Central-I Family

CiG1-IOC01-0A-01-00

Hardware User's Manual

Revision control table		
Version	Description	Date
1.0	Initial (based on Hardware Manual of previous hardware versions)	November 14, 2016
1.1	Change the connector pin definition	February 25, 2017

Table of contents

Scope

This manual describes hardware interfaces of the CIG1-IOC01-0A-01-00

Product description	Part numbers
IO Board	CIG1-IOC01-0A-01-00

The –XX defines a product's hardware variant, as describes below.

Product structure

CIG1-IOC01-0A-01-00

The following pictures show the overall structure CIG1-IOC01-0A-01-00 IO Board

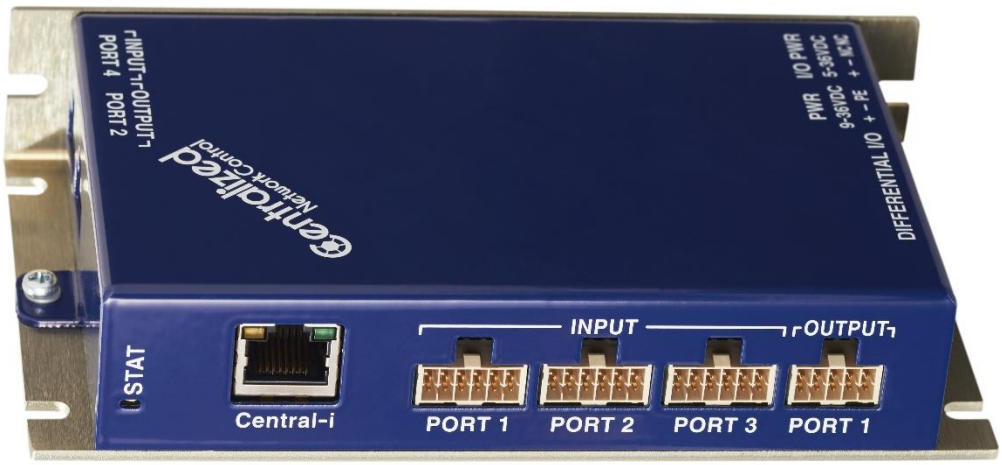

Figure 1: CiG1-IOC01-0A-01-00 Board Overview

Number of IO Ports

The CIG1-IOC-0A-01-00 (IO board) has up to 7 IO ports.

Supported IO types

The CIG1 IO board can support many different types of IO.

- Up to 16 isolated inputs, 8 isolated outputs
- Up to 4 analog inputs
- Up to 3 differential bidirectional IO

Products' variants

The –XX at the end of the product's part number (see label on the product) defines the product's variant.

For the IO Board

CIG1-IOC01-0A-01-00

Normally, we only have this 00 version IO board and future we will support more products.

IO BOARD – CIG1-IOC01-0A-01-00

This document provides a detailed description of the interface of the IO board.

Logic Power Connectors

This chapter describes the IO board's logic power connector.

IO Board – J1 – Input Logic Power

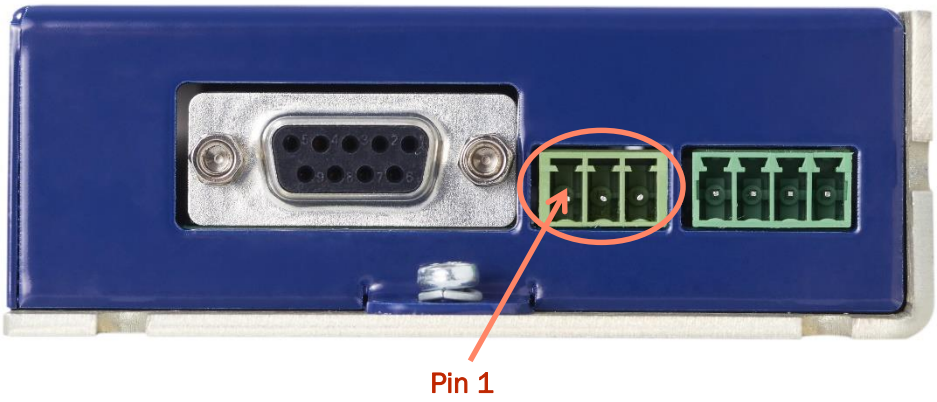

Figure 2: Input Logic Power Port

Manufacturer: DEGSON (Phoenix compatible)
P/N (product side): 15EDGRC3.5-03P-14-00AH
Pitch: 3.5mm
Mating Type: MC 1,5/ 3-ST-3,5

Pin #	Name	Type	Description
1	VIN_EXTERNAL	PWR - IN	Input IO Power 9-36VDC
2	VIN_EXTERNAL	PWR -IN	Input IO Power Return
3	GND_EARTH	PWR	Ground_Earth Connection

The IO Board includes a built-in protection to avoid damage in case of inversed polarity at the input power. The IO Board uses logic power of 9-36Vdc to reduce load of main power supply.

The controller includes a built-in protection to avoid damage in case of inversed polarity at the input.

Bulk Capacitors are also connected with the main input logic power to provide the external 5v output power for the IO ports.

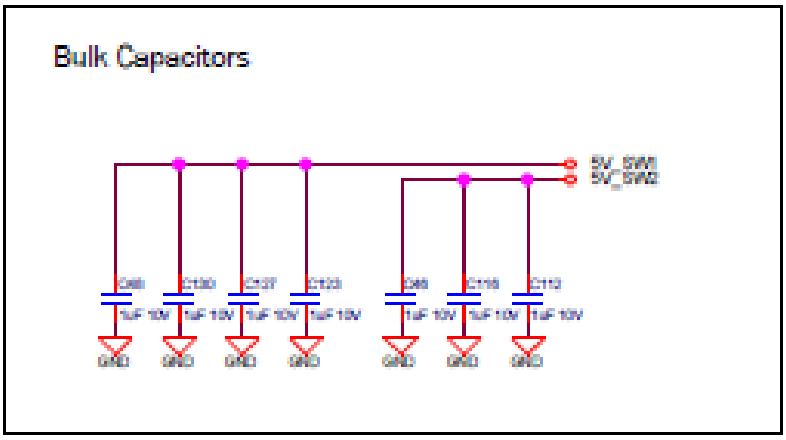

Figure 2: Bulk Capacitors

Filter Capacitors are also connected with the main input logic power to provide the external 24v output power (can be seen in J2 Input IO Power) for the external use.

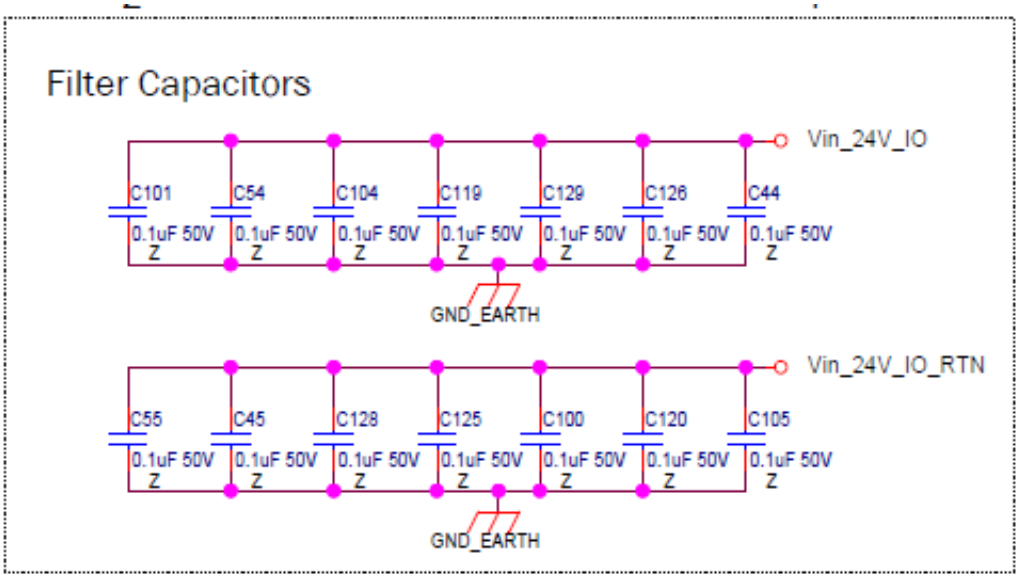

Figure 3: Filter Capacitors

IO Board – J2 – External Output IO Power

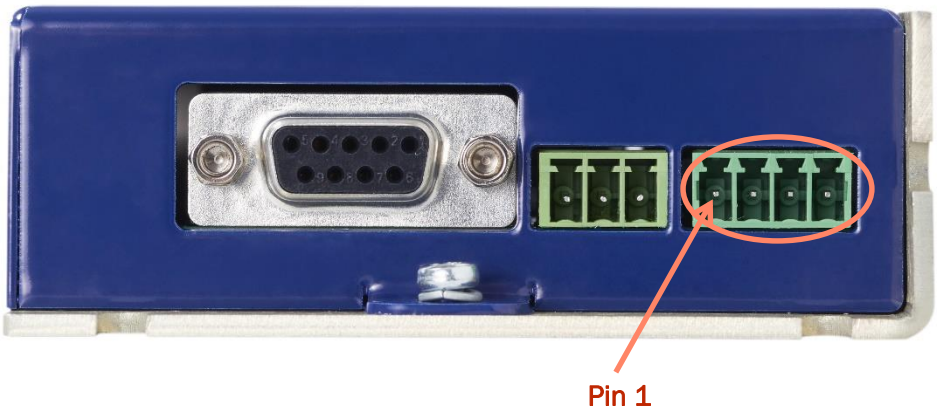

Figure 4: External Output IO Power Port

Manufacturer: DEGSON (Phoenix compatible)
P/N (product side): 15EDGRC-3.5-04P-14-00AH
Pitch: 3.5mm
Mating Type: MC 1,5/ 4-ST-3,5

Pin #	Name	Type	Description
1	Vin_24V_IO	PWR -IN	Input IO Power 24VDC
2	Vin_24V_IO_RTN	PWR -IN	Input IO Power Return
3	NA	PWR	Not Connected
4	NA	PWR	Not Connected

This input IO power can provide 24V, up to 8A IO power for external use. Filter Capacitors are also connected with the main power to provide power for the I/O ports. (can be seen in J1 Input Logic Power Port)

IO board connectors

The chapter describes the connectors and interfaces of the IO board.

IO Board– J3 – Analog & Isolated Inputs Port 1

J3 is the first IO port for analog and isolated inputs.

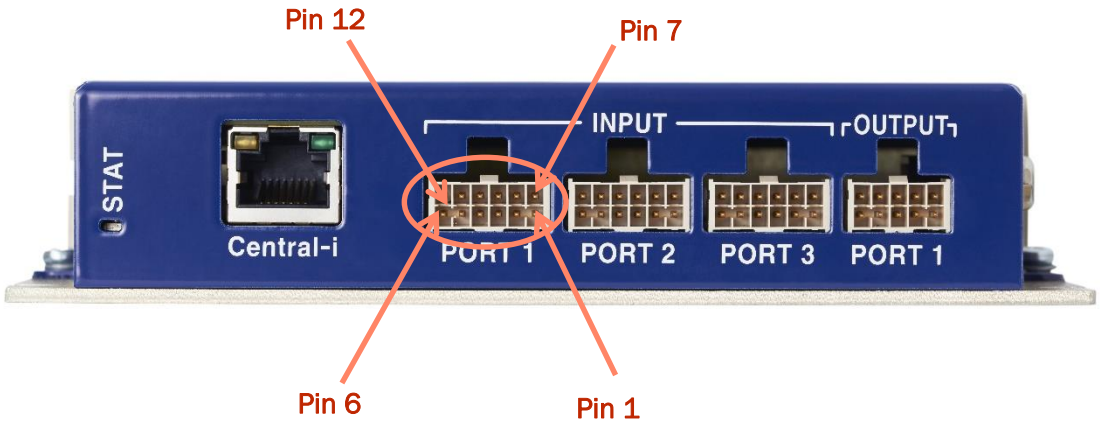

Figure 5: Analog &Isolated Inputs Port 1

Manufacturer: Samtec Inc
P/N (product side): IPL1-106-01-L-D-RA-K
Cable connector P/N: IPD1-06-D-K
Crimp P/N: CC79L-2630-01-L
Other options are possible; please, consult with the manufacturer.

Pin #	Name	Type	Description
1	Vin_24V_IO_RTN	PWR-OUT	24V IO Power return
2	Vin_24V_IO	PWR-OUT	24V IO Power for external use

3	OC_Input4	IN	4th isolated input, SW: DInPort (bit 3). NPN or PNP, depending on connection of the common pin of this group
4	OC_Input2	IN	2nd isolated input, SW: DInPort (bit 1). NPN or PNP, depending on connection of the common pin of this group
5	OC_Input_1-4_Common	IN	Common power pin for discrete, isolated, inputs 1 to 4
6	Analog_Input_1	IN	Analog input 1, ±12v, 12 bit AinPort[1]
7	GND_EARTH	PWR	Ground Earth Connection
8	GND	PWR-OUT	Power Ground
9	5V_SW1	PWR-OUT	5V Power Supply for other components
10	OC_Input3	IN	3rd isolated input, SW: DInPort (bit 2). NPN or PNP, depending on connection of the common pin of this group
11	OC_Input1	IN	1st isolated input, SW: DInPort (bit 0). NPN or PNP, depending on connection of the common pin of this group
12	Analog_Input_return_1	IN	Analog output 1 return (internally connected to GND

Electrical interfaces – Analog inputs:

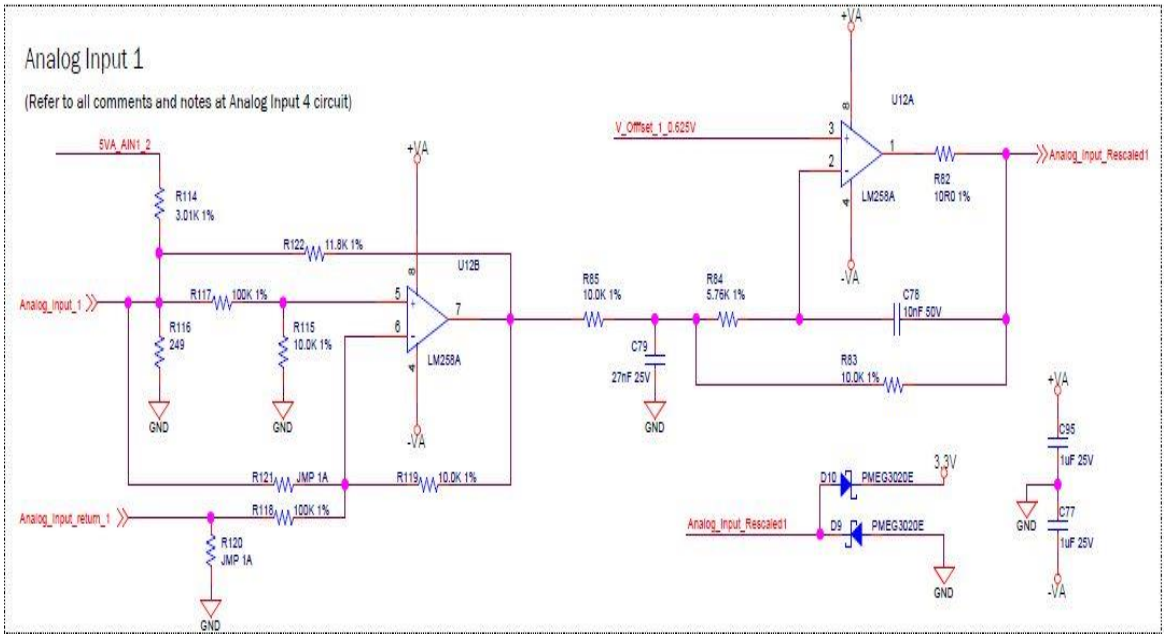

Figure 6 Analog Inputs circuit diagram

INPUT	VIN=-12V till +12V (Differencial)	VIN=-12V till +12V (Single Ended)	(4-20)mA (Single Ended)	FORCE SENSOR	PT100 SENSOR
RA	100 kOHm 1%	86.6 kOHm 1%	38.3 kOHm 1%	NC	11.0K 1%
RB	NC	NC	249R	NC	NC
RC	10 kOHm 1%	10kOHm 1%	10 kOHm 1%	0 OHm	NC
RD	NC	NC	NC	0 OHm	NC
RE	10 kOHm 1%	0 OHm	0 OHm	RFSR-min + 20% (*) (MAX. FORCE)	105K 1%
RF	100 kOHm 1%	NC	NC	NC	0 OHm
RG	NC	NC	NC	NC	3.01K 1%
RH	NC	NC	NC	NC	11.8K 1%
RM	NC	NC	NC	NC	12.4K 1%
	Default State				

Figure 7 Resistor Information

- The electrical interfaces of analog input 2 in port J4, analog input3 in port J5 and analog input4 in port J8 all are identical to those of analog input 1.
- The analog inputs are -12v to +12v, 12 bits.

- Input circuit drawing is quite complex, in order to optionally support variety of analog input sources. However, the default assembly (see black mark) is for standard differential analog input, with a simple input circuit, having an input resistance of ~60K ohms.
- Input circuit bandwidth: 1KHz, -40 db/dec.
- For dedicated (non-differential) analog input formats, as shown in the above table, or for any other type, please consult designer for dedicated hardware variants of the product.
- The software provides parameters to control the analog input reading, as follows:
  - Filter.
  - Offset.
  - Dead band.
  - Gain

Electrical interfaces – Discrete, Isolated, inputs:

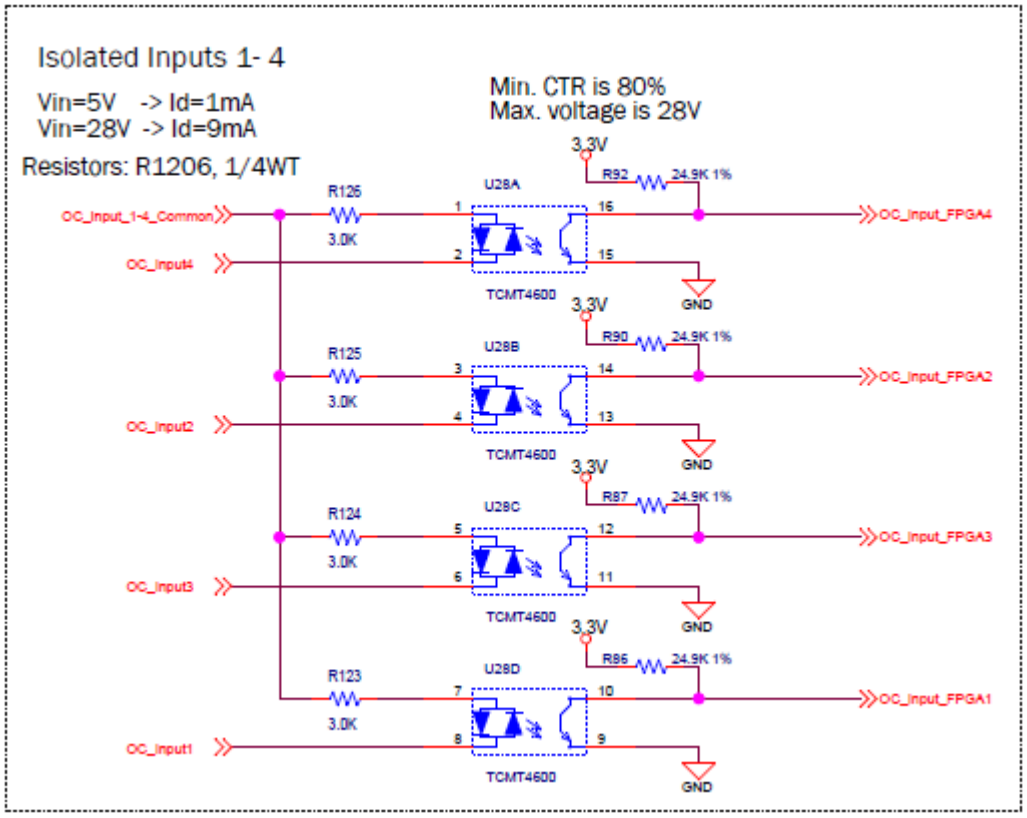

Figure 2 Isolated Inputs circuit diagram

- The interface circuit is identical for inputs 1 to 4, which are organized as a single group.
- Similarly, in port J4, inputs 5-8 are organized as a group with an identical interface circuits, in port J5, inputs 9-12 are a third independent group, and in port J8, inputs 13-16 are the forth independent group.
- Each group is fully isolated and independent of the other groups.
- Each group can be connected as NPN or PNP interfaces, depending on the wiring of the group common pin. If the common pin is connected to power (5v to 28v), then the inputs of this group can be used with external NPN devices (external current sinking devices). If the common is connected to the GND of some external power, then the inputs can be used with external PNP devices (external current sourcing devices).
- Note that the input circuit of the opto couplers includes two diodes. This enables the usage as NPN of PNP.
- Clearly, one group can be wired to interface external NPN devices and another group can be wired to interface PNP devices. However, within a group, all interfaces should be the same, as they are based on the connection of the group common pin

IO Board– J4 – Analog & Isolated Inputs Port 2

J4 is the first IO port for analog and isolated inputs.

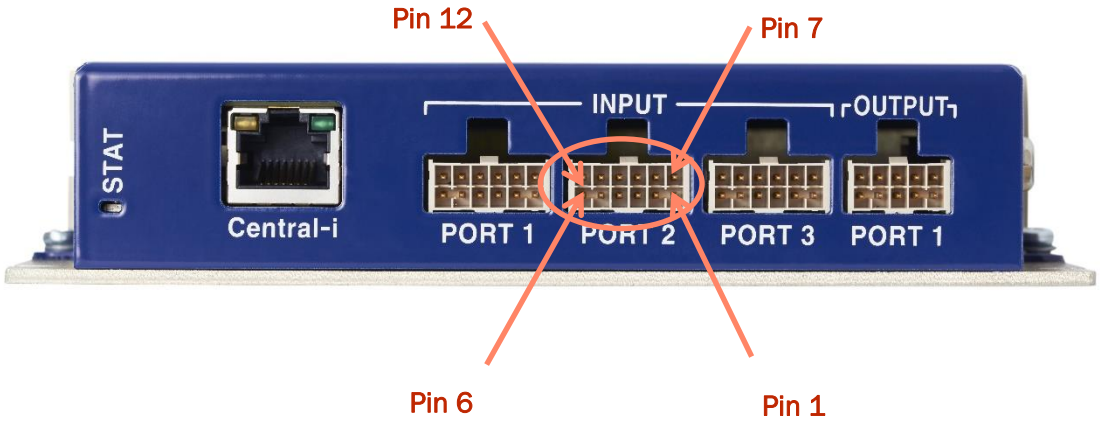

Figure 9: Isolated Inputs Port 2

Manufacturer: Samtec Inc
P/N (product side): IPL1-106-01-L-D-RA-K
Cable connector P/N: IPD1-06-D-K
Crimp P/N: CC79L-2630-01-L
Other options are possible; please, consult with the manufacturer.

Pin #	Name	Type	Description
1	Vin_24V_IO_RTN	PWR-OUT	24V IO Power return
2	Vin_24V_IO	PWR-OUT	24V IO Power for external use
3	OC_Input8	IN	8th isolated input, SW: DInPort (bit 7). NPN or PNP, depending on connection of the common pin of this group
4	OC_Input6	IN	6th isolated input, SW: DInPort (bit 5). NPN or PNP, depending on connection of the common pin of this group
5	OC_Input_5-8_Common	IN	Common power pin for discrete, isolated, inputs 5 to 8

6	Analog_Input_2	IN	Analog input 2, ±12v, 12 bit AinPort[2]
7	GND_EARTH	PWR	Ground Earth Connection
8	GND	PWR-OUT	Power Ground
9	5V_SW1	PWR-OUT	5V Power Supply for other components
10	OC_Input7	IN	7th isolated input, SW: DInPort (bit 6). NPN or PNP, depending on connection of the common pin of this group
11	OC_Input5	IN	5th isolated input, SW: DInPort (bit 4). NPN or PNP, depending on connection of the common pin of this group
12	Analog_Input_return_2	IN	Analog output 2 return (internally connected to GND

IO Board– J5 – Analog & Isolated Inputs Port 3

J5 is the third IO port for analog and isolated inputs.

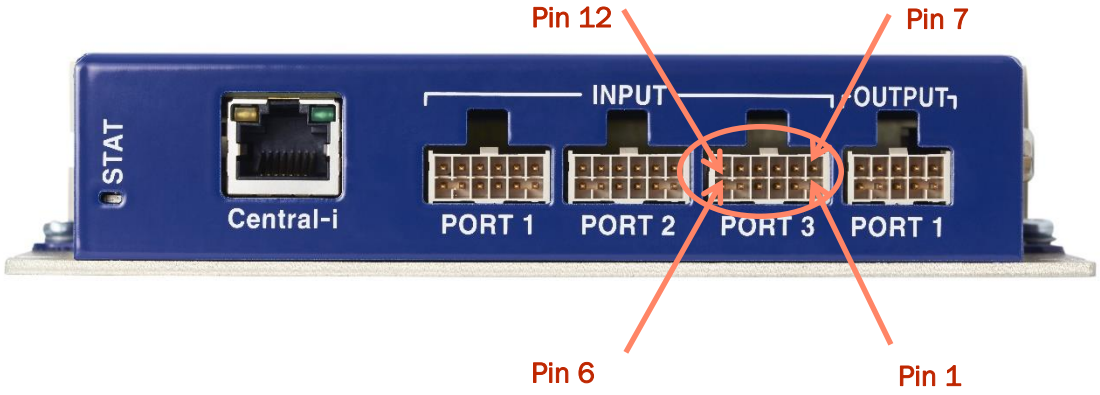

Figure 10: Isolated Inputs Port 3

Manufacturer: Samtec Inc
P/N (product side): IPL1-106-01-L-D-RA-K
Cable connector P/N: IPD1-06-D-K
Crimp P/N: CC79L-2630-01-L
Other options are possible; please, consult with the manufacturer.

Pin #	Name	Type	Description
1	Vin_24V_IO_RTN	PWR-OUT	24V IO Power return
2	Vin_24V_IO	PWR-OUT	24V IO Power for external use
3	OC_Input12	IN	12th isolated input, SW: DInPort (bit 11). NPN or PNP, depending on connection of the common pin of this group
4	OC_Input10	IN	10th isolated input, SW: DInPort (bit 9). NPN or PNP, depending on connection of the common pin of this group

5	OC_Input_9-12_Common	IN	Common power pin for discrete, isolated, inputs 9 to 12
6	Analog_Input_3	IN	Analog input 3, ±12v, 12 bit AinPort[3]
7	GND_EARTH	PWR	Ground Earth Connection
8	GND	PWR-OUT	Power Ground
9	5V_SW1	PWR-OUT	5V Power Supply for other components
10	OC_Input11	IN	11th isolated input, SW: DInPort (bit 10). NPN or PNP, depending on connection of the common pin of this group
11	OC_Input9	IN	9th isolated input, SW: DInPort (bit 8). NPN or PNP, depending on connection of the common pin of this group
12	Analog_Input_return_3	IN	Analog output 3 return (internally connected to GND

IO Board– J6 – Isolated Outputs Port 1

J6 is the first IO port for isolated outputs.

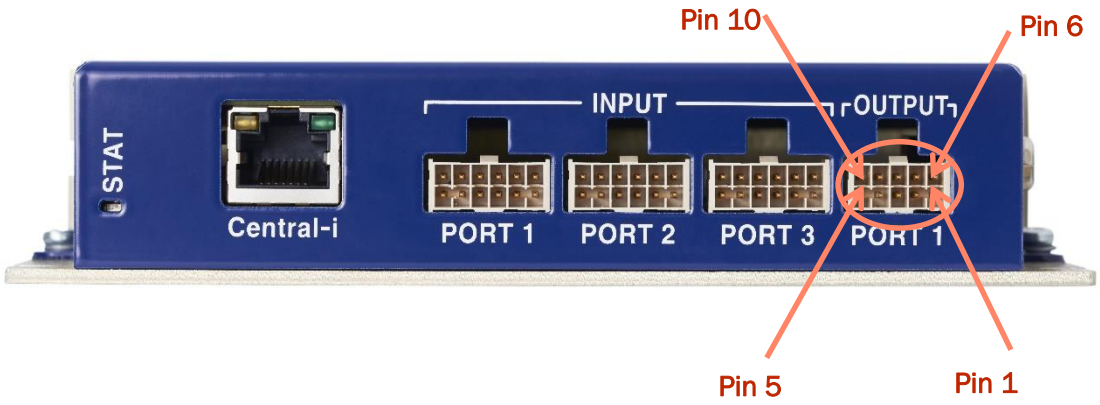

Figure 11: Isolated Outputs Port 1

Manufacturer: Samtec Inc
P/N (product side): IPL1-105-01-L-D-RA-K
Cable connector P/N: IPD1-05-D-K
Crimp P/N: CC79L-2630-01-L
Other options are possible; please, consult with the manufacturer.

Pin #	Name	Type	Description
1	Vin_24V_IO_RTN	PWR-OUT	24V IO Power return
2	Vin_24V_IO	PWR-OUT	24V IO Power for external use
3	OC_Output4	OUT	4th isolated output, SW: DOutPort (bit 3). Programmable sink or source
4	OC_Output2	OUT	2nd isolated output, SW: DOutPort (bit 1). Programmable sink or source
5	OC_Output_1-4_Common_Power	PWR-IN	Common power pin for discrete, isolated, outputs 1 to 4
6	GND	PWR-OUT	Power Ground
7	5V_SW2	PWR-OUT	5V Power Supply for other components

8	OC_Output3	OUT	3rd isolated output, SW: DOutPort (bit 2). Programmable sink or source
9	OC_Output1	OUT	1st isolated output, SW: DOutPort (bit 0). Programmable sink or source
10	OC_Output_1-4_Common_Return	PWR-IN	Common power return pin for discrete, isolated, outputs 1 to 4

Note: 5v supply limitation:

Note that the 5v supply that is provided both on pin 7 in Port J6 and Port J9 are internally limited to 0.5A (both pins together). This is in order to protect the amplifier from short to GND.

Future firmware version of the amplifier will be able to detect and report this fault and to disable the 5v supply until the fault is fixed. Currently, the current will be limited, but the detection of this limit and the shutting off of the 5v supply is not supported yet.

Electrical interfaces – Discrete, Isolated, outputs:

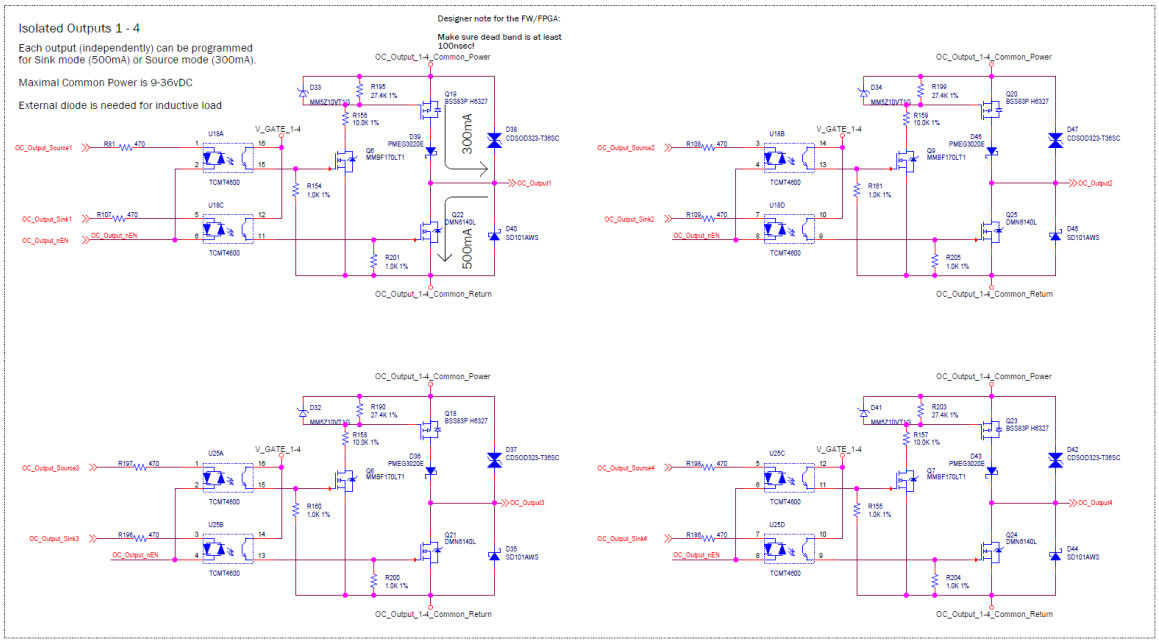

Figure 12 Isolated Outputs circuit diagram

- The interface circuit is identical for all outputs 1 to 4 in Port J6 and outputs 5-8 in Port J8.
- Each output can be programmed (by a software parameter) to act as a current sourcing output (up to 300mA) or as a current sinking output (up to 500mA).
- Common power is shared by all 4 outputs.

- The outputs are designed for resistive loads. For inductive loads, an external flyback diode is required.
- Common power can go up to 45 volts. Yet, typical usage should be limited by 36v.
- Discrete outputs specifications:

  - Discrete outputs common power voltage range is 5v to 36v.
  - Maximal load current, per each output:

    a. SINK mode, at any common power voltage: 500mA
    b. SOURCE mode, at 24v common power voltage: 300mA.
    c. SOURCE mode, at 5v common power voltage: 60mA
    (Output high voltage > 4.5v).

  Notes:

  1. Higher currents (but less than absolute maximal value of 250mA) can be driven at SOURCE mode with 5v common power voltage. However, the output high voltage will drop significantly.
  2. For additional and more detailed data, please write to our support team.

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IO Board– J7 – Differential Bidirectional I/O Port

J7 is the IO port for differential and bidirectional IO signals.

Figure 13: Differential IO port

Manufacturer: Amphenol
P/N (product side): I77SDE09SA4CH4F

Pin #	Name	Type	Description
1	Dif_BiDir_1+	Bidirectional	Differential input/output, not inverted
2	Dif_BiDir_2+	Bidirectional	Differential input/output, not inverted
3	Dif_BiDir_3+	Bidirectional	Differential input/output, not inverted
4	5V_SW2	PWR-OUT	5V Power Supply for other components
5	GND_EARTH	PWR	Ground Earth Connection
6	Dif_BiDir_1-	Bidirectional	Differential input/output, inverted
7	Dif_BiDir_2-	Bidirectional	Differential input/output, inverted
8	Dif_BiDir_3-	Bidirectional	Differential input/output, inverted
9	GND	PWR-OUT	Power Ground
10	NA	PWR	Not Connected
11	GND	PWR-OUT	Power Ground

IO Board– J8 – Analog & Isolated Inputs Port 4

J8 is the forth IO port for analog and isolated inputs.

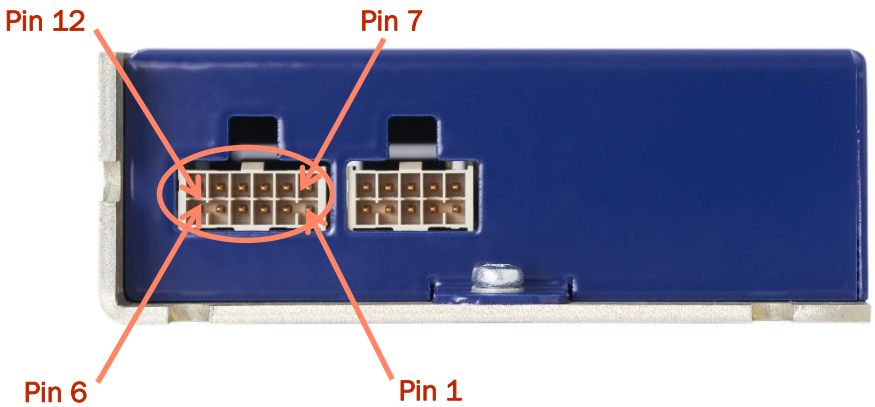

Figure 14: Analog & Isolated Inputs Port 4

Manufacturer: Samtec Inc
P/N (product side): IPL1-106-01-L-D-RA-K
Cable connector P/N: IPD1-06-D-K
Crimp P/N: CC79L-2630-01-L
Other options are possible; please, consult with the manufacturer.

Pin #	Name	Type	Description
1	Vin_24V_IO_RTN	PWR-OUT	24V IO Power return
2	Vin_24V_IO	PWR-OUT	24V IO Power for external use
3	OC_Input14	IN	14th isolated input, SW: DInPort (bit 13). NPN or PNP, depending on connection of the common pin of this group
4	OC_Input16	IN	16th isolated input, SW: DInPort (bit 15). NPN or PNP, depending on connection of the common pin of this group
5	OC_Input_13-16_Common	IN	Common power pin for discrete, isolated, inputs 13 to 16
6	Analog_Input_4	IN	Analog input 4, ±12v, 12 bit AInPort[4]
7	GND_EARTH	PWR	Ground Earth Connection
8	GND	PWR-OUT	Power Ground
9	5V_SW1	PWR-OUT	5V Power Supply for other components
10	OC_Input15	IN	15th isolated input, SW: DInPort (bit 14). NPN or PNP, depending on connection of the common pin of this group
11	OC_Input13	IN	13th isolated input, SW: DInPort (bit 12). NPN or PNP, depending on connection of the common pin of this group
12	Analog_Input_return_4	IN	Analog output 4 return (internally connected to GND

IO Board– J9 – Isolated Outputs Port 2

J9 is the second IO port for isolated outputs.

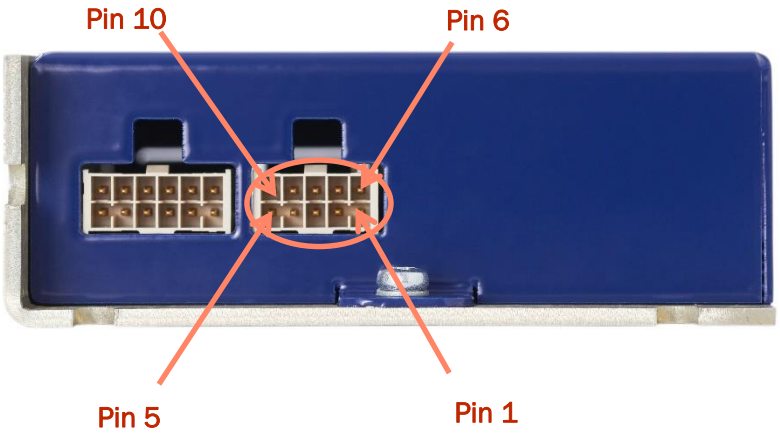

Figure 15: Isolated Outputs Port 2

Manufacturer: Samtec Inc
P/N (product side): IPL1-105-01-L-D-RA-K
Cable connector P/N: IPD1-05-D-K
Crimp P/N: CC79L-2630-01-L
Other options are possible; please, consult with the manufacturer.

Pin #	Name	Type	Description
1	Vin_24V_IO_RTN	PWR-OUT	24V IO Power return
2	Vin_24V_IO	PWR-OUT	24V IO Power for external use
3	OC_Output8	OUT	8th isolated output, SW: DOutPort (bit 7). Programmable sink or source
4	OC_Output6	OUT	6th isolated output, SW: DOutPort (bit 5). Programmable sink or source
5	OC_Output_5-8_Common_Power	PWR-IN	Common power pin for discrete, isolated, outputs 5 to 8
6	GND	PWR-OUT	Power Ground
7	5V_SW2	PWR-OUT	5V Power Supply for other components

8	OC_Output7	OUT	7th isolated output, SW: DOutPort (bit 6). Programmable sink or source
9	OC_Output5	OUT	5th isolated output, SW: DOutPort (bit 4). Programmable sink or source
10	OC_Output_5-8_Common_Return	PWR-IN	Common power return pin for discrete, isolated, outputs 5 to 8

Communication board connectors

The Communication Board is used to realize the communication between the IO board and the master.

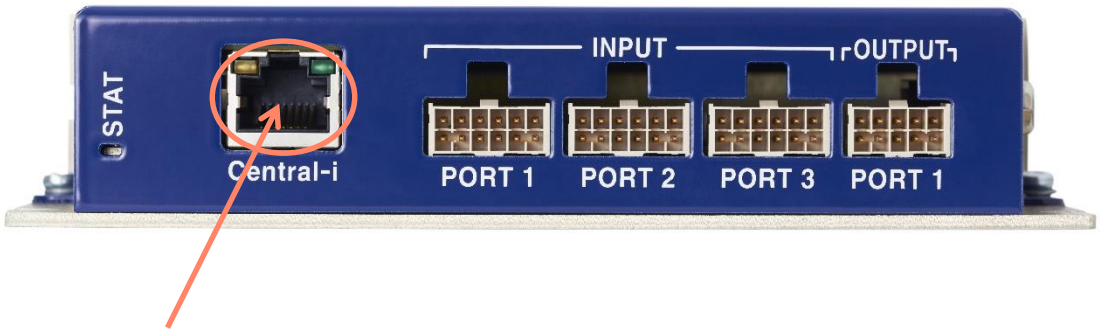

Figure17: Communication Port

Description:	CONNECTOR, RJ45, PLUG, 8P8C, 1 PORT
Manufacturer:	TE
P/N (product side):	5-554720-2
Cable:	CAT5

Note:

1. The J11/J12 connectors are communication unit connectors and J13/J14 are mechanical connectors.
2. All of them are used to connect with another PCB board— CIGI-COM01-1A-02-01 to realize the communication between the master controller CIG1-MAS and the product. (The details of the board can be referred to in the hardware manual of CIGI-COM01-1A-02-01)
3. The RJ45 connector is between the two connectors to communicate with the master controller CIG1-MAS product variants via the Central-I Protocol

Environmental conditions

Requirement	Units	Allowed range
Operational temperature	°C	0 to 50
Storage temperature	°C	-20 to 70
Humidity	%	<90

References

[1] Central-i PN SN Definitions 6 March 2016.docx, 06-03-2016, V1.3