CHAPTER

5

EXPANSION MODULES

Input/Output Modules

General Description

Trio can supply a range of Input/Output Modules and Operator Interface Units. 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. The operator interface units all communicate with controllers using the Trio fibre-optic network system. Alternatively third party operator interface units may be connected via a serial port. A third option is for machine manufacturers to build a dedicated operator interface for their application. Dedicated operator interfaces can be easily connected to the Trio fibre-optic network by building in a flexible interface board: FO-VFKB.

Product:	Product Code:
CAN 16-I/O Module	P316
CAN Analog Input Module	P325
Membrane Keypad	P503
Mini-Membrane Keypad	P502
Application Specific Keypad using FO-VFKB	P504

CAN 16-I/O Module (P316)

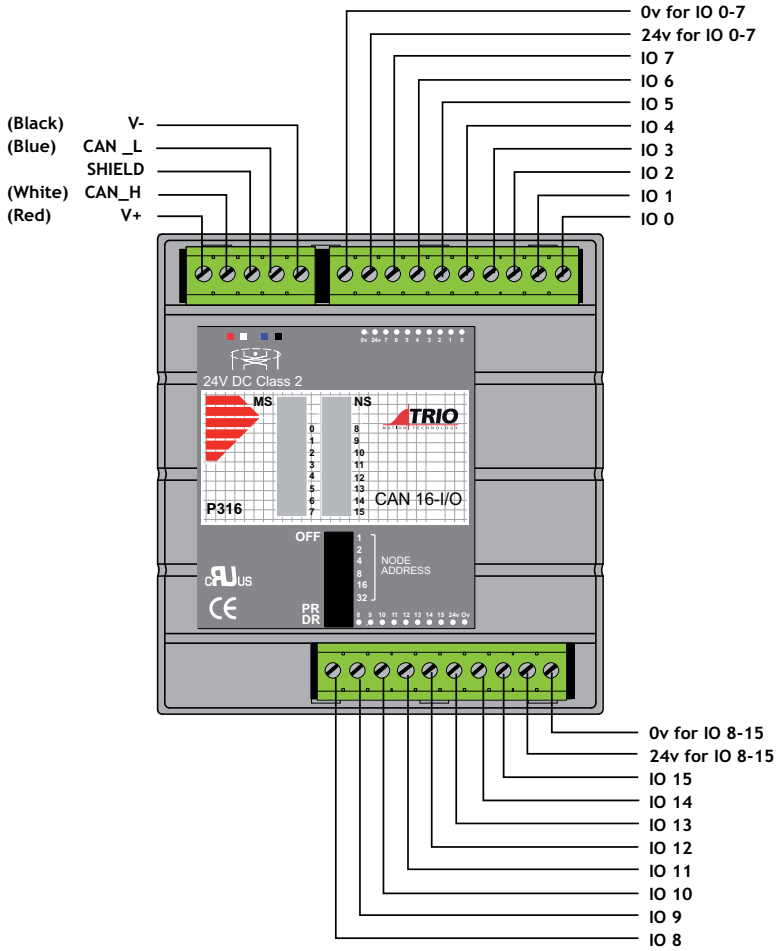
The CAN 16-I/O Module allows the 24 volt digital inputs and outputs of the *Motion Coordinator* to be expanded in blocks of 16 bi-directional channels.

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.

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

The CAN 16-I/O Module may also be used as an I/O expander for Lenze drives with an appropriate CAN interface.

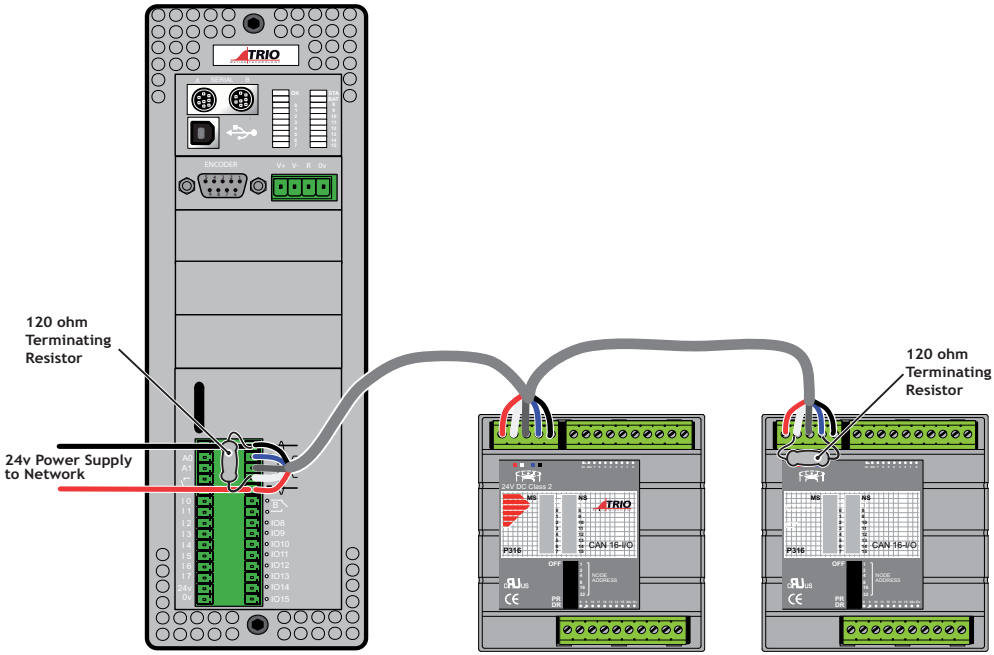
The earlier CAN Module (P315) is entirely compatible with the P316. P315 and P316 can be mixed within the same system.



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.

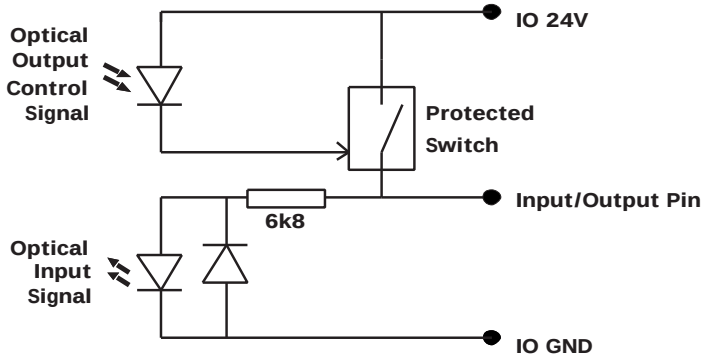
The CAN 16-I/O modules are powered from the network. The 24 Volts supply for the network must be externally connected. The *Motion Coordinator* **does NOT provide the network power.** In many installations the power supply for the *Motion Coordinator* will also provide the network power.

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.*

24V I/O Channels

All input/output channels are bi-directional. The inputs have a protected 24V sourcing output connected to the same pin. If the output is unused it 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.



CAN16-I/O 24V I/O 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

Address:	Start:	End:
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 Trio I/O module to be used with other manufacturers devices. At present the only other protocol supported is that utilised by LENZE drives.

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 LENZE drive expansion I/O.

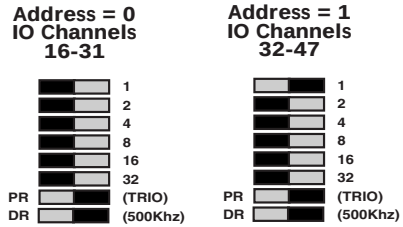
TRIO Protocol:

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:



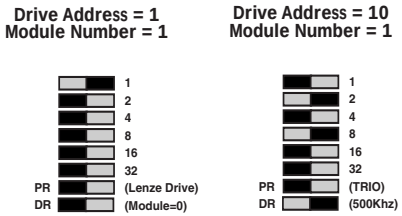
Note: *The I/O Channels referred to above start at 16. This is because the numbering sequence starts with channels 0 - 15, which are on the Motion Coordinator master unit itself.*

LENZE Drive Protocol:

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

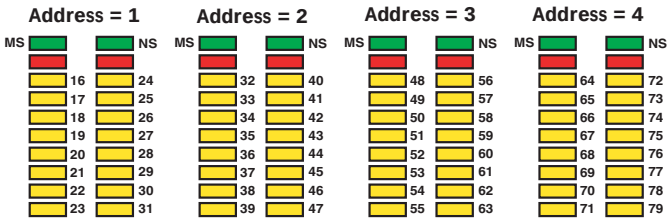
The top 6 DIP switches are used to set the drive number. This should be set to a to 1..63. If the drive number is set to 0, the module will transmit to drive 1.

The switch marked DR selects which of 2 potential I/O modules can transmit to each drive. The drive should be set to use 500Khz baudrate.



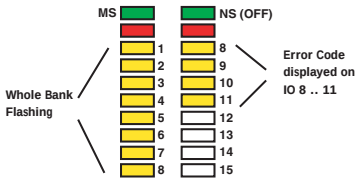
LED Indicators

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 depends 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 *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 - 31 ONLY are available for use with system parameters which specify an input, such as **FWD_IN**, **REV_IN**, **FH_IN** etc.
- Outputs 8 - 31 ONLY are available for use with the **PSWITCH** command.
- The built-in I/O channels have the fastest operation <1mS
- CAN I/O channels 16 - 63 have the next fastest operation <2mS
- CAN I/O channels 64 - 191 have the next fastest operation <8mS
- Inputs 0 - 63 are available for use with the system parameter **DATUM_IN**.

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...?
- System Software Version 1.40 (or higher)?
- *Motion Coordinator* CANIO_ADDRESS=32?

Specification

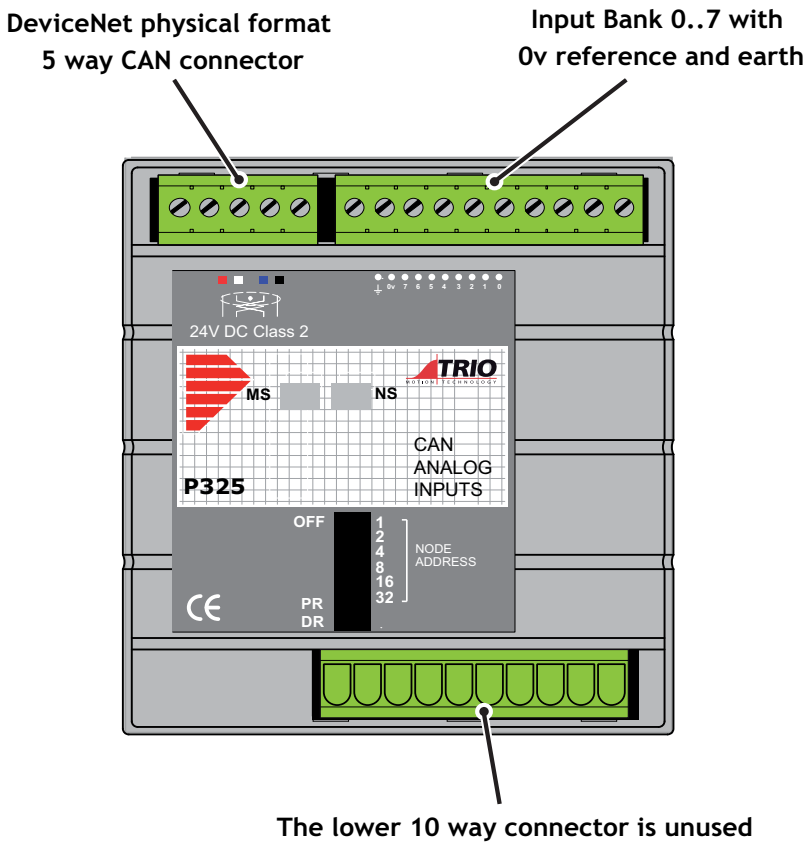
Inputs:	16 24Volt inputs channels with 2500V isolation
Outputs:	16 24Volt output channels with 2500V isolation
Configuration:	16 bi-directional channels
Output Capacity:	Outputs are rated at 250mA/channel. (1 Amp total/ bank of 8 I/O's)
Protection:	Outputs are overcurrent and over temperature protected
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:	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 (2001) Industrial Noise Emissions

CAN Analog Inputs Module (P325)

The CAN Analog Input Module allows the *Motion Coordinator* to be expanded with banks of 8 analogue input channels. Up to 4 x P325 Modules may be connected allowing up to 32 x 12 bit analogue channels. 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:

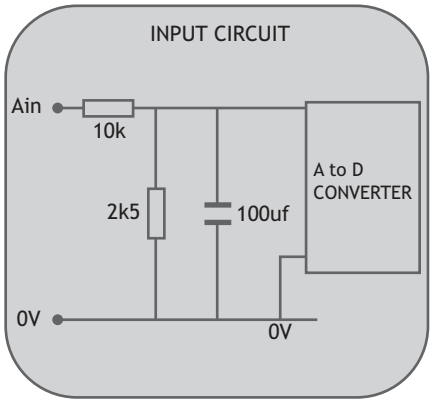


Bus Wiring

See Can 16-I/O for details

Input Terminals

The 8 analogue inputs are single-ended and are interfaced to a common 0V. An earth connection is provided as a termination point for shielded cables.
Analogue input nominal impedance = 12k

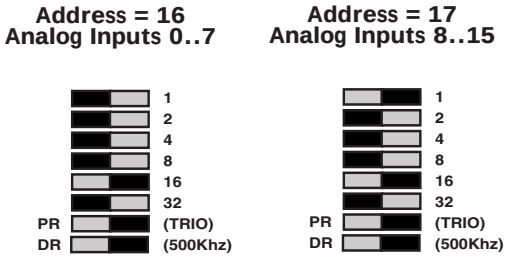


DIP Switch Settings

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:



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

Note: P325 modules and P316 (16-I/O) modules may be mixed on the network. The P316 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 analogue input channels is reported in the startup message and is also available to the programmer via an additional system parameter "NAIO".

The analogue 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...?
- System Software Version 1.42 (or higher)?
- *Motion Coordinator* CANIO_ADDRESS=32?

Specification

Analogue Inputs:	8+/-10Volt 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 analogue input channels
EMC:	BSEN50082-2 (1995) Industrial Noise Immunity / BS EN55022 (2001) Industrial Noise Emissions

Operator Interfaces

There are two main options when considering Operator Interface products. You can utilise products connected to either the Trio Fibre-Optic Network, or third party products connected to one of the *Motion Coordinator*'s communication ports.

Using the Trio Fibre-Optic Network

Trio supply a range of operator interfaces which are designed to connect via the *Motion Coordinator*'s fibre-optic network connection. these are:

- P502 - Membrane Keypad
- P503 - Mini-membrane keypad
- P504 - Fibre-optic interface module (Allows users to design their own keypad on Trio fibre-optic network)

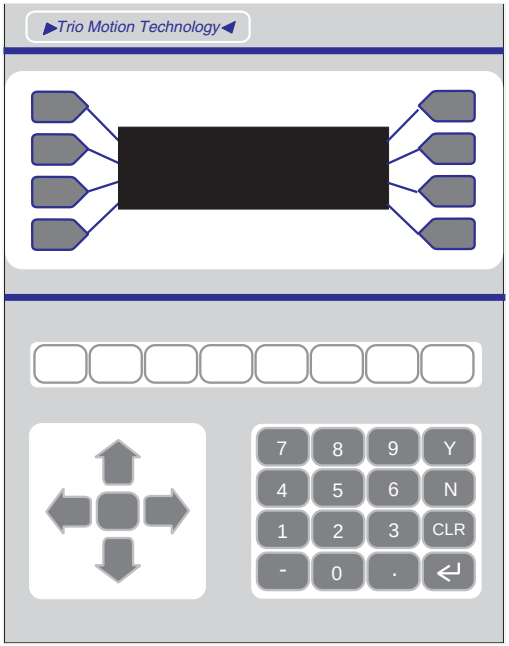
Third Party Modules

It is possible to connect to a wide variety of third-party operator interface panels via one of the *Motion Coordinator*'s serial ports (RS232 or RS485).

A growing number of programmable keypads and HMIs provide the user with a choice of serial interface protocols to enable communication with various PLCs and Industrial Computers. One such protocol is Modbus RTU. The *Motion Coordinator* system software provides built-in support for the Modbus protocol.

The Modbus protocol provides single point to point communication between the *Motion Coordinator* and a programmable keypad/display. Implementation of the protocol is provided on serial port 1 for RS232 and port 2 for RS485. Port 0 is the main programming port and does not have the Modbus option.

Membrane Keypad (P503)

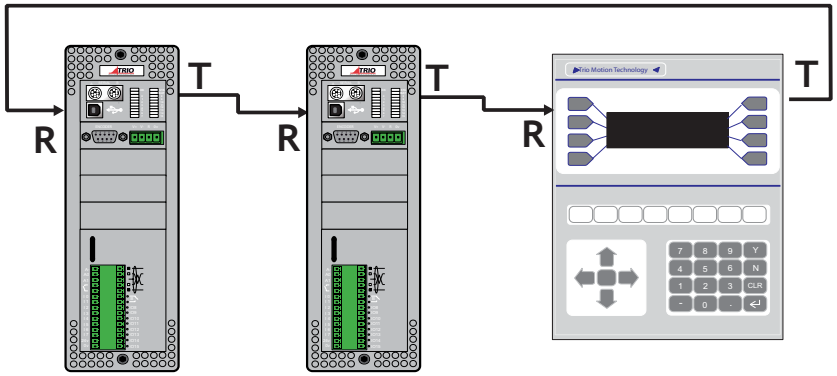


The Membrane Keypad brings together all the elements required for an effective man-machine interface in one package thus minimising the time taken to mount and connect to the rest of the system. The keypad has 37 tactile keys, eight of which can be defined by the user by inserting key legends from the rear of the keypad. Incorporated into the keypad is a four line by twenty character vacuum fluorescent display. Connection to the control system is via a fibre optic cable to the *Motion Coordinator* master module or network of master modules and membrane keypads. The interfacing to the master is provided by a built in fibre-optic interface module. The only other connection necessary is a 24 Volts DC power supply input.

The TRIO fibre optic network has been designed to link up to fifteen *Motion Coordinator* modules and membrane keypads. Any number of either type of module can be on the network up to the maximum of fifteen but at least one must be a *Motion Coordinator*.

The physical connection of the network takes the form of a ring. The interconnections between nodes being made with fibre optic cable

.



Example of Network Connection

Connection of the Membrane Keypad

The fibre optic link to a master module or network of masters is the Hewlett-Packard “Versatile Link” format connected using the P435 Serial to Fibre-Optic Adaptor.

The fibre optic connectors are colour coded:

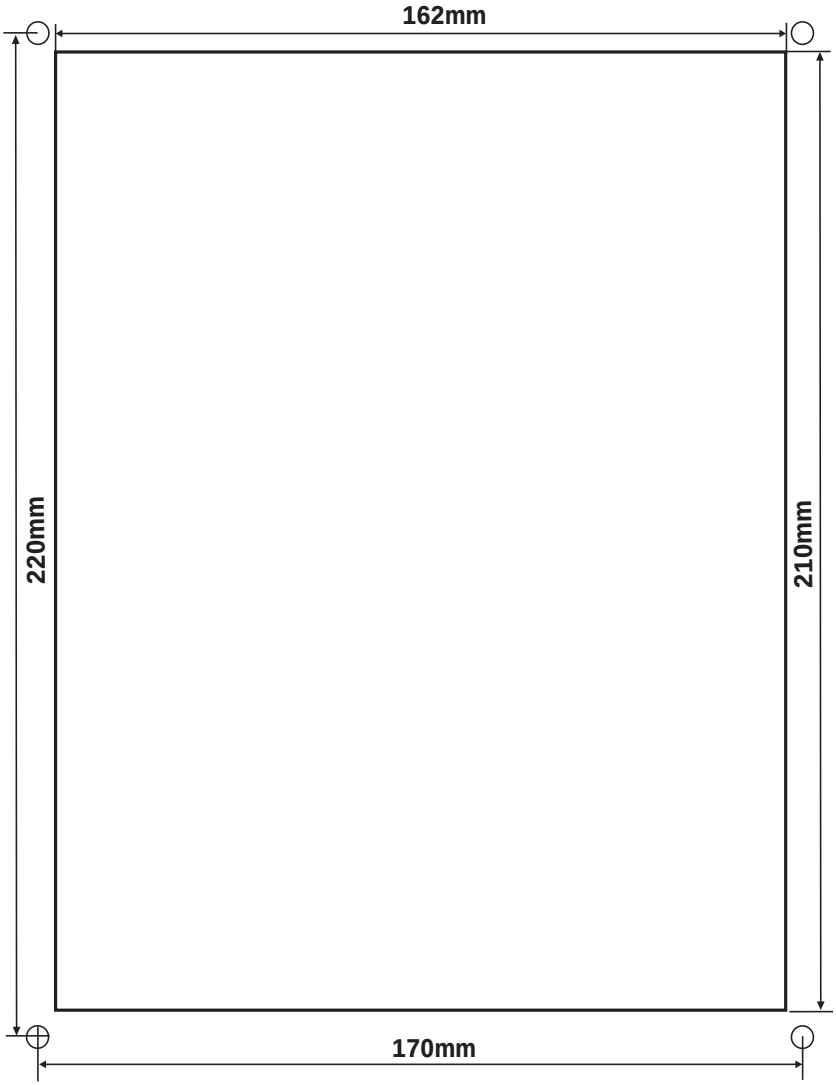
- Grey or Black- Transmitter
- Blue - Receiver

The receiver on the membrane keypad must be connected a transmitter and vice-versa. The fibre optic link is running at 38400 baud and will operate over a distance of up to 30m. Care must be taken when installing the fibre cable, making sure it is not bent in a tighter radius than 100mm. Failure to observe this restriction could lead to a break in the cable or at very least attenuation of a signal giving a reduced distance over which the link will operate. An excessive number of bends in the cable will attenuate the signal and hence reduce the operating distance.

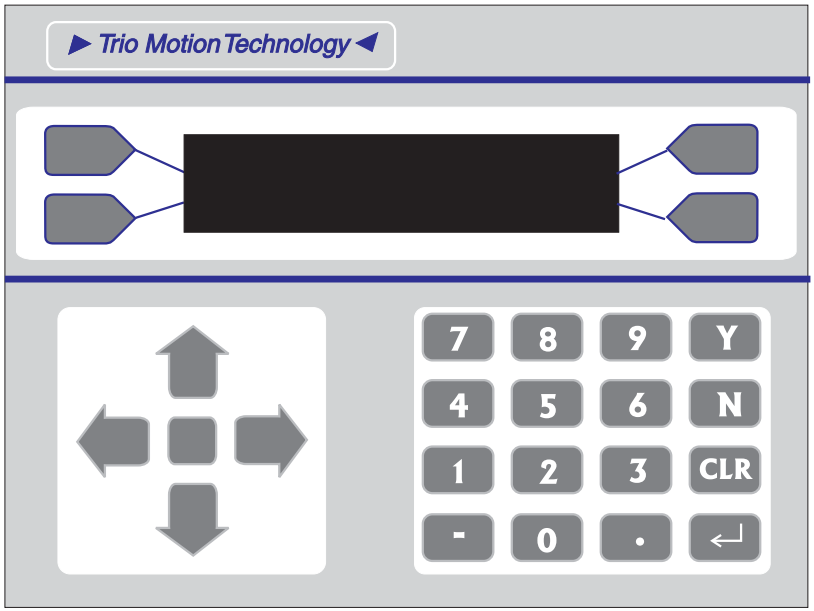
Power is applied to the two pin disconnect terminals on the side of the Keypad.

Mounting the Membrane Keypad

To mount the Membrane Keypad a rectangular cutout and four holes are required, as shown below. The Keypad is offered up to the front of the panel and fixed with the four studs in the corners of the Keypad. A depth of 50mm behind the front panel is needed to mount the Keypad, with an extra 50mm clearance for the fibre optic connector on the back.



Mini-Membrane Keypad (P502)

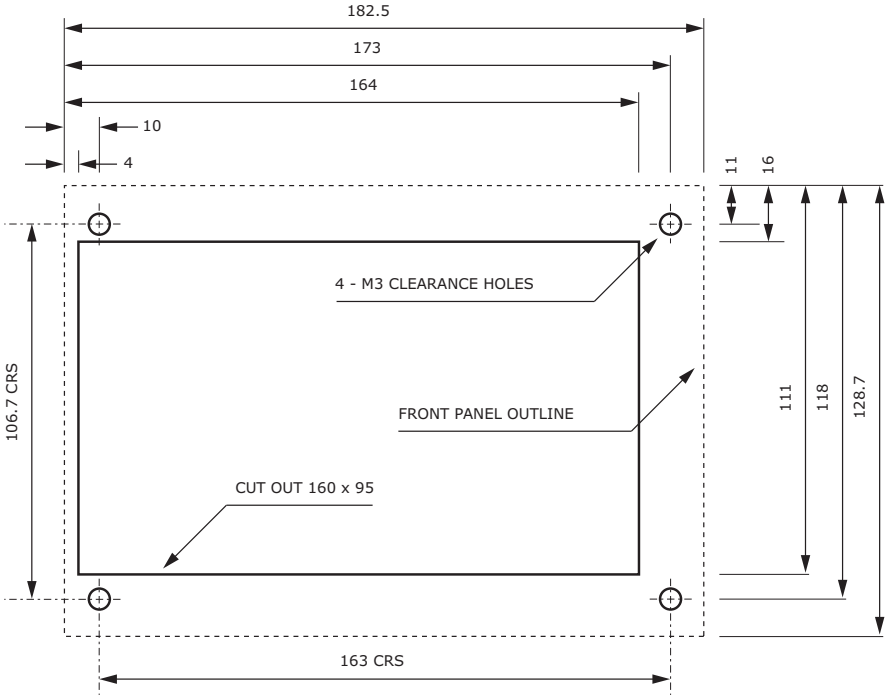


The Mini-Membrane Keypad is a lower cost alternative to the full membrane keypad. The keypad has 25 tactile keys. Incorporated into the keypad is a two line by twenty character vacuum fluorescent display. Connection to the control system is via a fibre optic cable to the *Motion Coordinator* master module or network of master modules. The interfacing to the master is provided by a built in fibre-optic interface module. The only other connection necessary is a 24 Volts DC power supply input.

Mounting the Mini-Membrane Keypad

The Mini-Membrane Keypad can be either mounted into a rectangular cutout or may the mounted into a 3U rack. If rack mounted the 4 blind holes in the panel need to be extended to allow 4 2.5mm diameter screws (Not supplied) to be fitted to secure the unit into a rack. To mount the Mini-Membrane Keypad into a rec-

tangular cutout the figure 5.7 should be followed. The Keypad is offered up to the front of the panel and fixed with the four studs in the corners of the Keypad. A depth of 50mm behind the front panel is needed to mount the Keypad, with an extra 50mm clearance for the fibre optic connector on the back.



Connection of Mini-Membrane Keypad

The connections are identical to the membrane keypad.

Programming the Membrane Keypad

The Keypads make use of standard Trio BASIC commands to write to the display and read from the keypad. The output /input device should be specified as 4 or 3 in any PRINT, GET, or KEY statement E.G.

```
>>PRINT#4,"Hello"
```

Alternatively the membrane keypad can be used as part of a network, in which case see chapter 11 for further details.

Writing to the Membrane and Mini-Membrane Display

The Trio BASIC command **PRINT** is used to write to the display. By using the **CHR** command with the **PRINT** it is possible to send control codes to the display to perform certain functions as described below:

CHR(..)	Function	Description
8	Back Space	The cursor moves one character to the left.
9	Horizontal Tab	The cursor moves one character to the right.
10	Line Feed	The cursor moves to the same column on the next line down.
12	Form Feed	The cursor moves to the top left hand corner.
13	Carriage Return	The cursor moves to the end on the same line.
14	Clear	All displayed characters are cleared. The cursor doesn't move.
17	Overwrite Mode	When the cursor reaches the bottom right hand corner it moves to the top left hand corner.
18	Scroll Up Mode	display scrolls up one line and the cursor moves to the left hand end of the next line.
20	Cursor _	Cursor is displayed as an _ character (Mini-Membrane only)
21	Cursor Visible	Cursor is displayed as a blinking all dot character.
22	Cursor Invisible	Cursor is turned off.
23	Cursor Flashing _	Cursor is displayed as a blinking _ character (Mini Only)
27+72+ 0..79	Position Cursor	The cursor is moved to the position specified by the last number (in the range 0..79 on Membrane keypad, 0..39 on Mini-Membrane) where each position on the screen is numbered,starting with zero in the top left hand corner to 79 or 39 in the bottom right hand corner.

Note: The **CURSOR** command provides a easy method of controlling the cursor.

Example:
```
PRINT CURSOR(10);
```

This will send the cursor to the 10th position on the first row. Note the use of the semicolon to suppress the carriage return which the **PRINT** command would normally send as well.

Reading from the Membrane Keypad/Mini-Membrane Keypad

Use the KEY command to test if a key has been pressed and the GET command to read which key has been pressed. **For simplicity and consistency it is recommended to use KEY and GET with the #4 channel number.** It is also possible to use the #3 channel number, in which case the numbers returned can be modified using DEFKEY.

Key	Key #	Get #4 Value	Get #3 Value
Up Arrow	1	33	20
Left Arrow	2	34	22
Centre Button	3	35	24
Right Arrow	4	36	23
Down Arrow	5	37	21
*Undefined 1 (Left most)	12	44	30
*Undefined 2	13	45	31
*Undefined 3	14	46	32
*Undefined 4	15	47	33
*Undefined 5	16	48	34
*Undefined 6	17	49	35
*Undefined 7	18	50	36
*Undefined 8 (Right most)	19	51	37
7	23	55	55
8	24	56	56
9	25	57	57
Y	26	58	89
4	27	59	52
5	28	60	53
6	29	61	54
N	30	62	78
1	34	66	49
2	35	67	50
3	36	68	51
CLR	37	69	27
-	38	70	45
0	39	71	48
.	40	72	46
<enter>	41	73	13

Key	Key #	Get #4 Value	Get #3 Value
*Menu Select 4 (Bottom Left)	45	77	50
*Menu Select 3	46	78	51
Menu Select 2	47	79	52
Menu Select 1 (Top Left)	48	80	53
Menu Select 5 (Top Right)	49	81	54
Menu Select 6	50	82	55
*Menu Select 7	51	83	56
*Menu Select 8 (Bottom Right)	52	84	57

Keys marked * are not present on Mini-Membrane

Keypad KEY ON - KEY OFF Mode

Keypads with software version 3.00 (see back panel for version number) and higher support a mode of operation where the keypad returns the key pressed and then a further character (31) is returned when the key is released. The keypad has to be set into this mode. On power up the keypad is in the normal mode where it returns just the key number.

Example: To set KEY ON-KEY OFF mode:

```
PRINT#4,CHR(140);CHR(127);CHR(136);
```

To return to default mode:

```
PRINT#4,CHR(140);CHR(0);CHR(136);
```

Note: In this mode the key presses should be fetched with a GET#4 rather than GET#3. This is because the KEY RELEASED character (31) is not included in the DEFKEY table used with GET#3.

This character sequence is formatted as a Trio network message (type 4). It is designed to work only when there is one keypad and one *Motion Coordinator* OR where the keypad is the next node in the network. See chapter 11 for details of how to construct network messages for keypads at other nodes.

Summary of Features		
	P503 Membrane Keypad	**P502 Mini-Membrane**
Size	230mm x 180mm x 50mm	192mm z 183mm x 50mm
Weight	1.450Kg	0.600Kg
Operating Temperature	0-45 degrees C	0-45 degrees C
Power supply	24V dc, Class 2 transformer or power source. 18 … 29V dc 500mA.	24V dc, Class 2 transformer or power source. 18 … 29V dc 500mA.
Number of Keys	37	25
Type of Keys	Metal dome tactile, debounced.	Metal dome tactile, debounced.
Display	4x20 Vacuum Fluorescent, with anti-glare filter.	2x20 Vacuum Fluorescent, with anti-glare filter.
Environmental	Sealed to IP65, provided mating face to panel is sealed.	Sealed to IP65, provided mating face to panel is sealed.

Summary of Features		
	P503 Membrane Keypad	P502 Mini-Membrane
Material	Polyester top layer resistant to most solvents	Polyester top layer resistant to most solvents
Data Output	8 bit serial, no parity	8 bit serial, no parity

FO-VFKB Fibre Optic Keypad/Display Interface (p504)

This is not packaged as a module like the rest of the TRIO range. Instead it is a single PCB designed to fix directly on to the back of a Vacuum Fluorescent display to allow customers to easily build their own design of membrane keypad on the Trio fibre-optic network.

The connectors and mounting holes on the board are specifically intended for mounting on the following displays:

ITRON	2 x 20
	4 x 20

Other displays can be supported but connection may have to be made via a short cable from the display to the FO-VFKB. To give reliable, noise free transmission of data to and from the FO-VFKB, the link to the master module is made with a fibre optic cable.

FO-VFKB Display Interface

Display Interface DIL connector:

FUNCTION	PIN NO.		FUNCTION
D7	1	2	D6
D5	3	4	D4
D3	5	6	D2
D1	7	8	D0
WR	9	10	GND
N/C	11	12	BUSY
GND	13	14	GND
+5V	15	16	+5V

FO-VFKB Keypad Interface

The keypad interface permits connection of proprietary or custom keypads with matrix outputs of up to 5 rows by 11 columns. Up to five common output keypads may be connected provided that each one has no more than 11 keys. The keypad is easily accessed via Trio BASIC commands which enables a program to accept run-time data from an operator or scroll through a menu for example. Connection to the keypad is made via a short ribbon cable between the 16 way IDC plug on the back of the FO-VFKB module and the similar connector on the back of the key-pad.

~Function	IDC plug pin no.		Function
Row 4	1	2	Column 0
Row 1	34		Column 7
Column 4	5	6	Row 2
Column 1	7	8	Column 8
Column 5	9	10	Row 3
Column 2	11	12	Column 9
Column 6	13	14	Column 3
Row 0	15	16	Column 10

Power Requirements

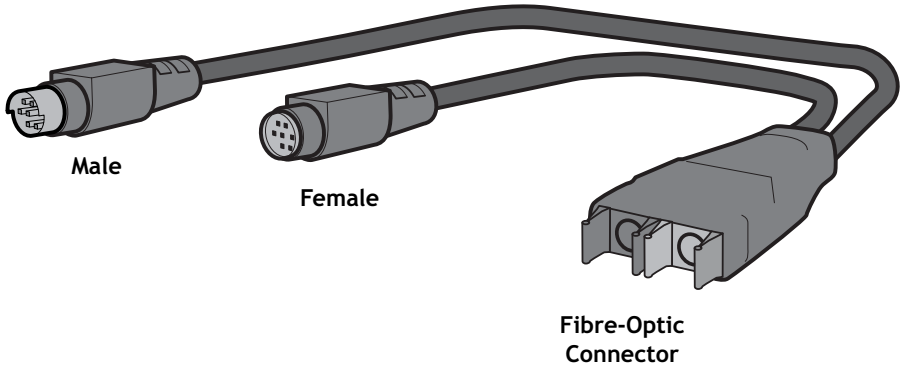
A 24V DC power supply is required to drive the FO-VFKB. This is also the supply for the display so must be capable of delivering at least 750mA. Power is applied on the two way disconnect terminal. The board is diode protected against reverse voltages being applied to the power connector. With power applied to the board the green LED on the top of the board should be lit.

Data Connection

The data connection is identical to that of a membrane keypad.

Summary of Features P504 FO-VFKB	
Size	150mm x 64mm
Weight	0.065 Kg
Operating Temperature	0-45 degrees C
Keypad	5x11 debounced keypad decoder with key on/key off option
V/F Display	Direct connection on DIL header
Data Connection	Fibre optic data link
Power supply	24V DC external power supply required

Serial to Fibre-Optic Adapter (P435)



The P435 Fibre Optic Adapter may be connected to the MC224, Euro205x or MC206X controllers to enable the connection of the Trio Mini-membrane, Membrane Keypad and the FO-VFKB.

The adapter provides a pass-through connector for the RS-232 serial port.

Controller Type	Serial Connector Used
Euro205x	A
Euro209	A
MC206X	A
MC224	A

SD Card Adaptor (P396)

Removable Storage

A memory adaptor used with the MC206X and MC224 allows a simple means of transferring programs without a PC connection. Offering the OEM easy machine replication and servicing.
The memory adaptor is compatable with a wide range of Micro SD cards up to 2Gbytes. Each Micro SD Card must be pre-formatted using a PC to FAT32 before it can be used in the SD Card Adaptor.
Order the SD Card Adaptor from a Trio supplier (order code: P396). The adaptor does not include the Micro SD Card which must be bought separately.

Checking Programs on Micro SD card:

DIR D	Lists a directory of the Micro SD card in a DOS-like format.
FILE "cd" "directory_name"	Change the current directory

Reading Programs from Micro SD card:

FILE "load_program" "prog_name"	load one program from the Micro SD card to the controller.
FILE "load_project" "proj_name"	Load complete project from the Micro SD card to the controller.
FILE "type" "filename.bas"	Print a file to the *Motion* Perfect terminal 0.

Saving Programs to Micro SD card:

FILE "save_program" "program"	Save a program to the current SD card directory.
FILE "save_project" "proj_name"	Save all the programs to the named project on the SD card.

Read and Write data from/to Micro SD card:

STICK_WRITE(flash_file#, table_start[, length[, format]])	Write controller TABLE data to a file on the SDCARD in either comma separated values (CSV) or binary (BIN).
STICK_READ(flash_file#, table_start[, format])	Read TABLE data stored in a file from the SDCARD to the controller. Binary or CSV data can be read depending on the setting of the format parameter.

Note: See Chapter 8 for full description of SD Card commands.

Automatic Program Loading:

Programs will be copied on power up or **EX** from the Micro SD card into the Motion Coordinator if an adaptor is inserted and the SD card has a TRIOINIT.BAS file in the root directory.

The programs on the Micro SD card have auto/manual run settings in the same way as programs loaded from a *Motion* Perfect project do.

Typical TRIOINIT.BAS:

Load and run from RAM	load and copy into EPROM
FILE "LOAD_PROJECT" "proj_name" AUTORUN	**FILE 2LOAD_PROJECT" "proj_name"** **EPROM** **POWER_UP=1** **AUTORUN**

Notes: The programs on the Micro SD card must be arranged as a project in the same way that *Motion* Perfect saves projects.

While multiple projects can be saved on the Micro SD card, only one is loaded using the example TRIOINIT.BAS shown. This provides compatibility with the Next-Flash Mediastick stick cards. Requires system software 1.6629 or later.

Methods of Use A machinery builder could use a P396 + Micro SD card with programs loaded and the TRIOINIT.BAS set to install programs on to a series of machines.

If an application update is sent out on a Micro SD card to a machinery customer the EPROM function could be left off. In this way if the update does not do what is required the old program will be copied from internal EPROM when the P396 is removed.