

I/O EXPANSION MODULES

5

General Description

Trio can supply a range of Input/Output Modules.

The *Motion Coordinator* controllers allow for I/O expansion by having a CAN interface. This allows the I/O modules to form a network up to 100m in length.

Operator interface units can communicate with controllers using the serial RS232/RS485 ports or the Ethernet port. Third party operator interface units may connect using either the built-in Modbus protocol or a serial protocol written in BASIC.

Product Code:

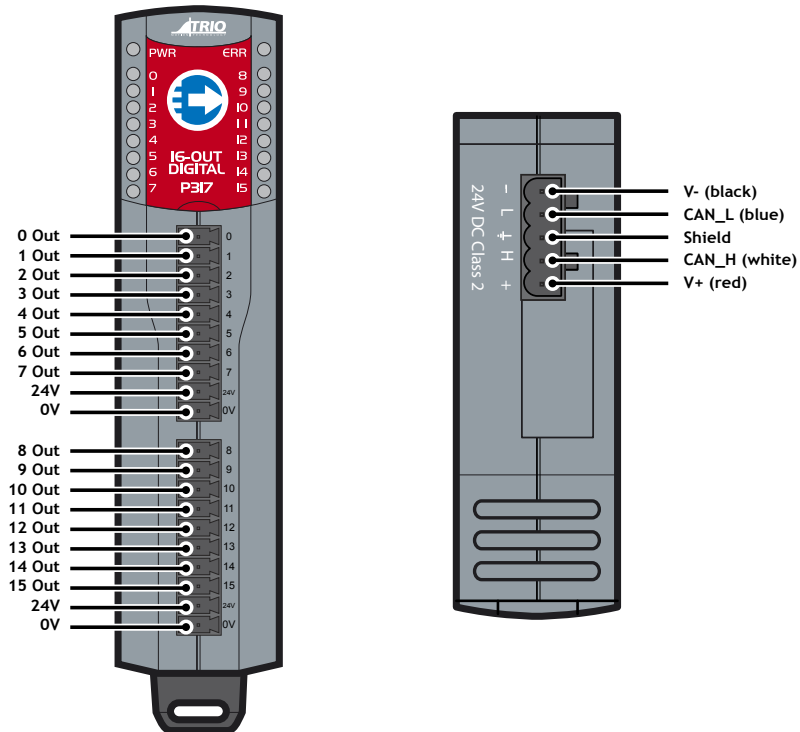
CAN 16-Output Module	P317
CAN 16-Input Module	P318
CAN 16-I/O Module	P319
CAN Analogue I/O Module	P326
CAN 8-Relay Module	P327

CAN 16-Output Module (P317)

The CAN 16-Output Module allows the 24 Volt digital outputs of the *Motion Coordinator* to be expanded in blocks of 16 additional output channels.

Up to 16 CAN 16-Output Modules may be connected allowing up to 256 Input channels in addition to the internal channels built-in to the *Motion Coordinator*. CAN 16-Output modules may be mixed with CAN 16-Input, CAN 16-I/O and CAN 8-Relay modules on the same network to build the I/O configuration required for the system.

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



I/O Connections:

The CAN 16-Output Module has 3 disconnect terminal connectors:

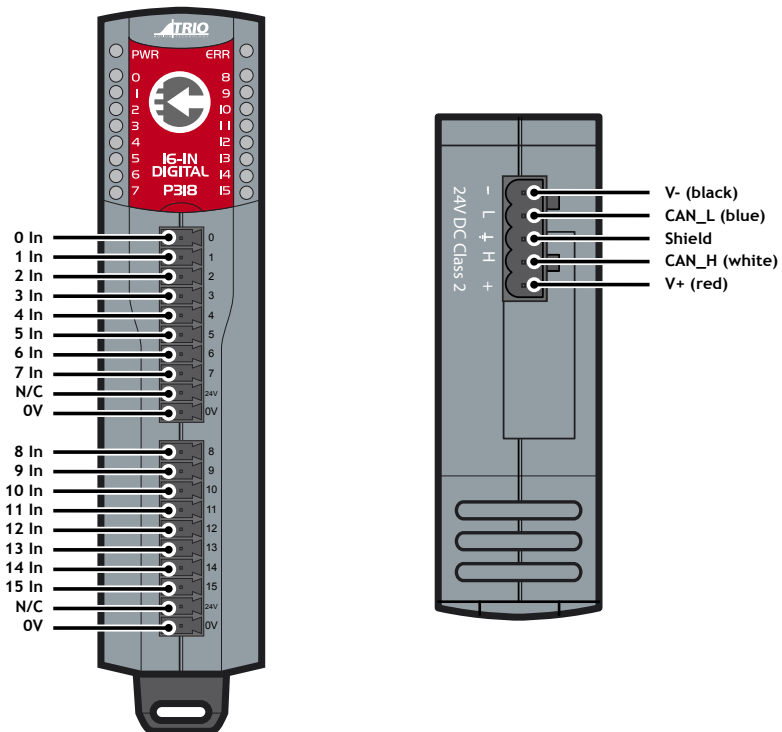
- DeviceNet physical format 5 way CAN connector (on top)
- Output Bank 0 - 7 and power supply for bank 0 - 7 on 10 way connector
- Output Bank 8 - 15 and power supply for bank 8 - 15 on 10 way connector.

CAN 16-Input Module (P318)

The CAN 16-Input Module allows the 24 Volt digital inputs of the *Motion Coordinator* to be expanded in blocks of 16 additional input channels.

Up to 16 CAN 16-Input Modules may be connected allowing up to 256 Input channels in addition to the internal channels built-in to the *Motion Coordinator*. CAN 16-Input modules may be mixed with CAN 16-Output, CAN 16-I/O and CAN 8-Relay modules on the same network to build the I/O configuration required for the system.

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



I/O Connections:

The CAN 16-Input Module has 3 disconnect terminal connectors:

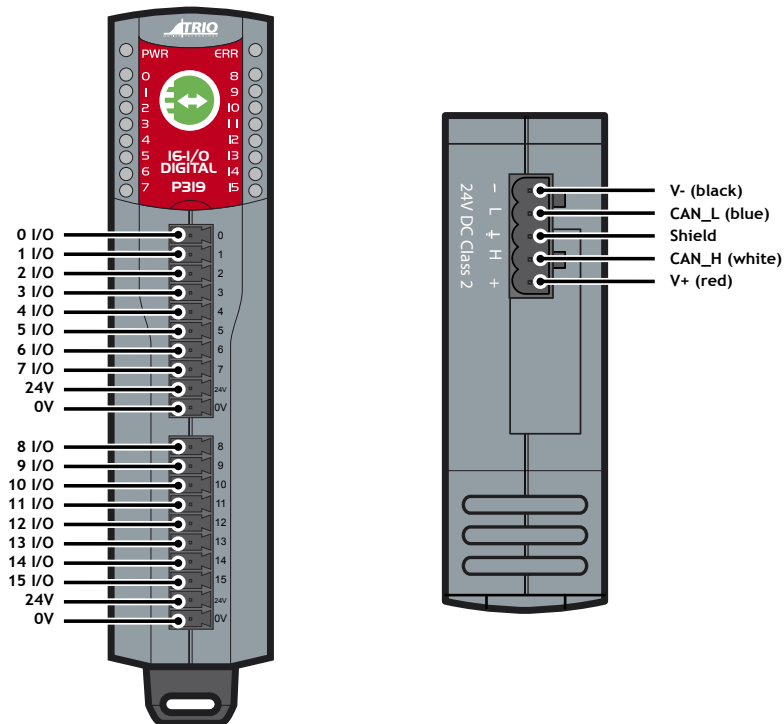
- DeviceNet physical format 5 way CAN connector (on top)
- Input Bank 0 - 7 and power supply for bank 0 - 7 on 10 way connector
- Input Bank 8 - 15 and power supply for bank 8 - 15 on 10 way connector.

CAN 16-I/O Module (P319)

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 *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. CAN 16-I/O modules may be mixed with CAN 16-Input, CAN 16-Output and CAN 8-Relay modules on the same network to build the I/O configuration required for the system.

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



I/O Connections

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

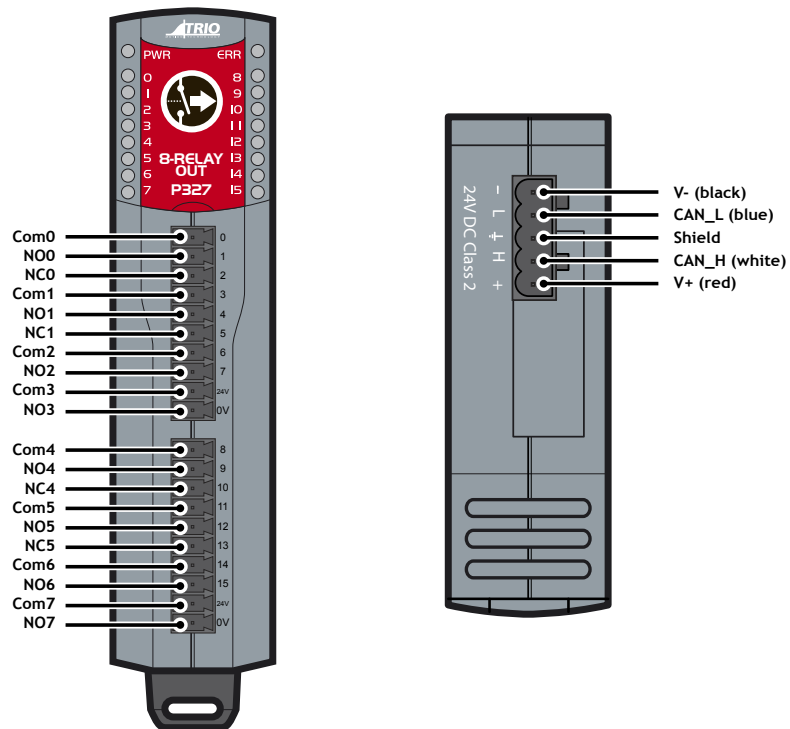
- DeviceNet physical format 5 way CAN connector
- Input/Output Bank 0 - 7 and power supply for bank 0 - 7 on 10 way connector
- Input/Output Bank 8 - 15 and power supply for bank 8 - 15 on 10 way connector.

CAN 8-Relay Module (P327)

The CAN 8-Relay Module allows the 24 Volt digital inputs and outputs of the *Motion Coordinator* to be expanded in blocks of 8 “voltage free” relay contacts.

Up to 16 CAN 8-Relay Modules may be connected allowing up to 128 relay channels in addition to the internal channels built-in to the *Motion Coordinator*. Four of the 8 channels in each module is a change-over contact and the remaining four are simple normally-open contacts. CAN 8-relay modules may be mixed with CAN 16-Input, CAN 16-Output and CAN 16-I/O modules on the same network to build the I/O configuration required for the system.

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



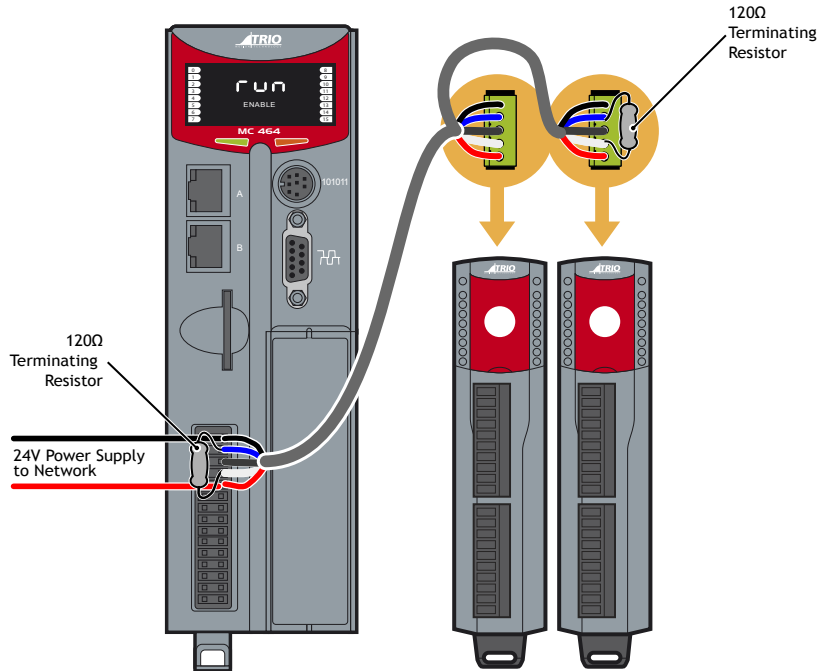
I/O Connections

The CAN 8-Relay Module has 3 disconnect terminal connectors:

- DeviceNet physical format 5 way **CAN** connector
- Relay contacts Bank 0 - 3 on 10 way connector
- Relay contacts Bank 4 - 7 on 10 way connector.

Bus Wiring

The CAN 16-I/O Modules and the *Motion Coordinator* are connected together on a CAN network 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.

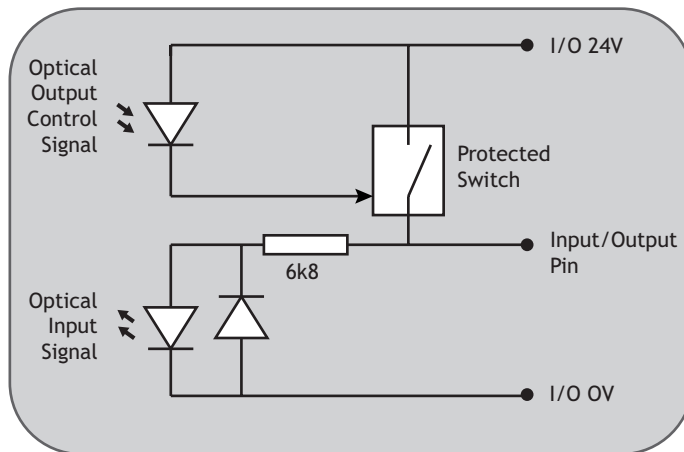


It is recommended that you use a separate power supply from that used to power the I/O to power the network as switching noise from the I/O devices may be carried into the network.

24V I/O Channels

Input/output channels can be bi-directional, input or output. Bi-directional inputs have a protected 24V sourcing output connected to the same pin. If the output is unused, the pin may be used as an input in the program. The output circuit has electronic over-current protection and thermal protection which shuts the output down when the current exceeds 250mA.

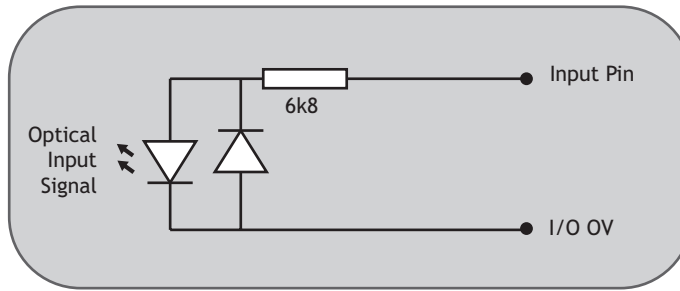
Care should be taken to ensure that the 250mA limit for the output circuit is not exceeded, and that the total load for the group of 8 outputs does not exceed 1 amp.



CAN 16-I/O 24V I/O Channel

24V Input Channels

Input channels have an opto-isolated 24V input which is designed to be **ON** when the input voltage is greater than 18 Volts and **OFF** when the signal voltage is below 2V. The input has a 6k8 resistor in series and so provides a load of approximately 3.5mA at 24V.

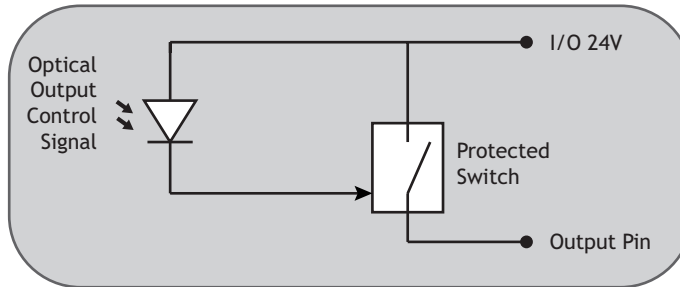


CAN16-Input 24V Input Channel

24V Output Channels

Output channels have a protected 24V sourcing output connected to the output pin. The output circuit has electronic over-current protection and thermal protection which shuts the output down when the current exceeds 250mA.

Care should be taken to ensure that the 250mA limit for the output circuit is not exceeded, and that the total load for the group of 8 outputs does not exceed 1 amp.

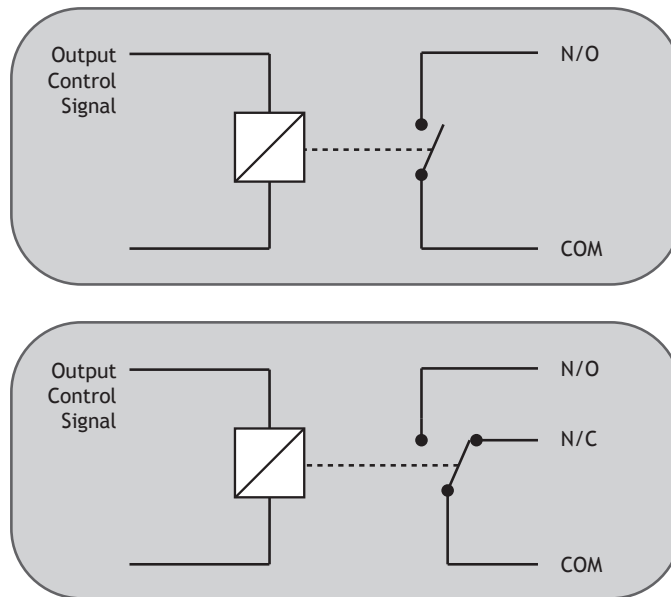


CAN16-Output 24V Output Channel

P327 Relay Channels

Each relay channel is an independent isolated voltage-free set of contacts. Channels 0, 1, 4 and 5 are change-over contacts and channels 2, 3, 6 and 7 are normally open contacts only. Each contact is rated at 30V dc (24 Watts) or 49V ac (62.5 VA). Absolute maximum current for any one contact is 1A under all conditions.

Relay contacts do not have built-in suppression so external EMC suppression components must be fitted as required.



CAN 8-Relay Module Output Channel

DIP Switch Settings

Address:	Start:	End:
0	16	31
1	32	47
2	48	63
3	64	79
4	80	95
5	96	111
6	112	127
7	128	143
8	144	159
9	160	175
10	176	191
11	192	207
12	208	223
13	224	239
14	240	255
15	256	271

Alternative connection protocols

The DIP switches can be set up to allow for different protocols to be used, enabling the CAN I/O modules to be used with other manufacturer's devices. The DIP switch marked "**PR**" selects the protocol to be used. Switched right it selects the TRIO protocol, switched left it selects the module to act as a CANopen DS401 expansion I/O.

TRIO Protocol:

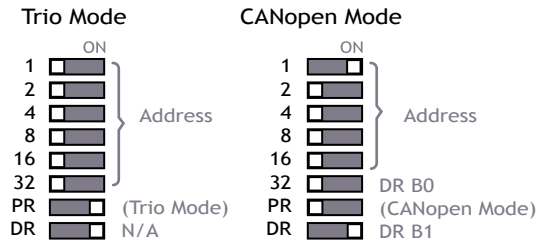
The switch marked **PR** is set **ON** to select the standard Trio protocol.


The top 5 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. 500KHz must be selected when using Trio Protocol Mode.

Switch 32 selects the operating mode. Set **ON** for Trio Mode.

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:



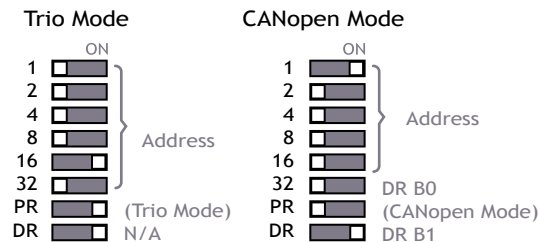
 The I/O Channels referred to above start at 16. This is because the numbering sequence starts with channels 0 - 15, which are on the Motion Coordinator master unit itself.

CANopen Protocol

The switch marked **PR** is set **OFF** to select the CANopen protocol.

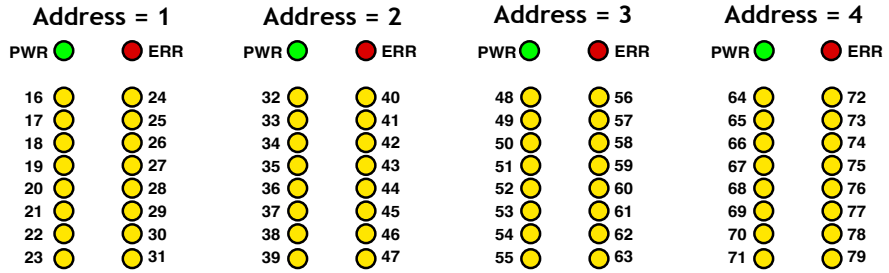
The top 6 DIP switches are used to set the node number. This should be set to a number 1..63.

The baud rate is selected by setting the switches marked 32 and **DR**. Four speeds are available.



LED Indicators

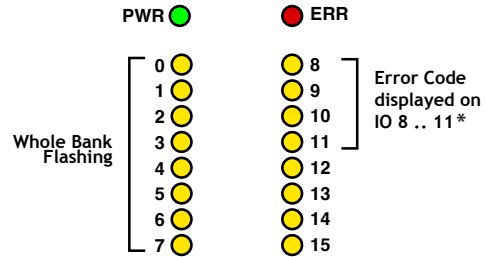
When **ERR** is **OFF** LEDs marked 0 - 15 represent the input or output channels 0 - 15 of the module. The actual input as seen by the *Motion Coordinator* software will depend on the I/O modules' address:



Error Codes:

When an error occurs on a CAN I/O module, the ERR LED will be lit and 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



* Error code on P327 is displayed on the left-hand bank of LEDs when the red ERR led is ON.

Software Interfacing Digital I/O

The *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 **NIO** 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 - 63 ONLY are available for use with system parameters which specify an input, such as **FWD _ IN**, **REV _ IN**, **DATUM _ IN** etc.
- The built-in I/O channels have the fastest operation <1mS
- CAN I/O channels 16 - 63 have the next fastest operation up to 2mS
- CAN I/O channels 64 - 271 have the next fastest operation up to 16mS



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

Troubleshooting- Digital I/O

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...?
- Cable used is the correct CAN bus specification?
- *Motion Coordinator* **CANIO _ ADDRESS=32?**

Specification P317

Outputs:	16 24 Volt output channels with 2500V isolation
Configuration:	16 output channels
Output Capacity:	1A per bank of 250mA / channel
Protection:	Outputs are overcurrent and over temperature protected
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:	26mm wide 85mm deep 130mm high
Weight:	128g
CAN:	500kHz, Up to 256 expansion I/O channels
EMC:	EN 61000-6-2 : 2005 Industrial Noise Immunity / EN 61000-6-4 : 2007 Industrial Noise
CAN protocol:	Trio CAN I/O or CANopen DS401.

Specification P318

Inputs:	16 24 Volt input channels with 2500V isolation
Configuration:	16 input channels
Protection:	Inputs are reverse polarity protected
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:	26mm wide 85mm deep 130mm high
Weight:	128g
CAN:	500kHz, Up to 256 expansion I/O channels
EMC:	EN 61000-6-2 : 2005 Industrial Noise Immunity / EN 61000-6-4 : 2007 Industrial Noise Emissions
CAN protocol:	Trio CAN I/O or CANopen DS401.

Specification P319

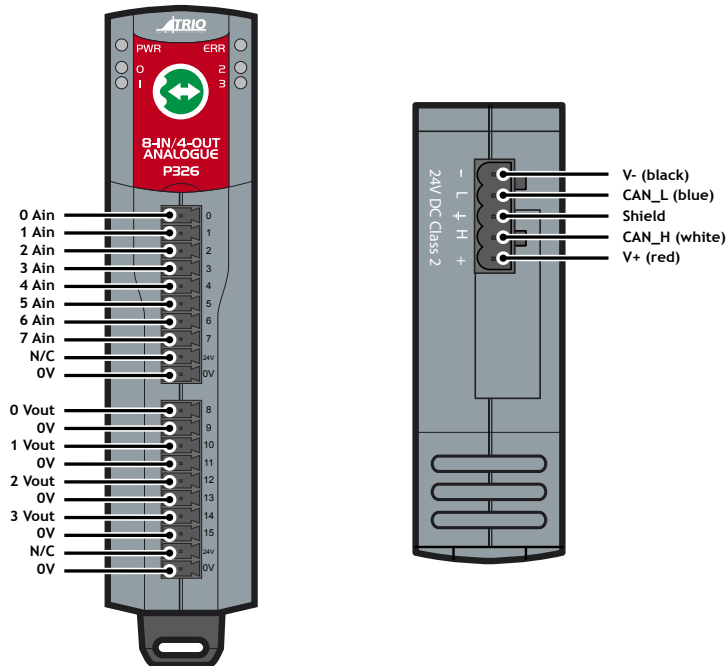
Inputs:	16 24 Volt input channels with 2500V isolation
Outputs:	16 24 Volt output channels with 2500V isolation
Configuration:	16 input/output channels
Output Capacity:	Outputs are rated at 250mA/channel. (1 Amp total/bank of 8 I/O's)
Protection:	Outputs are overcurrent and over temperature protected
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:	26mm wide 85mm deep 130mm high
Weight:	128g
CAN:	500kHz, Up to 256 expansion I/O channels
EMC:	EN 61000-6-2 : 2005 Industrial Noise Immunity / EN 61000-6-4: 2007 Industrial Noise
CAN protocol:	Trio CAN I/O or CANopen DS401.

Specification P327

Outputs:	8 relays 30V dc / 49V ac
Configuration:	4 NO relays and 4 change-over relays
Output Capacity:	Maximum switching power per contact: 62.5 VA, 24W (dc) Max current 1 Amp.
Protection:	Outputs to CAN circuit isolation, 1,500V dc.
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:	26mm wide 85mm deep 130mm high
Weight:	174g
CAN:	500kHz, Up to 128 expansion relay channels
EMC:	EN 61000-6-2: 2005 Industrial Noise Immunity / EN 61000-6-4: 2007 Industrial Noise
CAN protocol:	Trio CAN I/O or CANopen DS401

CAN Analogue I/O Module (P326)

The CAN Analogue I/O Module allows the *Motion Coordinator* to be expanded with banks of 8 analogue input channels and 4 analogue output channels. Up to 4 x P326 Modules may be connected allowing up to 32 x 12 bit analogue inputs and 16 x 12 bit analogue output channels. Convenient disconnect terminals are used for the I/O connections. The input channels are designed for +/-10 Volt operation and the 4 output channels each provide a -10V to +10V signal. Each bank of 8 in / 4 out channels is opto-isolated from the CAN bus.



I/O Connections:

The CAN analogue I/O Module has 3 disconnect terminal connectors:

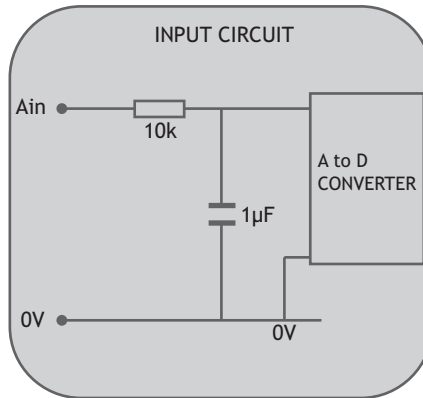
- DeviceNet physical format 5 way CAN connector (on top)
- Analogue Input Bank 0 - 7 and 0V ref on 10 way connector
- Analogue Output Bank 0 - 3 and 0V ref on 10 way connector.

Bus Wiring

See Can 16-I/O for details.

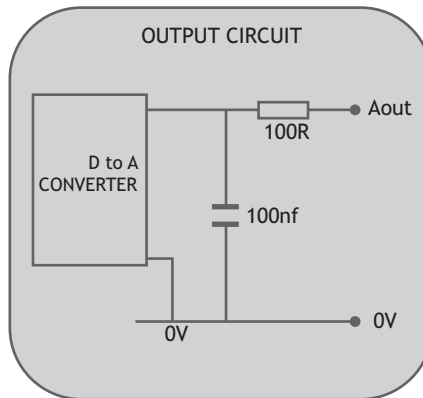
Input Terminals

The 8 analogue inputs are single-ended and have a common 0V. Analogue input nominal impedance = 30kOhm.



Output Terminals

The 4 analogue outputs are single-ended and have a common 0V. Analogue output nominal impedance = 200Ohm.

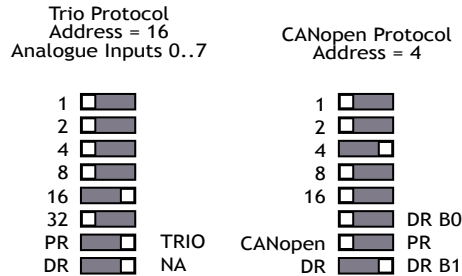


DIP Switch Settings

The switch marked “**PR**” selects the protocol. To the right selects the Trio CAN protocol. To the left selects CANopen protocol, DS401.

The switch marked **DR** sets the baud rate. 500KHz must be selected when using Trio Protocol.

When using the Trio protocol, the addresses for P326 modules **MUST** be set 16,17,18 or 19 in sequence. Therefore the first P326 Module should have the switch setting as shown.



The **AIN** command addresses the analogue inputs as per the following table.

Address:	Start:	End:
16	0	7
17	8	15
18	16	23
19	24	31



P326 modules and P316, P317 and P318 I/O modules may be mixed on the network. The P316, P317 and P318 addresses will be 0 to 15 in sequence and the P326 modules will have addresses 16 to 19 in sequence.

LED Indicators

PWR	ON when module powered on OK
ERR	ON when there is a CAN network error
0	Error code display bit 0
1	Error code display bit 1
2	Error code display bit 2
3	Error code display bit 3



See page 5-14, P317 Error codes for error code table.

Software Interfacing P326

The *Motion Coordinator* will automatically detect and allow the use of correctly connected P326 modules. The number of connected analogue input channels is reported in the startup message and is also available to the programmer via an additional system parameter “**NAIO**”.

In the Trio compatibility mode, the analogue input resolution is fixed at +10Volts to -10Volts single ended 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.

When using extended CAN functions in CANopen, the input scale and offset are programmable. See the P326 CANopen manual for details.

Analogue outputs are set using the **AOUT** command. **AOUT(n)=2047** sets the output to +10V and **AOUT(n)=-2048** sets the output to -10V. In CANopen mode, they are settable using standard DS401 CANopen objects.

Troubleshooting P326

If the network configuration is incorrect 2 indications will be seen: The P326 module will indicate that it is uninitialised and the *Motion Coordinator* will report the wrong number when questioned:

>>? **NAIO**

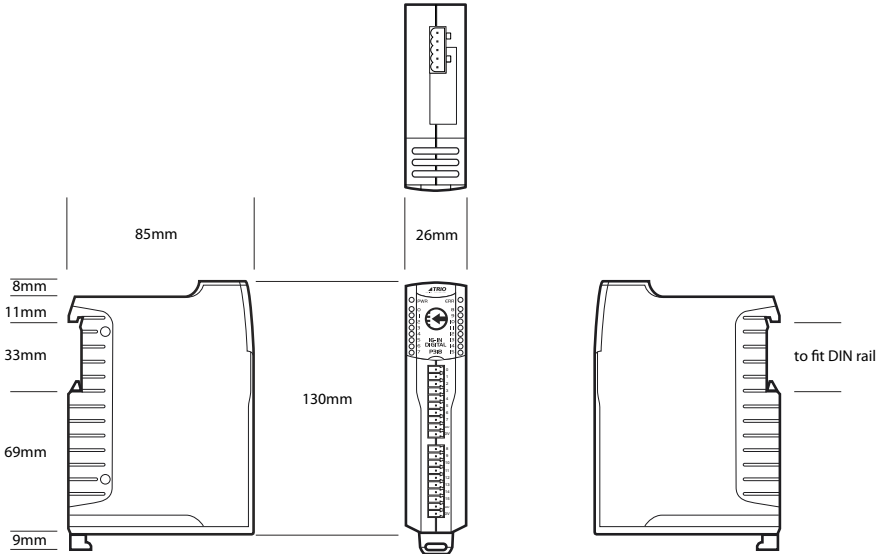
If this is not as expected check:

- Terminating 120Ohm Network Resistors fitted?
- 24Volt Power to Network?
- DIP switches in sequence starting 16,17,18...?
- Cable used is the correct CAN bus specification?
- *Motion Coordinator* CANIO_ADDRESS=32?

Specification P326

Analogue Inputs:	8 +/-10 Volt inputs with 500V isolation from CAN bus.
Resolution:	12 bit.
Protection:	Inputs are protected against 24V over voltage.
Analogue Outputs:	4 -10V to +10V outputs with 500V isolation from CAN bus.
Resolution:	12Bit.
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:	26mm wide 85mm deep 130mm high.
Weight:	128g
CAN:	500kHz, Up to 32 analogue input channels and 16 analogue output channels.
EMC:	EN 61000-6-2 : 2005 Industrial Noise Immunity / EN 61000-6-4 : 2007 Industrial Noise Emissions.
CAN Protocol:	Trio CAN I/O or CANopen DS401.

General Dimensions



Allow 40mm at front for connectors and wiring

