

CHAPTER

5

I/O MODULES

Input/Output Modules

General Description

Trio can supply a range of Input/Output Modules for the PCI 208. The *Motion Coordinator* controllers allow for I/O expansion by having a CAN interfaces. The PCI 208 has 2 built-in CAN interfaces of which channel A is always used for Trio I/O modules. This allows the I/O modules to form a network up to 100m in length.

The Trio I/O modules use a dedicated protocol which must be run on a physically separate CAN interface to CANopen or DeviceNet. *If the built-in Trio protocol is not to be used it is necessary to set the CANIO_ADDRESS value to a value other than it's default of 32.*

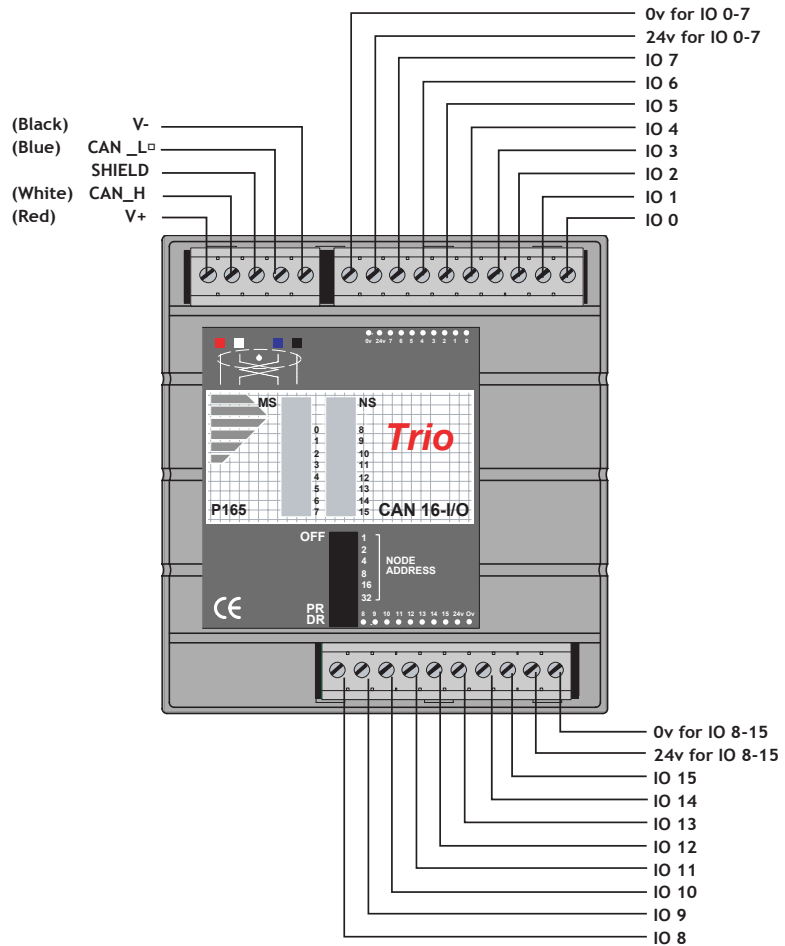
Product:	Product Code:
CAN 16-I/O Module	P315
CAN Analog Input Module	P325

CAN 16-I/O Module (P315)

The CAN 16-I/O Module allows the 24 volt digital inputs and outputs of the *Motion Coordinator* to be expanded in blocks of 16 bi-directional channels.

Up to 16 CAN 16-I/O Modules may be connected allowing up to 256 I/O channels in addition to the internal channels built-in to the PCI 208 *Motion Coordinator*. Each of the 16 channels in each module is bi-directional and can be used either as an input OR as an output.

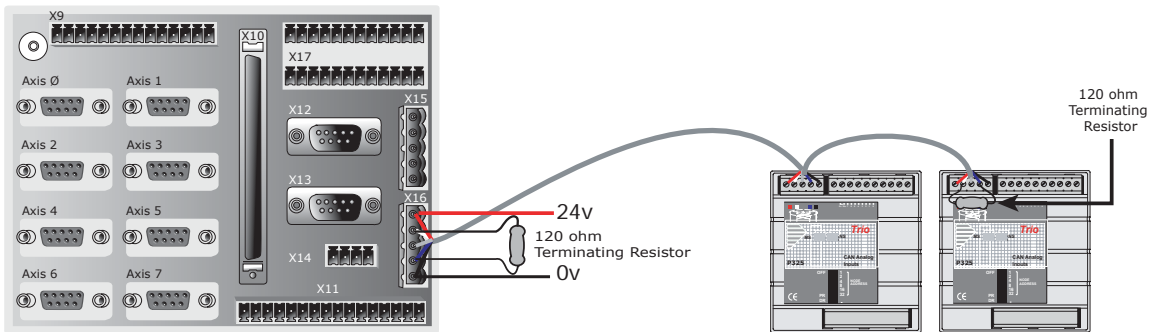
Convenient disconnect terminals are used for all I/O connections.



I/O Connections: The CAN 16-I/O Module has 3 disconnect terminal connectors:

- DeviceNet physical format 5 way CAN connector
- Input/Output Bank 0 - 7 and power supply for bank 0 - 7 on 10 way connector
- Input/Output Bank 8 - 15 and power supply for bank 8 - 15 on 10 way connector.

Bus Wiring The CAN 16-I/O Modules and the *Motion Coordinator* are connected together on a network which matches the physical specification of DeviceNet running at 500kHz. The network is of a linear bus topology. That is the devices are daisy-chained together with spurs from the chain. The total length is allowed to be up to 100m, with drop lines or spurs of up to 6m in length. At both ends of the network, 120 Ohm terminating resistors are required between the CAN_H and CAN_L connections. The resistor should be 1/4 watt, 1% metal film.



The cable required consists of:

- Blue/White 24AWG data twisted pair
- + Red/Black 22AWG DC power twisted pair
- + Screen

A suitable type is Belden 3084A.

The CAN 16-I/O modules are powered from the network. The 24 volts supply for the network must be externally connected. The *Motion Coordinator* does **NOT** provide the network power. In many installations the power supply for the *Motion Coordinator* will also provide the network power.

Note: *It is recommended that you use a separate power supply from that used to power the I/O to power the network as switching noise from the I/O devices may be carried into the network.*

DIP Switch Settings

Address:	Start:	End:
0	32	47
1	48	63
2	64	79
3	80	95
4	96	111
5	112	127
6	128	143
7	144	159
8	160	175
9	176	191
10	192	207
11	208	223
12	224	239
13	240	255
14	256	271
15	272	287

Note that the IO mapping of the PCI 208 starts at 32 rather than 16 which is the usual setting for *Motion Coordinator's* with 16 or fewer IO's built-in.

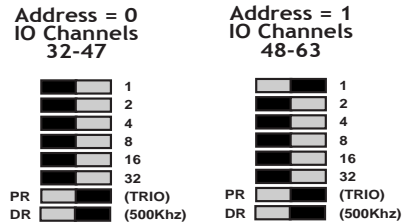
TRIO Protocol

The switch marked PR is set ON to select the standard TRIO protocol.

The top 6 DIP switches on the CAN 16-I/O set the module address. Only addresses 0 - 15 are valid for CAN 16-I/O modules.

The switch marked DR sets the CAN Bus communications rate to 125kHz or 500kHz. Only 500Khz is valid with the TRIO protocol.

The addresses for I/O modules MUST be set in sequence, 0,1,2 etc. Therefore the first two CAN 16-I/O Modules would have switch settings as shown below:



Note: *The I/O Channels referred to above start at 32. This is because the numbering sequence starts with channels 0 - 31, which are on the PCI 208 master unit itself.*

DUAL IO Mapping:

The PCI 208 has 20 inputs built-in. These are read by the software as inputs 0..19. The I/O module inputs/output start at number 32. There is therefore a set of inputs 20..31 which are unused.

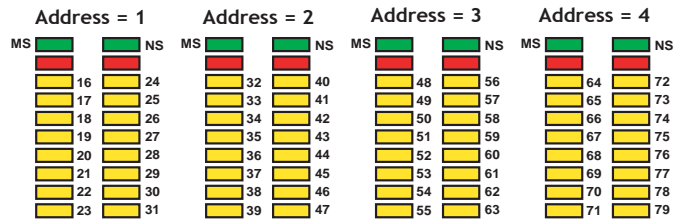
When at least one I/O module is connected to the PCI 208 the first 12 inputs from the I/O module are also mapped into this range automatically by the software.

For example: Input 32 can also be read via input 20, and input 33 can also be read via input 21.

This arrangement allows the CAN I/O module inputs to be used as limit inputs and to be used with the INVERT_IN command.

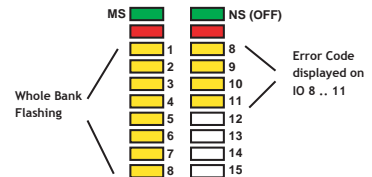
LED Indicators

When NS is ON LEDs marked 0 - 15 represent the input channels 0 - 15 of the module. The actual input as seen by the *Motion Coordinator* software will depend on the I/O modules address:



Error Codes:

When an error occurs on a CAN I/O module, the fault code is represented by a binary number displayed on the leds.



Code	Error Description
1	Invalid Protocol
2	Invalid Module Address
3	Invalid Data Rate
4	Uninitialised
5	Duplicate Address
6	Start Pending
7	System Shutdown
8	Unknown Poll
9	Poll Not Implemented
10	CAN Error
11	Receive Data Timeout

Software Interfacing

The PCI 208 *Motion Coordinator* will automatically detect and allow the use of correctly connected CAN I/O channels. The CAN I/O are accessed with the same `IN` and `OP` commands used to access the built-in I/O on the *Motion Coordinator*. The *Motion Coordinator* sets the system parameter `NI0` which reflects the number of I/O's connected to the system. 3 system parameters are available to facilitate the use of the CAN 16-I/O:

`CANIO_STATUS`, `CANIO_ADDRESS` and `CANIO_ENABLE`

When choosing which I/O devices should be connected to which channels the following points need to be considered:

- Inputs 0 - 31 ONLY are available for use with system parameters which specify an input, such as `FWD_IN`, `REV_IN`, `DATUM_IN` etc. See note on page 7 on dual mapping of I/O's
- Outputs 8 - 17 ONLY are available for use with the `PSWITCH` command.
- The built-in I/O channels have the fastest operation <1mS
- CAN I/O channels 32 - 79 have the next fastest operation <2mS
- CAN I/O channels 80 - 207 have the next fastest operation <8mS

It is not possible to mix the CAN 16-I/O module which is running the TRIO I/O protocol with DeviceNet equipment on the same network.

Troubleshooting

If the network configuration is incorrect 2 indications will be seen: The CAN 16-I/O module will indicate that it is uninitialised and the *Motion Coordinator* will report the wrong number when questioned:

>>? NIO

If this is not as expected check:

- Terminating 120 Ohm Network Resistors fitted?
- 24Volt Power to each IO bank required?
- 24Volt Power to Network?
- DIP switches in sequence starting 0,1,2...?
- *Motion Coordinator* `CANIO_ADDRESS=32`?

P315 Specification

Inputs:	16 24volt inputs channels with 2500v isolation
Outputs:	16 24volt output channels with 2500v isolation
Configuration:	16 bi-directional channels
Output Capacity:	Outputs are rated at 250mA/channel. (1 Amp total/ bank of 8 I/O's)
Protection:	Outputs are overcurrent and over temperature pro- tected
Indicators:	Individual status LED's
Address Setting:	Via DIP switches
Power Supply:	24V dc, Class 2 transformer or power source. 18 ... 29V dc / 1.5W
Mounting:	DIN rail mount
Size:	95mm wide x 45mm deep x 105mm high
Weight:	200g
CAN:	500kHz, Up to 256 expansion I/O channels
EMC:	BSEN50082-2 (1995) Industrial Noise Immunity / BS EN55022 (1995) Class A Industrial Noise Emissions

CAN Analog Inputs Module (P325)

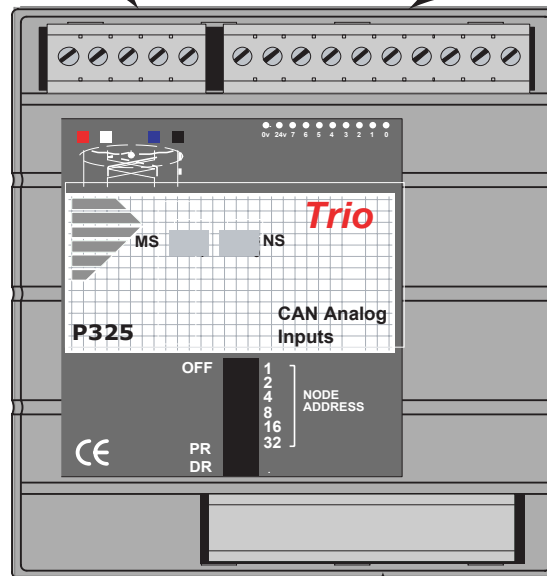
The CAN Analog Input Module allows the PCI 208 *Motion Coordinator* to be expanded with banks of 8 analog input channels. Up to 4 x P325 Modules may be connected allowing up to 32 x 12 bit analog channels in addition to the 4 potential analog inputs if the P184 is fitted. Convenient disconnect terminals are used for the I/O connections. The input channels are designed for +/-10volt operation. Each bank of 8 channels is opto-isolated from the CAN bus.

I/O Connections

The CAN Analog Input Module has 3 disconnect terminal connectors:

DeviceNet physical format
5 way CAN connector

Input Bank 0..7 with
0v reference and earth



The lower 10 way connector is unused

Bus Wiring

See Can 16 I/O for details

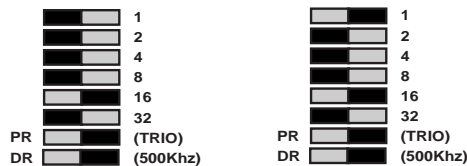
DIP Switch Settings

The switch marked “PR” selects the protocol, but is currently unused as only the TRIO protocol is available.

The switch marked DR sets 125kHz or 500kHz. Only 500Khz is valid with the TRIO protocol.

The addresses for P325 modules MUST be set 16,17,18... in sequence. Therefore the first P325 Module should have the switch setting:

Address = 16 Address = 17
Analog Inputs 8..15 Analog Inputs 16..23



Address:	Start:	End:
16	8	15
17	16	23
18	24	31
19	32	39

Note: P325 modules and P315 (16-I/O) modules may be mixed on the network. The P315 addresses will be 0 to 15 in sequence and the P325 modules will be 16 to 19 in sequence.

LED Indicators

MS “Module Status” ON when module powered on OK
NS “Network Status” ON when module powered on OK and initialised.

Software Interfacing

The *Motion Coordinator* will automatically detect and allow the use of correctly connected P325 modules. The number of connected analog input channels is reported in the startup message and is also available to the programmer via an additional system parameter “NAIO”.

The analog input resolution is fixed at +10volts to -10volts and will return values -2047 to 2048 to the function AIN(). The first 4 channels are also available as system parameters AIN0, AIN1, AIN2, and AIN3. This allows these values to be seen using the SCOPE function.

The P325 works “single ended” and does not return differential values.

It is not possible to mix the P325 module which is running the TRIO I/O protocol with DeviceNet equipment on the same network.

Troubleshooting

If the network configuration is incorrect 2 indications will be seen: The P325 module will indicate that it is uninitialised and the *Motion Coordinator* will report the wrong number when questioned:

>>? NAIO

If this is not as expected check:

- Terminating 120 Ohm Network Resistors fitted?
- 24Volt Power to Network?
- DIP switches in sequence starting 16,17,18...?
- *Motion Coordinator* CANIO_ADDRESS=32?

P325 Specification

Analog Inputs:	8+/-10 volt inputs with 500v isolation from CAN bus
Resolution:	12 bit
Protection:	Inputs are protected against 24v over voltage.
Address Setting:	Via DIP switches
Power Supply:	24V dc, Class 2 transformer or power source. 18 ... 29V dc / 1.5W
Mounting:	DIN rail mount
Size:	95mm wide x 45mm deep x 105mm high
Weight:	200g
CAN:	500kHz, Up to 32 analog input channels
EMC:	BSEN50082-2 (1995) Industrial Noise Immunity / BS EN55022 (1995) Class A Industrial Noise Emissions