DIN-825-GP4

User's Manual

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LEADING EDGE COMPUTING

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Preface

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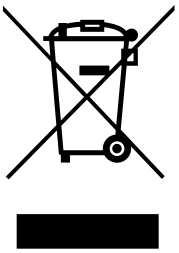
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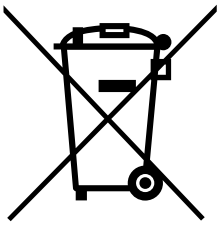
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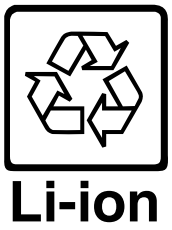
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Revision History

Revision	Description	Date	By
3.0	Previous release		
3.1	Updated manual part number, CMP1-CMP4 table, and document template.	2023-01-17	RA

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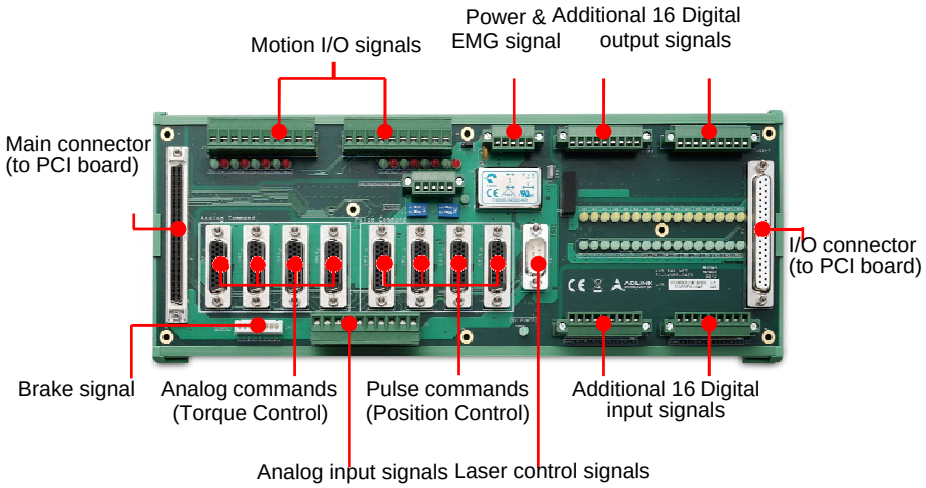
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1. Introduction

The DIN-825-GP4 is used for wiring between most common servo driver / stepper with pulse-train command interface and ADLINK PCI-8254, PCI-8258, AMP-204C and AMP-208C controllers ONLY. Never use this terminal board with other motion control cards.



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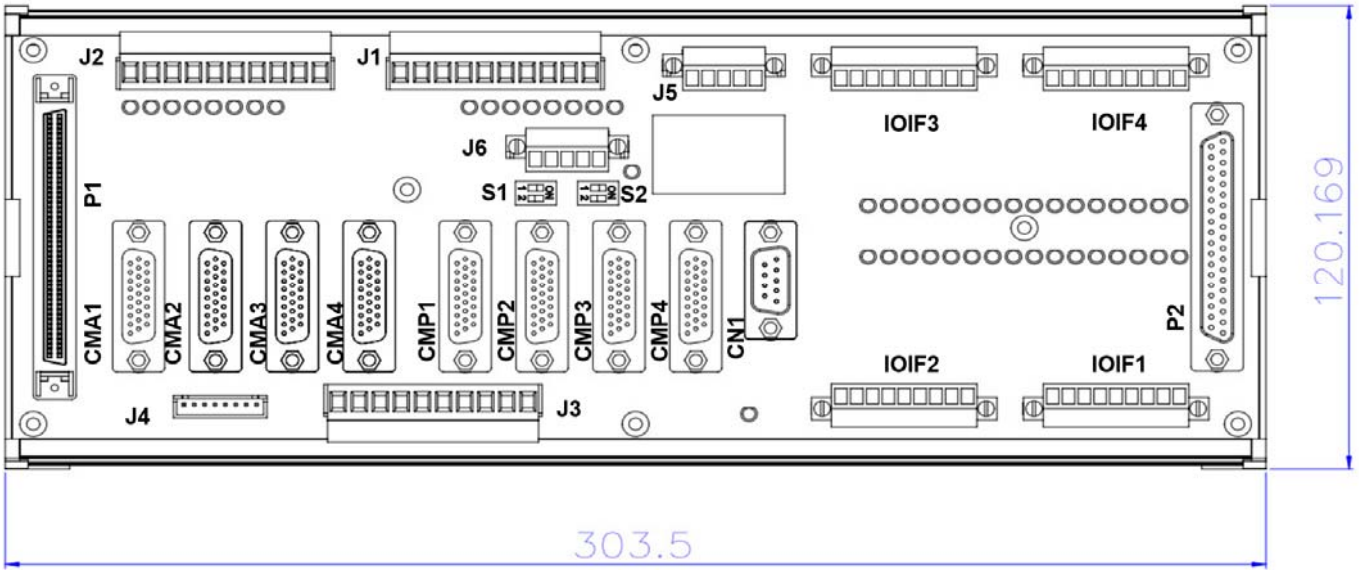
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2. Board Connectors

2.1. Connector Locations

This section describes the DIN-825-GP4 connectors and their pinouts.



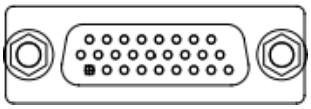
All are dimensions shown in millimeters.

Figure 1: DIN-825-GP4 Connector Locations

Item	Description
CMA1–4	26-pin connectors to connect servo drives with Voltage command including Mitsubishi J3/J4 series, Yaskawa Sigma II, III & V series, Panasonic MINAS A4/A5 series and any others servo driver by general purposed cable with one-side OPEN design
CMP1–4	26-pin connectors to connect specific servo / stepper drives with pulse-train command including Mitsubishi J3/J4 series, Yaskawa Sigma II, III & V series, Panasonic MINAS A4/A5 series, Delta A2 series and any others servo / stepper driver by general purposed cable with one-side OPEN design
CN1	Laser control signals
IOIF1-IOIF4	9-pin screw connector to connect 16-channel isolated digital inputs and 16-channel digital outputs
J1–J3	10-pin screw type connector to connect all analog input signals, trigger output signals and motion I/Os which include EL+/EL-/ORG and universal IO
J4	Brake signal connector
J5	Main power & EMG connector
J6	4-channel isolated digital output connector
P1	100-pin SCSI connector to command and feedback motion control signals
P2	37-pin D-sub connector which connect onboard 16-CH TTL digital input and 16-CH TTL digital output
S1, S2	S1/S2 switch selection to enable/disable the DO to reset the servo driver.

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2.2. CMA1-CMA4 Connector Pin Assignment

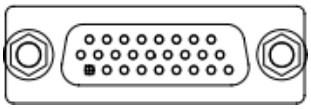


No.	Name	I/O	Function	No.	Name	I/O	Function	No.	Name	I/O	Function
				10	ALM_RST / DO	O	Reset driver signal / Digital output signal				
1	SVON	O	Servo On signal					**19**	EMG	I	Emergency signal
				11	ALM	I	Servo alarm signal				
2	ZSP	I	Zero speed signal					**20**	IGND	--	Ext. power ground
				12	I24V	--	Ext. power supply, +24V				
3	Rsv.	--	Reserved					**21**	IGND	--	Ext. power ground
				13	IGND	--	Ext. power ground				
4	Rsv.	--	Reserved.					**22**	IGND	--	Ext. power ground
				14	BRAKE-	O	Brake signal(-)				
5	AOUT-	O	Analog command output (-)					**23**	Rsv.	--	Reserved
				15	AGND	--	Analog ground				
6	AOUT+	O	Analog command output (+)					**24**	Rsv.	--	Reserved
				16	EB-	I	Encoder B-phase(-)				
7	EA-	I	Encoder A-phase(-)					**25**	EZ-	I	Encoder Z-phase(-)
				17	EB+	I	Encoder B-phase(+)				
8	EA+	I	Encoder A-phase(+)					**26**	EZ+	I	Encoder Z-phase(+)
				18	AGND	--	Analog ground				
9	BRAKE+	O	Brake signal(+)								

- **ALM_RST / DO**: This signal can be switched to reset a servo driver alarm or as a general digital output via DIP-switch **S1 / S2** selection.

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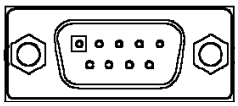
2.3. CMP1-CMP4 Connector Pin Assignment



No.	Name	I/O	Function	No.	Name	I/O	Function	No.	Name	I/O	Function
				10	ALM_RST / DO	O	Reset driver signal / Digital output signal				
1	SVON	O	Servo On signal					19	EMG	I	Emergency signal
				11	ALM	I	Servo alarm signal				
2	INP	I	In-position signal					20	IGND	--	Ext. power ground
				12	I24V	--	Ext. power supply, +24V				
3	ERC	--	Dev. ctr, clr. signal					21	IGND	--	Ext. power ground
				13	IGND	--	Ext. power ground				
4	RDY	--	Servo ready signal					22	IGND	--	Ext. power ground
				14	BRAKE-	O	Brake signal(-)				
5	OUT-	O	Pulse signal (-)					23	DIR-	O	Dir. Signal(-)
				15	DGND	--	Digital ground				
6	OUT+	O	Pulse signal (+)					24	DIR+	O	Dir. Signal(+)
				16	EB-	I	Encoder B-phase(-)				
7	EA-	I	Encoder A-phase(-)					25	EZ-	I	Encoder Z-phase(-)
				17	EB+	I	Encoder B-phase(+)				
8	EA+	I	Encoder A-phase(+)					26	EZ+	I	Encoder Z-phase(+)
				18	DGND	--	Digital ground				
9	BRAKE+	O	Brake signal(+)								

- **ALM_RST / DO**: This signal can be switched to reset a servo driver alarm or as a general digital output via DIP-switch **S1 / S2** selection.

2.4. CN1 Connector Pin Assignment

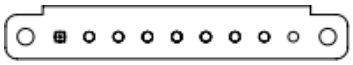


No.	Name	I/O	Function	No.	Name	I/O	Function
1	EDO4	O	Digital output (4)	6	EDO4-	O	Digital output (-) , (4)
2	TRG1+	O	Trigger output (+), (1)	7	TRG1-	O	Trigger output (-), (1)
3	TRG2+	O	Trigger output (+), (2)	8	TRG2-	O	Trigger output (-), (2)
4	--	--	--	9	DGND	--	Digital ground
5	--	--	--				

EDO4 and EDO4- is for devices with I24V and IGND.

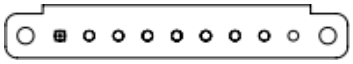
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2.5. IOIF1 Connector Pin Assignment



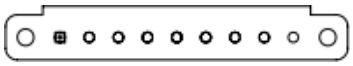
No.	Name	I/O	Function	No.	Name	I/O	Function
1	DI1	I	Additional isolated digital input, (1)	**6**	DI6	I	Additional isolated digital input, (6)
2	DI2	I	Additional isolated digital input, (2)	**7**	DI7	I	Additional isolated digital input, (7)
3	DI3	I	Additional isolated digital input, (3)	**8**	DI8	I	Additional isolated digital input, (8)
4	DI4	I	Additional isolated digital input, (4)	**9**	DIO24V	--	Ext. power supply, +24V
5	DI5	I	Additional isolated digital input, (5)	--	--	--	--

2.6. IOIF2 Connector Pin Assignment



No.	Name	I/O	Function	No.	Name	I/O	Function
1	DI9	I	Additional isolated digital input, (9)	**6**	DI14	I	Additional isolated digital input, (14)
2	DI10	I	Additional isolated digital input, (10)	**7**	DI15	I	Additional isolated digital input, (15)
3	DI11	I	Additional isolated digital input, (11)	**8**	DI16	I	Additional isolated digital input, (16)
4	DI12	I	Additional isolated digital input, (12)	**9**	DIO24V	--	Ext. power supply, +24V
5	DI13	I	Additional isolated digital input, (13)	**--**	--	--	--

2.7. IOIF3 Connector Pin Assignment

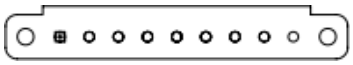


No.	Name	I/O	Function	No.	Name	I/O	Function
1	※DO1	O	Additional isolated digital output, (1)	**6**	※DO6	O	Additional isolated digital output, (6)
2	※DO2	O	Additional isolated digital output, (2)	**7**	※DO7	O	Additional isolated digital output, (7)
3	※DO3	O	Additional isolated digital output, (3)	**8**	※DO8	O	Additional isolated digital output, (8)
4	※DO4	O	Additional isolated digital output, (4)	**9**	DIOGND	--	Ext. power ground
5	※DO5	O	Additional isolated digital output, (5)	**--**	--	--	--

- ※means the channel is able to sink up to 250mA.
- When using DO, DIO24V must be connected to 24 volts.

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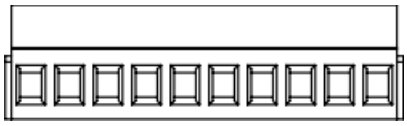
2.8. IOIF4 Connector Pin Assignment



No.	Name	I/O	Function	No.	Name	I/O	Function
1	※DO9	O	Additional isolated digital output, (9)	6	※DO14	O	Additional isolated digital output, (14)
2	※DO10	O	Additional isolated digital output, (10)	7	※DO15	O	Additional isolated digital output, (15)
3	※DO11	O	Additional isolated digital output, (11)	8	※DO16	O	Additional isolated digital output, (16)
4	※DO12	O	Additional isolated digital output, (12)	9	DIOGND	--	Ext. power ground
5	※DO13	O	Additional isolated digital output, (13)	--	--	--	--

- ※means the channel is able to sink up to 250mA.
- When using DO, DIO24V must be connected to 24 volts.

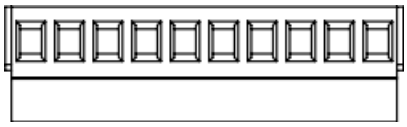
2.9. J1 Connector Pin Assignment



No.	Name	I/O	Function	No.	Name	I/O	Function
1	DICOM	--	Digital input common	6	EDI4	I	Isolated digital input, (4)
2	EDI3	I	Isolated digital input, (3)	7	PEL4	I	Positive limit, (4)
3	PEL3	I	Positive limit, (3)	8	ORG4	I	Home limit, (4)
4	ORG3	I	Home limit, (3)	9	MEL4	I	Negative limit, (4)
5	MEL3	I	Negative limit, (3)	10	DOCOM	--	Digital output common

- **DICOM**: This signal must be connected to I24V.
- **DOCOM**: This signal must be connected to IGND.

2.10. J2 Connector Pin Assignment

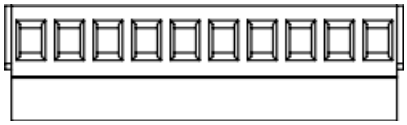


No.	Name	I/O	Function	No.	Name	I/O	Function
1	DICOM	--	Digital input common	6	EDI2	I	Isolated digital input, (2)
2	EDI1	I	Isolated digital input, (1)	7	PEL2	I	Positive limit, (2)
3	PEL1	I	Positive limit, (1)	8	ORG2	I	Home limit, (2)
4	ORG1	I	Home limit, (1)	9	MEL2	I	Negative limit, (2)
5	MEL1	I	Negative limit, (1)	10	DOCOM	--	Digital output common

- **DICOM**: This signal must be connected to I24V.
- **DOCOM**: This signal must be connected to IGND.

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2.11. J3 Connector Pin Assignment



No.	Name	I/O	Function	No.	Name	I/O	Function
1	DGND	-	Isolated digital ground	**6**	AGND	-	Analog ground
2	TRG2-	O	Trigger output (-), (2)	**7**	AI4	I	Analog input, (4)
3	TRG2+	O	Trigger output (+), (2)	**8**	AI3	I	Analog input, (3)
4	TRG1-	O	Trigger output (-), (1)	**9**	AI2	I	Analog input, (2)
5	TRG1+	O	Trigger output (+), (1)	**10**	AI1	I	Analog input, (1)

2.12. J4 Connector Pin Assignment



No.	Name	I/O	Function	No.	Name	I/O	Function
1	1+	O	Brake signal (+), (1)	**6**	3+	O	Brake signal (+), (3)
2	1-	O	Brake signal (-), (1)	**7**	3-	O	Brake signal (-), (3)
3	2+	O	Brake signal (+), (2)	**8**	4+	O	Brake signal (+), (4)
4	2-	O	Brake signal (-), (2)	**9**	4-	O	Brake signal (-), (4)

2.13. J5 Connector Pin Assignment



No.	Name	I/O	Function	No.	Name	I/O	Function
1	I24V	--	Ext. power supply, +24V	**4**	DOCOM	--	Digital output common
2	IGND	--	Ext. power ground	**5**	EEMG	I	Emergency signal
3	DICOM	--	Digital input common	**--**	--	--	--

- **DICOM**: This signal must be connected to I24V.
- **DOCOM**: This signal must be connected to IGND.

2.14. J6 Connector Pin Assignment

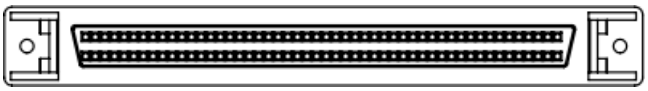


No.	Name	I/O	Function	No.	Name	I/O	Function
1	EDO1	O	Digital output, (1)	**4**	EDO4	O	Digital output, (4)
2	EDO2	O	Digital output, (2)	**5**	DOCOM	--	Digital output common
3	EDO3	O	Digital output, (3)	**--**	--	--	--

- **DOCOM**: This signal must be connected to IGND.
- **EDO** is for devices with I24V and IGND.

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2.15. P1 Connector Pin Assignment

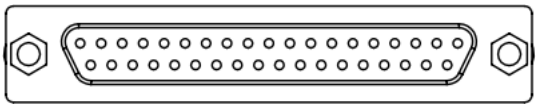


No.	Name	I/O	Function of Axis	No.	Name	I/O	Function of Axis
1	DGND	--	Digital ground	**51**	IEMG	I	Emergency stop input
2	DGND	--	Digital ground	**52**	Rsv.	--	Reserved
3	AGND	--	Analog ground	**53**	AGND	--	Analog ground
4	AGND	--	Analog ground	**54**	AGND	--	Analog ground
5	AOUT1+	O	Analog output (+),(1)	**55**	AOUT3+	O	Analog output (+),(3)
6	AOUT1-	O	Analog output (-),(1)	**56**	AOUT3-	O	Analog output (-),(3)
7	AOUT2+	O	Analog output (+),(2)	**57**	AOUT4+	O	Analog output (+),(4)
8	AOUT2-	O	Analog output (-),(2)	**58**	AOUT4-	O	Analog output (-),(4)
9	AIN1	I	Analog input, (1)	**59**	AIN3	I	Analog input, (3)
10	AIN2	I	Analog input, (2)	**60**	AIN4	I	Analog input, (4)
11	Rsv.	--	Reserved	**61**	DGND	--	Digital ground
12	Rsv.	--	Reserved	**62**	DGND	--	Digital ground
13	OUT1+	O	Pulse output (+), (1)	**63**	OUT3+	O	Pulse output (+), (3)
14	OUT1-	O	Pulse output (-), (1)	**64**	OUT3-	O	Pulse output (-), (3)
15	DIR1+	O	Direction output (+), (1)	**65**	DIR3+	O	Direction output (+), (3)
16	DIR1-	O	Direction output (-), (1)	**66**	DIR3-	O	Direction output (-), (3)
17	OUT2+	O	Pulse output (+), (2)	**67**	OUT4+	O	Pulse output (+), (4)
18	OUT2-	O	Pulse output (-), (2)	**68**	OUT4-	O	Pulse output (-), (4)
19	DIR2+	O	Direction output (+), (2)	**69**	DIR4+	O	Direction output (+), (4)
20	DIR2-	O	Direction output (-), (2)	**70**	DIR4-	O	Direction output (-), (4)
21	TRG1+	O	Trigger output (+), (1)	**71**	TRG2+	O	Trigger output (+), (2)
22	TRG1-	O	Trigger output (-), (1)	**72**	TRG2-	O	Trigger output (-), (2)
23	EA1+	I	Encoder A-phase (+),(1)	**73**	EA3+	I	Encoder A-phase (+),(3)
24	EA1-	I	Encoder A-phase (-),(1)	**74**	EA3-	I	Encoder A-phase (-),(3)
25	EB1+	I	Encoder B-phase (+),(1)	**75**	EB3+	I	Encoder B-phase (+),(3)
26	EB1-	I	Encoder B-phase (-),(1)	**76**	EB3-	I	Encoder B-phase (-),(3)
27	EZ1+	I	Encoder Z-phase (+),(1)	**77**	EZ3+	I	Encoder Z-phase (+),(3)
28	EZ1-	I	Encoder Z-phase (-),(1)	**78**	EZ3-	I	Encoder Z-phase (-),(3)
29	EA2+	I	Encoder A-phase (+),(2)	**79**	EA4+	I	Encoder A-phase (+),(4)
30	EA2-	I	Encoder A-phase (-),(2)	**80**	EA4-	I	Encoder A-phase (-),(4)
31	EB2+	I	Encoder B-phase (+),(2)	**81**	EB4+	I	Encoder B-phase (+),(4)
32	EB2-	I	Encoder B-phase (-),(2)	**82**	EB4-	I	Encoder B-phase (-),(4)
33	EZ2+	I	Encoder Z-phase (+),(2)	**83**	EZ4+	I	Encoder Z-phase (+),(4)
34	EZ2-	I	Encoder Z-phase (-),(2)	**84**	EZ4-	I	Encoder Z-phase (-),(4)
35	ALM1	I	Servo alarm,(1)	**85**	ALM3	I	Servo alarm,(3)
36	ORG1	I	Home limit, (1)	**86**	ORG3	I	Home limit, (3)
37	SVON1	O	Servo-ON, (1)	**87**	SVON3	O	Servo-ON, (3)
38	PEL1	I	Positive limit, (1)	**88**	PEL3	I	Positive limit, (3)
39	ZSP1	I	Zero Speed (1)	**89**	ZSP3	I	Zero Speed (3)
40	MEL1	I	Negative limit, (1)	**90**	MEL3	I	Negative limit, (3)
41	ALM2	I	Servo alarm,(2)	**91**	ALM4	I	Servo alarm,(4)

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No.	Name	I/O	Function of Axis	No.	Name	I/O	Function of Axis
42	ORG2	I	Home limit, (2)	**92**	ORG4	I	Home limit, (4)
43	SVON2	O	Servo-ON, (2)	**93**	SVON4	O	Servo-ON, (4)
44	PEL2	I	Positive limit, (2)	**94**	PEL4	I	Positive limit, (4)
45	ZSP2	I	Zero Speed (2)	**95**	ZSP4	I	Zero Speed (4)
46	MEL2	I	Negative limit, (2)	**96**	MEL4	I	Negative limit, (4)
47	EDO1	O	Digital Output, (1)	**97**	EDO3	O	Digital Output, (3)
48	EDI1	I	Digital Input, (1)	**98**	EDI3	I	Digital Input, (3)
49	EDO2	O	Digital Output, (2)	**99**	EDO4	O	Digital Output, (4)
50	EDI2	I	Digital Input, (2)	**100**	EDI4	I	Digital Input, (4)

2.16. P2 Connector Pin Assignment



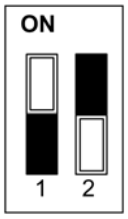
No.	Name	I/O	Function of Axis	No.	Name	I/O	Function of Axis
1	Rsv.	--	Reserved	**20**	VDD	--	+5V Power Supply
2	TDI1	I	TTL input, (1)	**21**	TDO1	O	TTL output, (1)
3	TDI2	I	TTL input, (2)	**22**	TDO2	O	TTL output, (2)
4	TDI3	I	TTL input, (3)	**23**	TDO3	O	TTL output, (3)
5	TDI4	I	TTL input, (4)	**24**	TDO4	O	TTL output, (4)
6	TDI5	I	TTL input, (5)	**25**	TDO5	O	TTL output, (5)
7	TDI6	I	TTL input, (6)	**26**	TDO6	O	TTL output, (6)
8	TDI7	I	TTL input, (7)	**27**	TDO7	O	TTL output, (7)
9	TDI8	I	TTL input, (8)	**28**	TDO8	O	TTL output, (8)
10	TDI9	I	TTL input, (9)	**29**	TDO9	O	TTL output, (9)
11	TDI10	I	TTL input, (10)	**30**	TDO10	O	TTL output, (10)
12	TDI11	I	TTL input, (11)	**31**	TDO11	O	TTL output, (11)
13	TDI12	I	TTL input, (12)	**32**	TDO12	O	TTL output, (12)
14	TDI13	I	TTL input, (13)	**33**	TDO13	O	TTL output, (13)
15	TDI14	I	TTL input, (14)	**34**	TDO14	O	TTL output, (14)
16	TDI15	I	TTL input, (15)	**35**	TDO15	O	TTL output, (15)
17	TDI16	I	TTL input, (16)	**36**	TDO16	O	TTL output, (16)
18	DGND	--	Digital ground	**37**	DGND	--	Digital ground
19	VDD	I	+5V power supply input	--	--	--	--

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2.17. S1/S2 Switch Selection

This switch enables/disables the DO to reset the servo driver.

ON = Reset servo driver			
S1	**1 ON**	2 OFF	Reset servo driver 1
	1 OFF	**2 ON**	Reset servo driver 2
S2	**1 ON**	2 OFF	Reset servo driver 3
	1 OFF	**2 ON**	Reset servo driver 4
OFF is default			



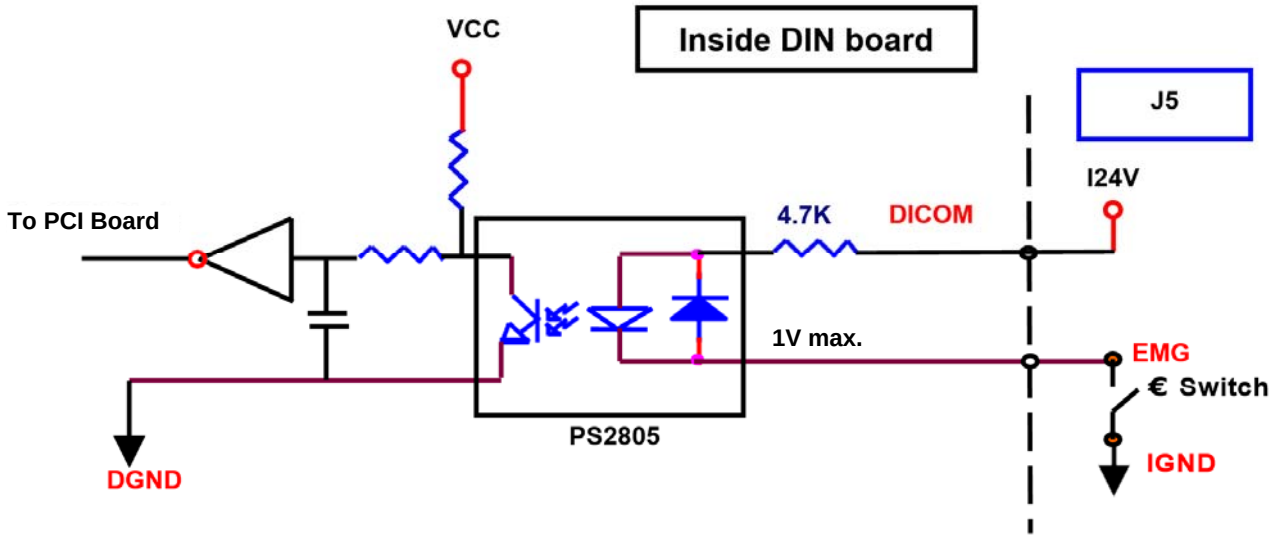
There are 4 alarm reset signal on the DIN-825-GP4. The alarm reset signals are programmed by J6.DO1-J6.DO4 signals. The switches are switched ‘ON’ and then pass DO1 signals to reset servo. (CMA1.10-CMA4.10, CMP1.10~CMP4.10)

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3. Wiring Examples: Signal Connections of Interface Circuit

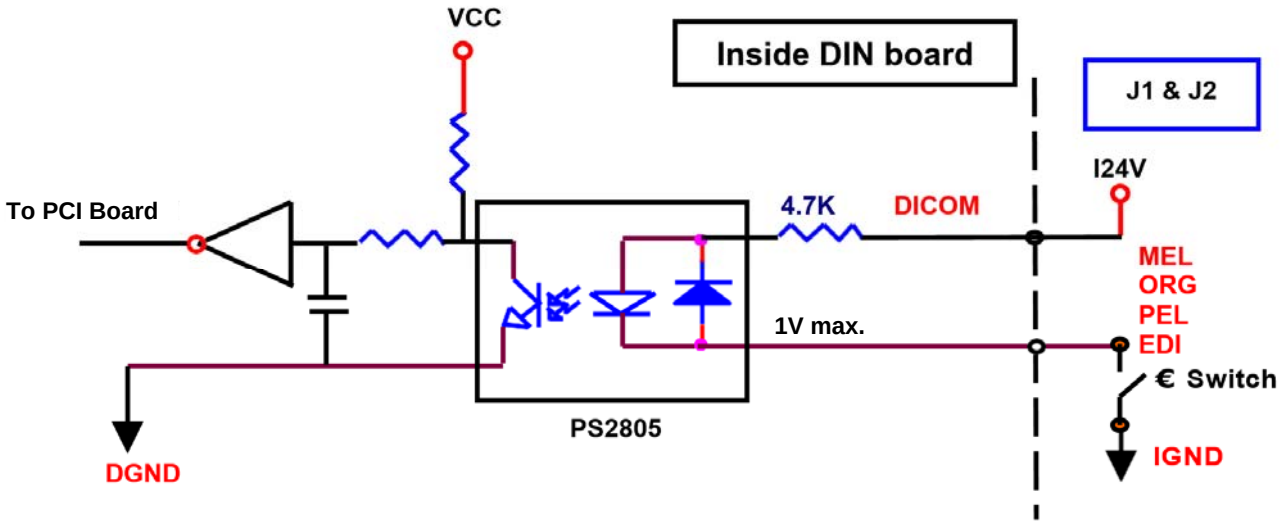
3.1. EMG: Emergency Stop Input

There is emergency stop input pin for this module. When EMG is active, all the motion pulse output command will be rejected until the EMG is inactive. The emergency stop switch should have a contact capacity of +24V @ 6mA minimum. 'B-type' (normal closed) contact switches can be used. The type of switch can be configured by software.



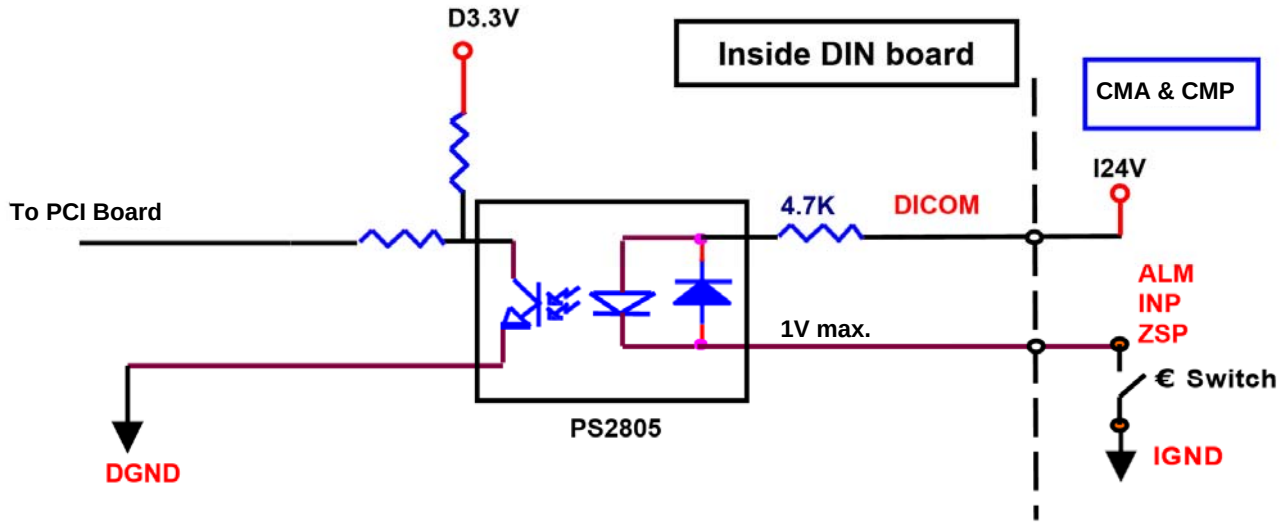
3.2. MEL, PEL, ORG, DI

Negative/Positive limit switch, Home limit switch, General purposed digital input.

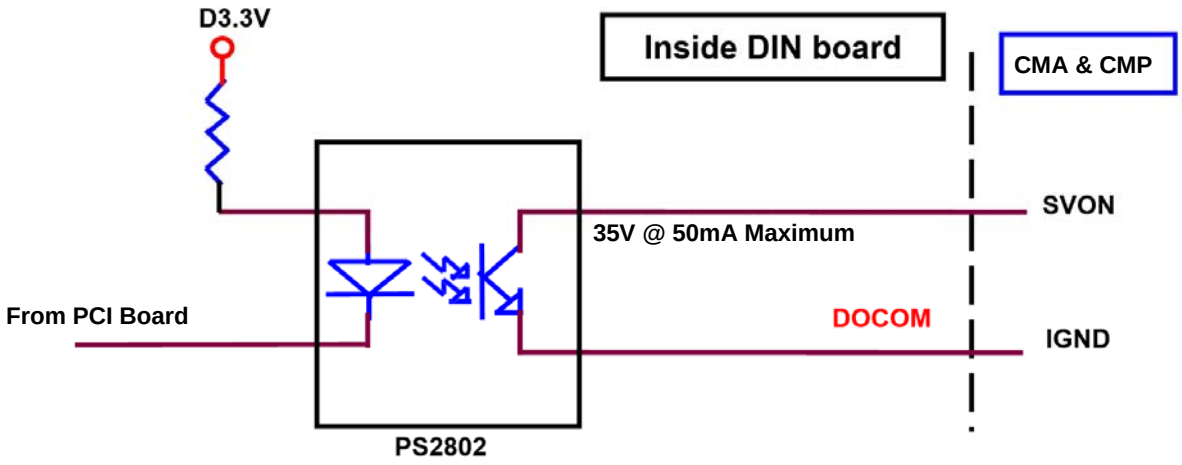


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3.3. ALM, INP/ZSP

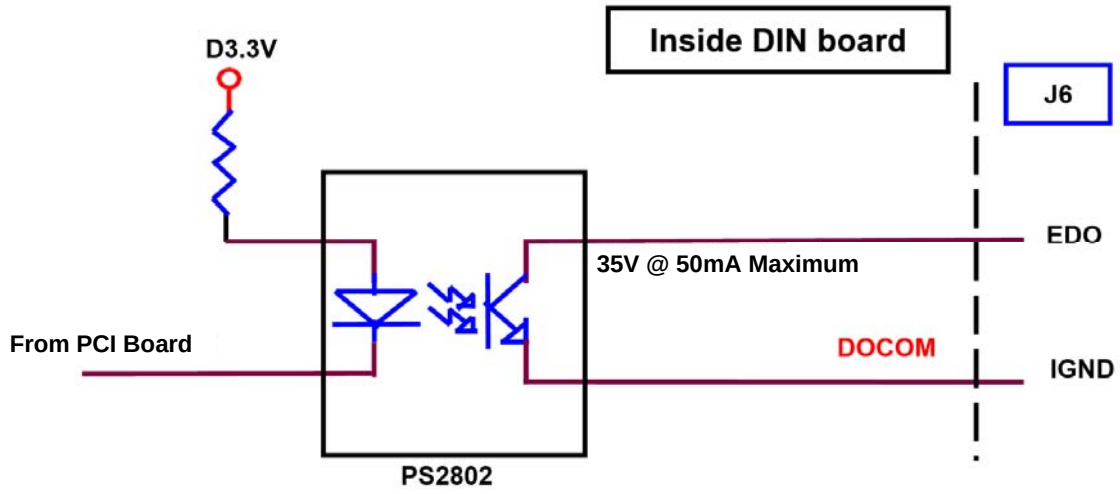


3.4. SVON

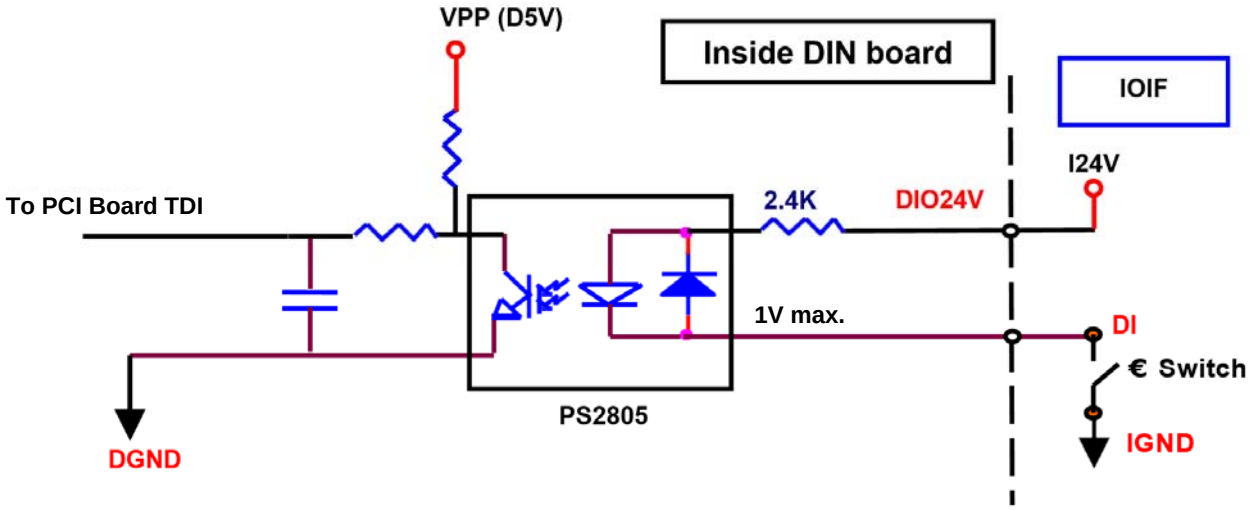


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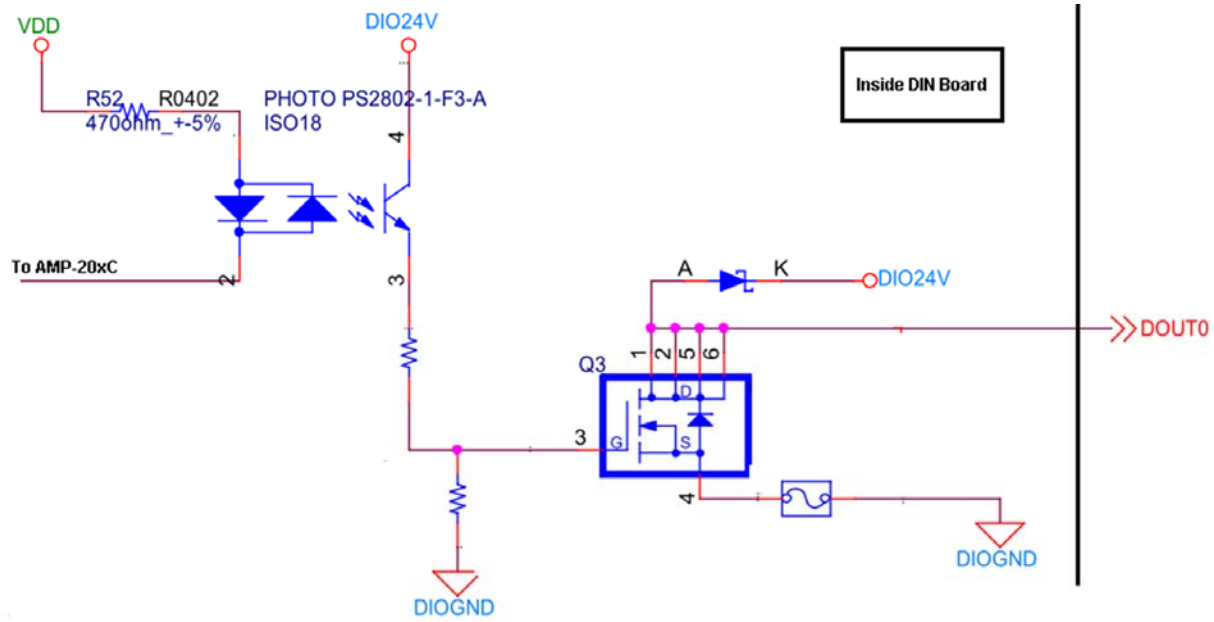
3.5. DO: General Purpose Digital Output



3.6. DI: From P2 Connector



3.7. DO: From P2 Connector



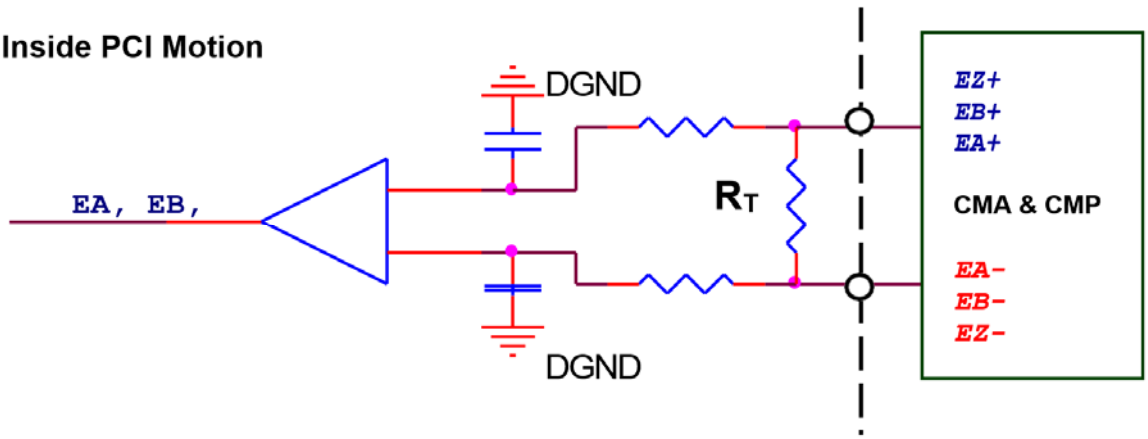
DOs were designed as High-Current Output to support up to 250mA current driving capacity to drive high-current valves or actuators. They are designed with MOSFET circuitry.

3.8. EA+, EB+, EZ+, EA-, EB-, EZ-

The encoder feedback signals include EA, EB, and EZ. Every axis has six pins for three differential pairs of phase-A (EA), phase-B (EB), and index (EZ) inputs. EA and EB are used for position counting, and EZ is used for zero position indexing. Please note that the voltage across each differential pair of encoder input signals (EA+, EA-), (EB+, EB-), and (EZ+, EZ-) have ±7V common mode range. Therefore, the output current must be observed when connecting to the encoder feedback or motor driver feedback as not to over drive the source. The differential signal pairs are converted to digital signals EA, EB, and EZ; then feed to the motion controller. Below is example of connecting the input signals with an external circuit. The input circuit can be connected to an encoder or motor driver if it is equipped with: a differential line driver.

3.8.1. Connection to Line Driver Output

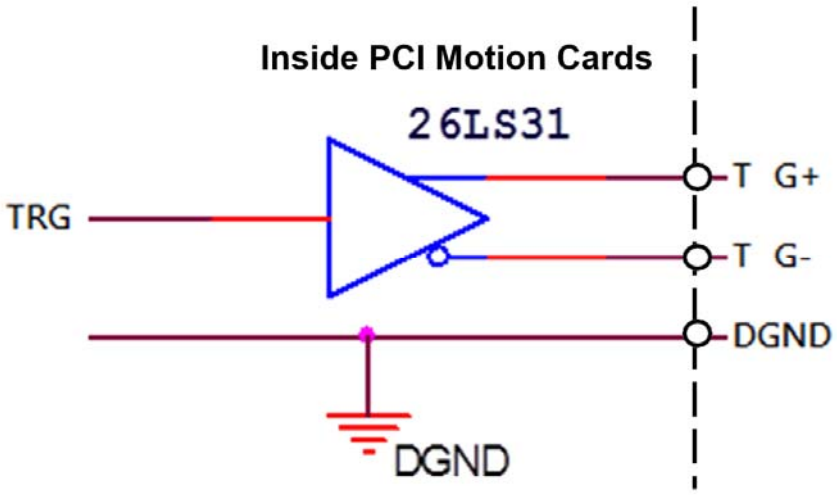
To drive the PCI-8254/58 encoder input circuitry, the driver output must provide at least 0.2V across the differential pairs. The case grounds of both sides must be tied together. The maximum frequency is 5MHz or more depends on wiring distance and signal conditioning.



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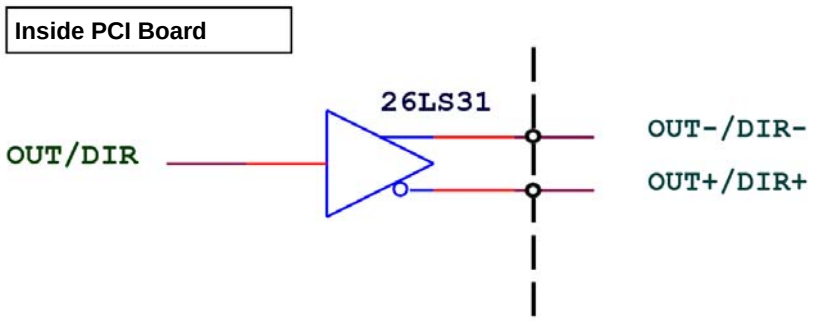
3.9. TRG+, TRG-

The PCI-8254/58 & AMP-204C/208C provides 2/4 comparison output channels. The comparison output channel will generate a pulse signal when the encoder counter reaches a pre-set value which set by the user.

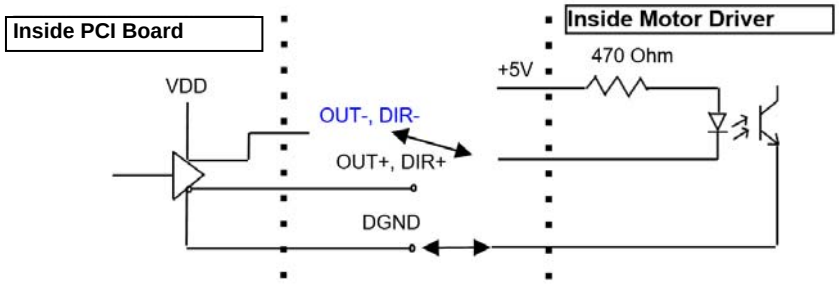


3.10. OUT/DIR +/-: Pulse Output Signals OUT and DIR

There are 4/8 axes pulse output signals. For each axis, two pairs of OUT and DIR differential signals are used to transmit the pulse train and indicate the direction. The OUT and DIR signals can also be programmed as CW and CCW signal pairs. In this section, the electrical characteristics of the OUT and DIR signals are detailed. Each signal consists of a pair of differential signals. For example, OUT1 consists of OUT1+ and OUT1- signals. The default setting of OUT and DIR is set to differential line driver mode. The following wiring diagram is for OUT and DIR signals of axis.



Note: For suggested usage, see the following figure. Choose OUT-/DIR- to connect to driver's OUT/DIR.

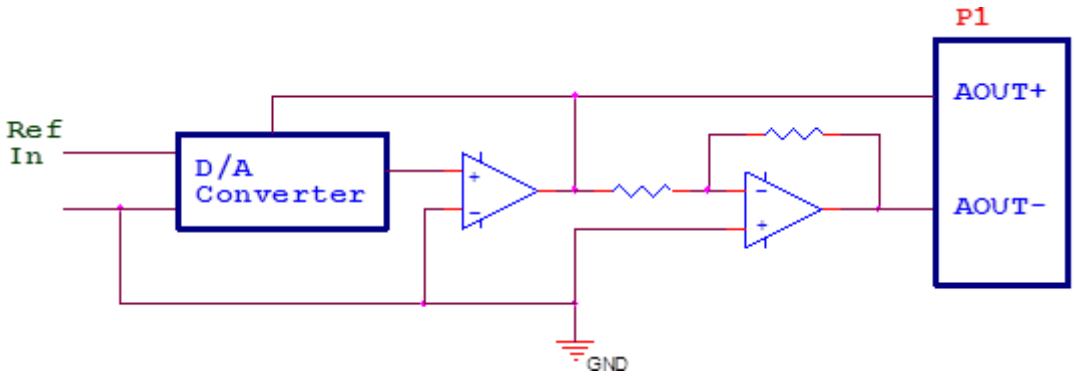


Warning: The sink current must not exceed 20mA or the 26LS31 will be damaged!

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3.11. AOUT +/-: Differential Analog Signal

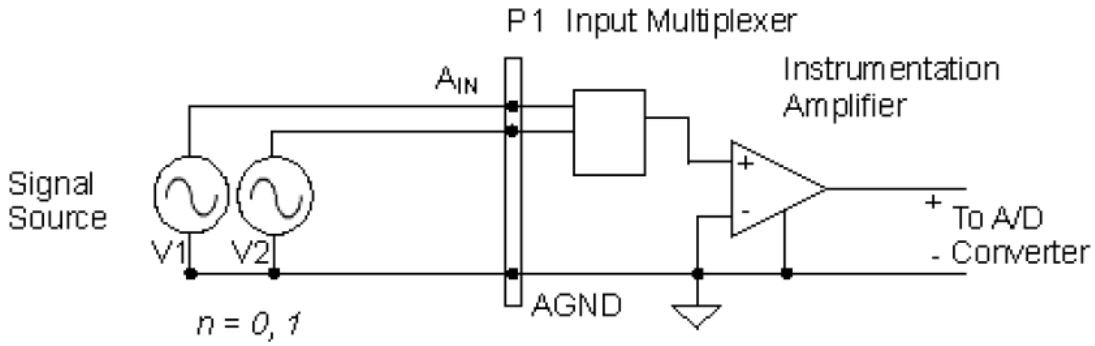
AOUT signal is used to drive the voltage command and indicate the direction. The AOUT signals can also decide motor forward/backward direction by plus/minus voltage output. The analog output can drive between +10V to -10V and its resolution guarantees to ±1mV.



The analog output channels are applicable on PCI-8254/8258 ONLY.

3.12. AIN: Analog Input Signal

AIN signal is used to receive the feedback voltage the direction. The analog input can indicate the voltage level between +10V to -10V and its resolution guarantees to 12 bits with no missing code.



The analog input channels are applicable on PCI-8254/8258 ONLY.

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Safety Instructions

Read and follow all instructions marked on the product and in the documentation before you operate your system. Retain all safety and operating instructions for future use.

- Please read these safety instructions carefully.
- Please keep this User‘s Manual for later reference.
- Read the specifications section of this manual for detailed information on the operating environment of this equipment.
- When installing/mounting or uninstalling/removing equipment, turn off the power and unplug any power cords/cables.
- To avoid electrical shock and/or damage to equipment:
  - Keep equipment away from water or liquid sources.
  - Keep equipment away from high heat or high humidity.
  - Keep equipment properly ventilated (do not block or cover ventilation openings).
  - Make sure to use recommended voltage and power source settings.
  - Always install and operate equipment near an easily accessible electrical socket-outlet.
  - Secure the power cord (do not place any object on/over the power cord).
  - Only install/attach and operate equipment on stable surfaces and/or recommended mountings.
  - If the equipment will not be used for long periods of time, turn off and unplug the equipment from its power source.
- Never attempt to fix the equipment. Equipment should only be serviced by qualified personnel.

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