 1 / SECTION B: 16 ANALOG IN

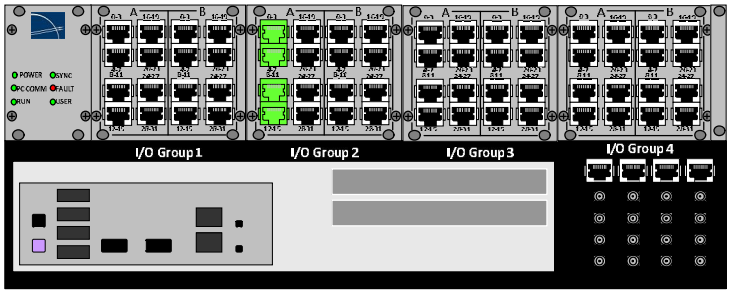


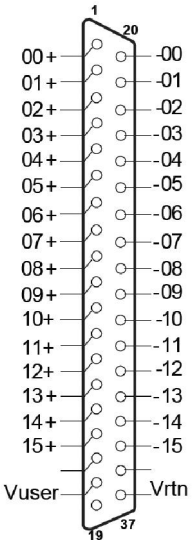


Relation between Simulink blocks and OP5340						
	Simulink block library path: RT-LAB I/O \ Opal-RT \ OP5142 \ OP5142EX1 AnalogIn					
Block #	Description **OP5142EX1 AnalogIn**	Ch	Pinout			
			Pin # DB37 Connector P1 ch. 0-15	Name	Comments	
1	**OP5142EX1 AnalogIn Parameters** Controller Name 'OP5142EX1 Ctrl' DataOut port number 1 Number of channels 8	0	1	+IN00		
			20	-IN00		
		1	2	+IN01		
			21	-IN01		
		2	3	+IN02		
			22	-IN02		
		3	4	+IN03		
			23	-IN03		
		4	5	+IN04		
			24	-IN04		
		5	6	+IN05		
			25	-IN05		
		6	7	+IN06		
			26	-IN06		
		7	8	+IN07		
			27	-IN07		
2	**OP5142EX1 AnalogIn Parameters** Controller Name 'OP5142EX1 Ctrl' DataOut port number 2 Number of channels 8	8	9	+IN08		
			28	-IN08		
		9	10	+IN09		
			29	-IN09		
		10	11	+IN10		
			30	-IN10		
		11	12	+IN11		
			31	-IN11		
		12	13	+IN12		
			32	-IN12		
		13	14	+IN13		
			33	-IN13		
		14	15	+IN14		
			34	-IN14		
		15	16	+IN15		
			35	-IN15		

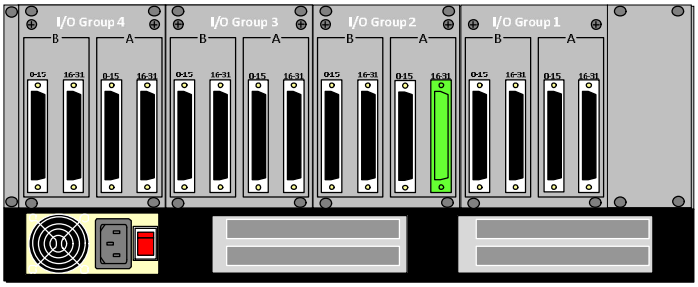
IO GROUP 2 / SECTION A: 32 DIGITAL IN (CH 00-15)

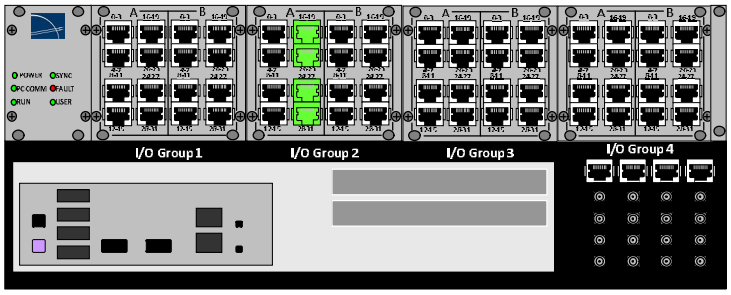


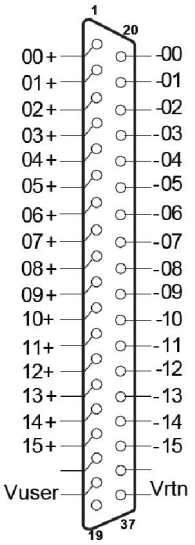


Relation between Simulink blocks and OP5353						
	Simulink block library path: RT-LAB I/O \ Opal-RT \ OP5142 \ OP5142EX1 EventDetector					
Block #	Description **OP5142EX1 EventDetector**	Ch	Pinout **Pin # DB37 Connector P1 ch. 0-15**	Name	Comments	
1	**OP5142EX1 EventDetector Parameters** Controller Name 'OP5142EX1 Ctrl' DataOut port number 3 Number of channels 8 Events per channel 4	0	1	+DIN00		
			20	-DIN00		
		1	2	+DIN01		
			21	-DIN01		
		2	3	+DIN02		
			22	-DIN02		
		3	4	+DIN03		
			23	-DIN03		
		4	5	+DIN04		
			24	-DIN04		
		5	6	+DIN05		
			25	-DIN05		
		6	7	+DIN06		
			26	-DIN06		
		7	8	+DIN07		
			27	-DIN07		
2	**OP5142EX1 EventDetector Parameters** Controller Name 'OP5142EX1 Ctrl' DataOut port number 4 Number of channels 8 Events per channel 4	8	9	+DIN08		
			28	-DIN08		
		9	10	+DIN09		
			29	-DIN09		
		10	11	+DIN10		
			30	-DIN10		
		11	12	+DIN11		
			31	-DIN11		
		12	13	+DIN12		
			32	-DIN12		
		13	14	+DIN13		
			33	-DIN13		
		14	15	+DIN14		
			34	-DIN14		
		15	16	+DIN15		
			35	-DIN15		

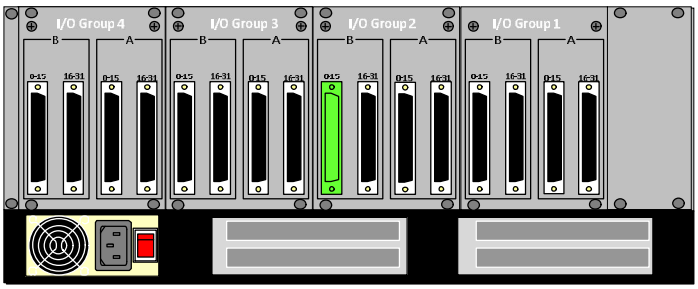
IO GROUP 2 / SECTION A: 32 DIGITAL IN (CH 16-31)

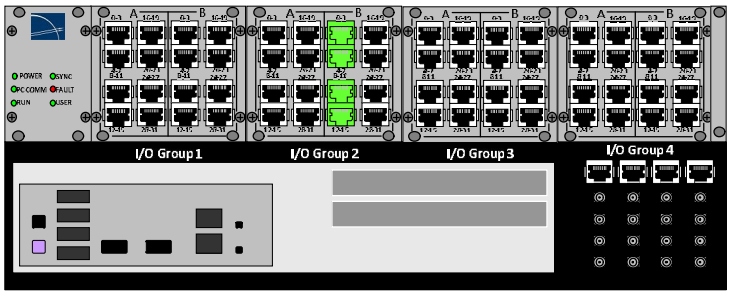




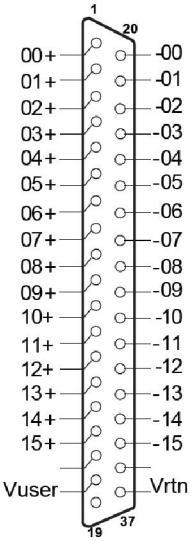
Relation between Simulink blocks and OP5353						
	Simulink block library path: RT-LAB I/O \ Opal-RT \ OP5142 \ OP5142EX1 DigitalIn					
Block #	Description **OP5142EX1 DigitalIn**	Ch	Pinout			
			Pin # DB37 Connector P2 ch. 16-31	Name	Comments	
1	**OP5142EX1 DigitalIn Parameters** Controller Name 'OP5142EX1 Ctrl' DataOut port number 5 Number of Din channels 8	16	1	+DIN16		
			20	-DIN16		
		17	2	+DIN17		
			21	-DIN17		
		18	3	+DIN18		
			22	-DIN18		
		19	4	+DIN19		
			23	-DIN19		
		20	5	+DIN20		
			24	-DIN20		
		21	6	+DIN21		
			25	-DIN21		
		22	7	+DIN22		
			26	-DIN22		
		23	8	+DIN23		
			27	-DIN23		
2	**OP5142EX1 DigitalIn Parameters** Controller Name 'OP5142EX1 Ctrl' DataOut port number 6 Number of Din channels 8	24	9	+DIN24		
			28	-DIN24		
		25	10	+DIN25		
			29	-DIN25		
		26	11	+DIN26		
			30	-DIN26		
		27	12	+DIN27		
			31	-DIN27		
		28	13	+DIN28		
			32	-DIN28		
		29	14	+DIN29		
			33	-DIN29		
		30	15	+DIN30		
			34	-DIN30		
		31	16	+DIN31		
			35	-DIN31		

IO GROUP 2 / SECTION B: 32 DIGITAL OUT (CH 00-15)

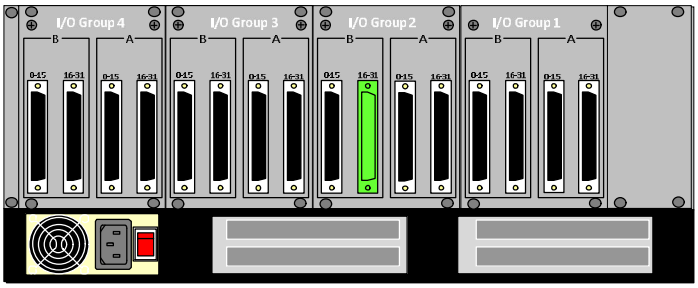


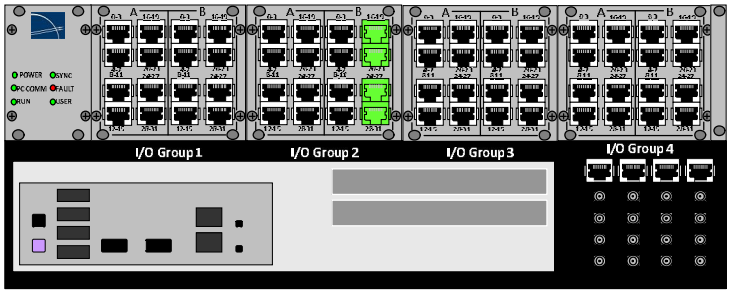


Relation between Simulink blocks and OP5354						
	Simulink block library path: RT-LAB I/O \ Opal-RT \ OP5142 \ OP5142EX1 EventGenerator					
Block #	Description **OP5142EX1 EventGenerator**	Ch	Pinout **Pin # DB37 Connector P1 ch. 0-15**	Name	Comments	
1	**OP5142EX1 EventGenerator Parameters** Controller Name 'OP5142EX1 Ctrl' DataIn port number 3 Number of channels 8 Events per channel 4	0	1	+DOUT00		
			20	-DOUT00		
		1	2	+DOUT01		
			21	-DOUT01		
		2	3	+DOUT02		
			22	-DOUT02		
		3	4	+DOUT03		
			23	-DOUT03		
		4	5	+DOUT04		
			24	-DOUT04		
		5	6	+DOUT05		
			25	-DOUT05		
		6	7	+DOUT06		
			26	-DOUT06		
		7	8	+DOUT07		
			27	-DOUT07		
2	**OP5142EX1 EventGenerator Parameters** Controller Name 'OP5142EX1 Ctrl' DataIn port number 4 Number of channels 8 Events per channel 4	8	9	+DOUT08		
			28	-DOUT08		
		9	10	+DOUT09		
			29	-DOUT09		
		10	11	+DOUT10		
			30	-DOUT10		
		11	12	+DOUT11		
			31	-DOUT11		
		12	13	+DOUT12		
			32	-DOUT12		
		13	14	+DOUT13		
			33	-DOUT13		
		14	15	+DOUT14		
			34	-DOUT14		
		15	16	+DOUT15		
			35	-DOUT15		

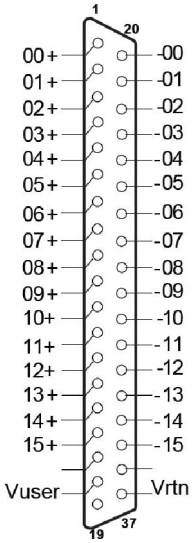


IO GROUP 2 / SECTION B: 32 DIGITAL OUT (CH 16-31)





Relation between Simulink blocks and OP5354						
	Simulink block library path: RT-LAB I/O \ Opal-RT \ OP5142 \ OP5142EX1 DigitalOut					
Block #	Description **OP5142EX1 DigitalOut**	Ch	Pinout			
			Pin # DB37 Connector P2 ch. 16-31	Name	Comments	
1	**OP5142EX1 DigitalOut Parameters** Controller Name 'OP5142EX1 Ctrl' DataIn port number 5 Number of Dout channels 8	16	1	+DOUT16		
			20	-DOUT16		
		17	2	+DOUT17		
			21	-DOUT17		
		18	3	+DOUT18		
			22	-DOUT18		
		19	4	+DOUT19		
			23	-DOUT19		
		20	5	+DOUT20		
			24	-DOUT20		
		21	6	+DOUT21		
			25	-DOUT21		
		22	7	+DOUT22		
			26	-DOUT22		
		23	8	+DOUT23		
			27	-DOUT23		
2	**OP5142EX1 DigitalOut Parameters** Controller Name 'OP5142EX1 Ctrl' DataIn port number 6 Number of Dout channels 8	24	9	+DOUT24		
			28	-DOUT24		
		25	10	+DOUT25		
			29	-DOUT25		
		26	11	+DOUT26		
			30	-DOUT26		
		27	12	+DOUT27		
			31	-DOUT27		
		28	13	+DOUT28		
			32	-DOUT28		
		29	14	+DOUT29		
			33	-DOUT29		
		30	15	+DOUT30		
			34	-DOUT30		
		31	16	+DOUT31		
			35	-DOUT31		



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