CHAPTER

4

DAUGHTER BOARDS

Description The axis daughter boards give the *Motion Coordinator* system enormous flexibility in its configuration.

The number of daughter boards which may be fitted is dependant on the controller type.

The MC224 master units can hold up to 4 daughter boards in any combination. Up to 12 further daughter boards can be connected using optional Axis Expander units (4 daughter boards per unit). Communication Daughter Boards P291, P292, P293, P295, P296, P297 and P298 can only be fitted in the master unit.

The Euro 205x and the Euro209 have a single daughter board slot which can be used to provide a fifth axis in addition to the four axes (maximum) on board.

The MC206X can use a single daughter board to provide a sixth axis in addition to the five axes (maximum) which are available on the standard controller.

The *Motion Coordinator* recognises the type of axis daughter board or communications daughter board fitted in each slot. For example, a slot with a stepper daughter board fitted will return its **ATYPE** axis parameter as 1:

```
>>PRINT ATYPE
1.0000
```

Also slot 0 fitted with a USB daughter board, will return its **COMMSTYPE** parameter as 21:

```
>>PRINT COMMSTYPE SLOT(0)
21.0000
```

There are 19 types of daughter board currently available:

Product Code:	Description	ATYPE	COMMS TYPE
P200	Servo Encoder	2	
P201	Enhanced Servo Encoder	12	
P210	Servo Resolver	5	
P220	Reference Encoder	3	
P225	Analogue Input (8 x 16 bit)		28
P230	Stepper	1	
P240	Stepper Encoder	4	
P242	Hardware Pswitch	10	
P260	Analogue Output	6	
P270	SSI Absolute Servo	7	
P280	Differential Stepper	4	
P290	CAN		20
P291	SERCOS		24
P292	3 Axis SLM		22
P293	Enhanced CAN		29
P295	USB Interface		21
P296	Ethernet		25
P297	Profibus		23
P298	Ethernet IP		30

Note: For volume / OEM applications, Trio can produce custom daughter boards for specific customer applications where required.

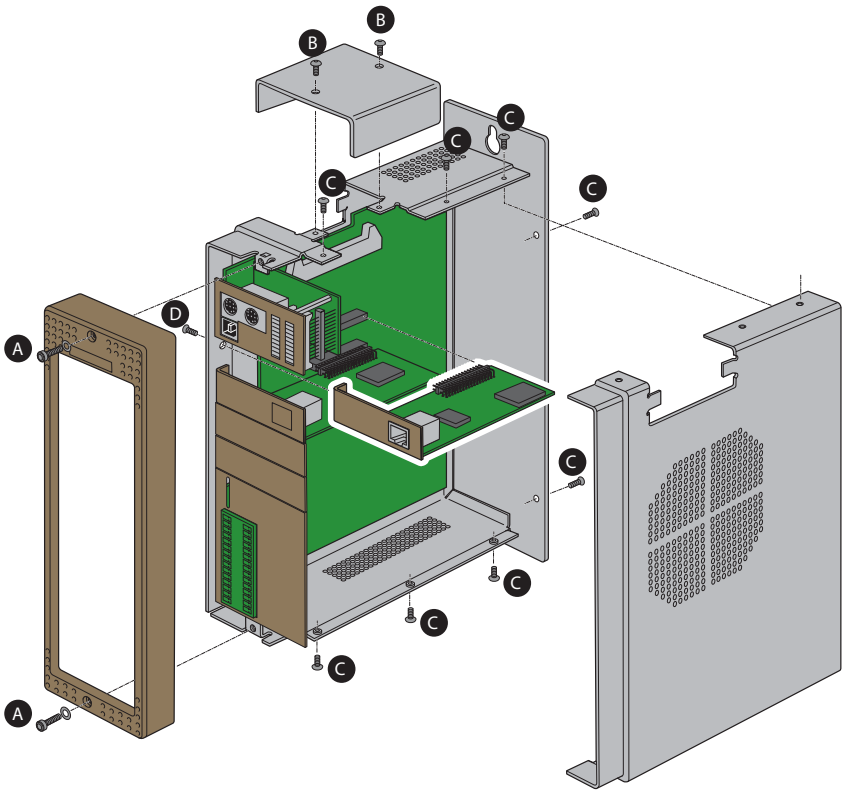
Fitting and Handling Daughter Boards

The axis daughter boards are normally supplied fitted into a *Motion Coordinator* system. If daughter boards need to be moved or replaced the following sequence must be followed.

The axis daughter boards are supplied in an anti-static bag or box. This should be used to hold the axis daughter board at all times when not installed in the *Motion Coordinator*.

Fitting Daughter Boards to the MC224 / Axis Expander

- Check there is no power on the module
- Unscrew the 2 Allen screws (A) which secure the front moulding cover and remove the cover
- Unscrew the top ribbon cable bus cover (B). If the ribbon cable is connected, remove this by pushing the retaining levers outwards.
- Unscrew the 8 screws (C) which secure the right hand side cover of the module
- Unscrew the single screw (D) which secures the axis daughter board to the left hand side of the module. This is located by the left hand end of the axis daughter front panel
- The sequence is reversed after inserting any new modules.



MC224 + Axis Expander Slot Sequence

The slot number of any daughter board is fixed by its position in the MC224 module. For standard axis daughter boards, this also fixes the axis number as shown.

Location	Axis
Slot 0 (Top)	Axis 0
Slot 1	Axis 1
Slot 2	Axis 2
Slot 3 (Bottom)	Axis 3

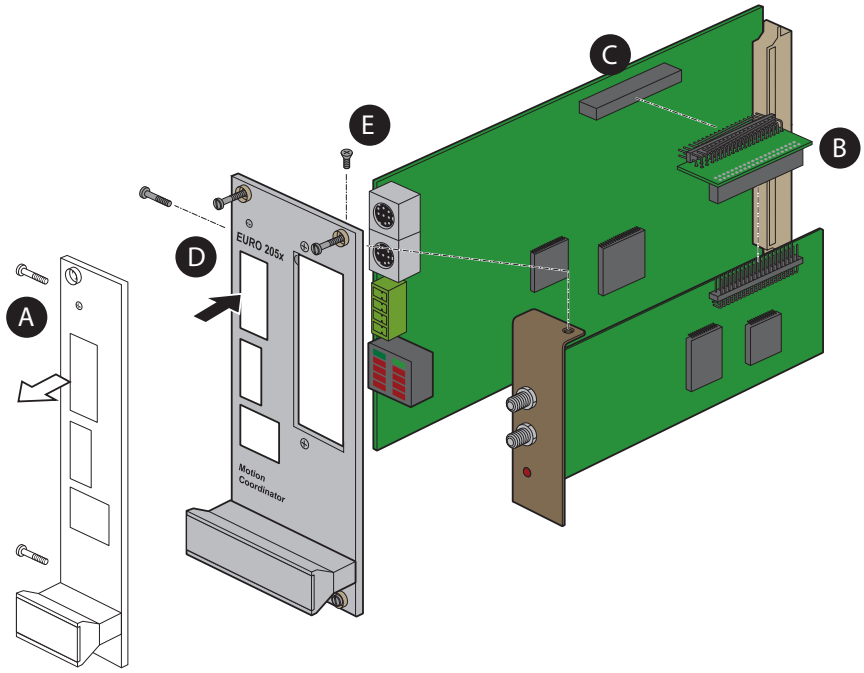
The axis number of any axis daughter board in the Axis Expander module is fixed by its position and the setting of the front panel selector switch on the Axis Expander.

Location	4-7*	8-11*	12-15**
Slot 0 (Top)	Axis 4	Axis 8	Axis 12
Slot 1	Axis 5	Axis 9	Axis 13
Slot 2	Axis 6	Axis 10	Axis 14
Slot 3 (Bottom)	Axis 7	Axis 11	Axis 15

Where digital drive communications daughter boards are used, the axis number is set by software and may not necessarily be the same as the slot number. In any case, with CANopen, SLM and SERCOS, multiple axes can be controlled via a single daughter board.

Fitting Daughter Boards to the Euro205x and Euro209

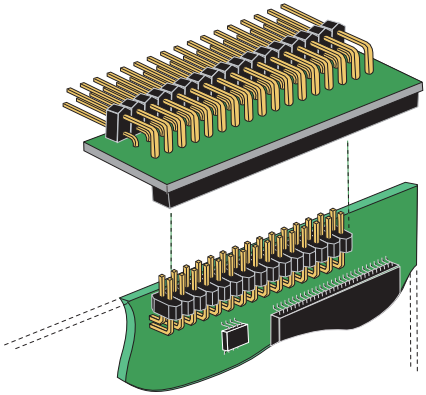
The *Motion Coordinator* Euro205x can use a single daughter board with an optional P445 Euro 205 Daughter Board Mounting Kit. The Euro 209 can use the P447 for the same purpose. Both consist of a replacement (double width) front panel and 90º header connector.



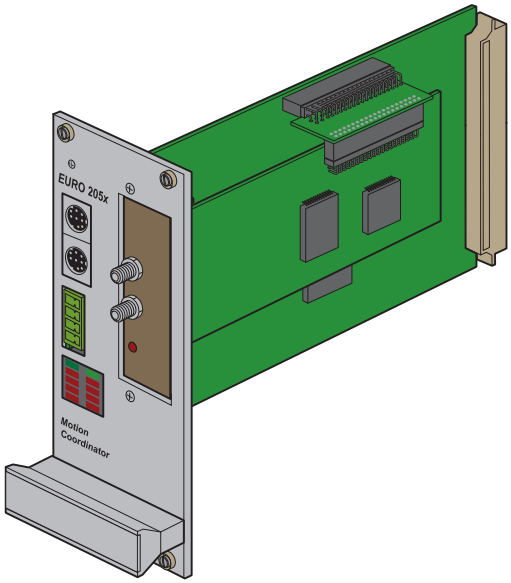
Installation Procedure

- Ensure that anti-static precautions are taken when handling the Euro205x and Euro209 boards.
- Check there is no power on the module
- Remove the standard front panel (A) by undoing the retaining screws from the rear of the PCB.
- Insert the new daughter board into the bottom of the adaptor (B), ensuring that the pins are inserted into the holes nearest the front of the Eurocard as shown in the following diagram.

Note: Some daughter boards, such as the CAN-Bus and Profibus communications boards, feature a longer connector and so the adaptor features a full-length socket to accommodate these. On an axis Daughter Board with the standard (shorter) connector the board should be inserted into the holes nearest the edge of the adaptor, as shown:



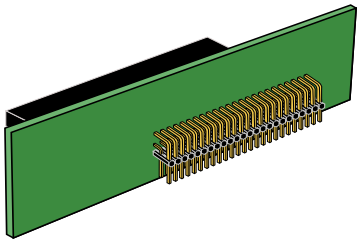
- Place the Euro205x/Euro209 PCB down on a firm flat surface and insert the adaptor pins into the daughter board socket (C).
- Fit the new front panel, being careful to line up the mounting bracket with the front panel of the daughter board (D).
- Insert the retaining screw into the front panel bracket to hold the daughter board in place (E).



Euro205x shown with Daughter Board in place

Fitting Daughter Boards to the MC206X

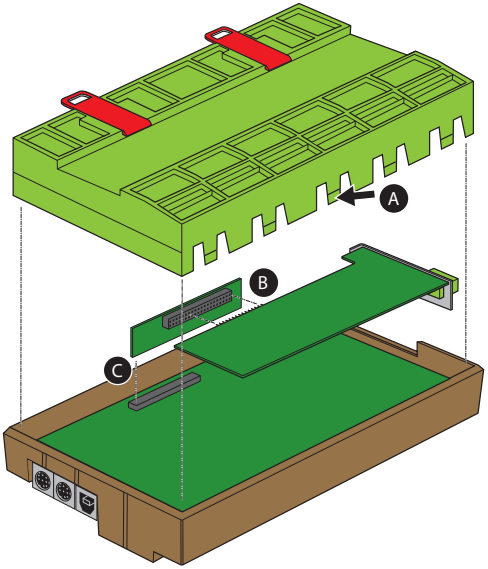
The *Motion Coordinator* MC206X can use a single daughter board. This is fitted internally, and connected via the optional P399 MC206X Daughter Board Adaptor (shown right).



The axis daughter boards are supplied in an anti-static bag or box. This should be used to hold the daughter board at all times when not installed in the *Motion Coordinator*.

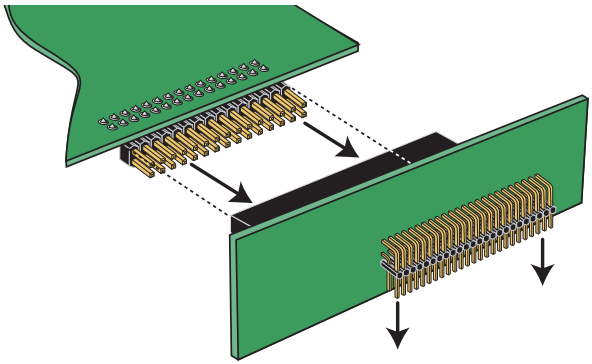
Installation Procedure

- Check there is no power on the module
- Turn the module face-down and carefully remove the back moulding. To remove the back moulding, a thin bladed small screwdriver needs to be inserted between the back and front mouldings to release in sequence each of the five latches (A) which locate the top edge of the back on to the front.
- Ensure that anti-static precautions are taken when handling the MC206X board.
- Connect the daughter board to the P399 adaptor (B), and insert the adaptor into the connector on the MC206X circuit board (C), as shown below

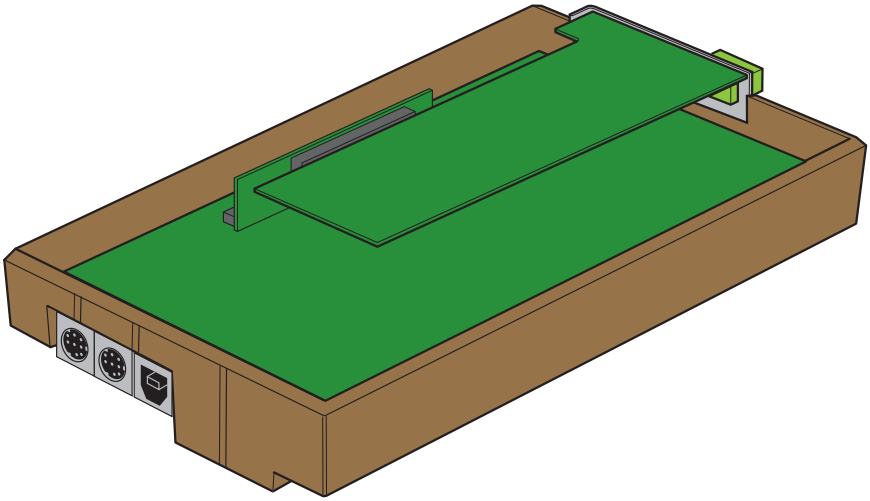


Rear of MC206X showing P399 daughter board adaptor

Note: Some daughter boards, such as the CANBus and Profibus communications boards, feature a longer connector and so the adaptor features a full-length socket to accommodate these. On an axis Daughter Board with the standard (shorter) connector the board should be inserted into the holes nearest the edge of the adaptor, as shown:



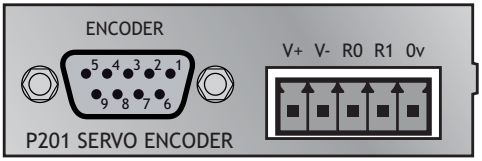
Alignment of MC206X daughter board adaptor



Rear of MC206X with Daughter Board In place

Enhanced Servo Encoder Daughter Board

Trio Product Code P201



Description: **ATYPE** parameter for Enhanced Servo Encoder Daughter Board = 12

The enhanced servo daughter board provides the interface to a DC or Brushless servo motor fitted with an encoder or encoder emulation.

Analogue Output

The Servo Encoder Daughter board provides a 16 bit +/-10V voltage output to drive most servo-amplifiers. The voltage output is opto-isolated as standard to maximise the noise immunity of the system.

Encoder Inputs

The encoder port provides differential line receiver inputs capable of counting up to 6MHz edge rate. These inputs are opto-isolated to maximise the noise immunity of the system. The encoder port also provides a convenient 5V output for powering the encoder, simplifying wiring and eliminating external supplies.

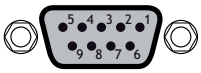
Registration Function

The Servo Encoder Daughter provides two hardware position capture functions for both the Z input and a dedicated 24 Volt registration input. Transitions of either polarity on both these inputs can be used to record the position of the axis at the time of the event within less than 1 micro second. This practically eliminates time delays and avoids interrupting the processor frequently in multi-axis systems.

Connections: **Encoder Connections:**

The encoder is connected via a 9 pin 'D' type socket mounted on the front panel. The plug supplied should be cable mounted and wired as shown below.

The encoder port is designed for use with differential output 5 Volt encoders.



Pin.	function
1	channel A true
2	channel A complement
3	channel B true
4	channel B complement
5	0V
6	marker (Z) true
7	marker (Z) complement
8	+5V (see Motion Coordinator for current rating)
9	Registration Input 5V Input pin
shell	Screen

The encoder may be powered from the +5V supply output on the daughter board, provided it requires a current that is less than the rating of the Motion Coordinator encoder supply. If the encoder is situated so far from the module that the supply is inadequate an external supply should be used and regulated locally to the encoder. In this case the +5V connection from pin 8 should not be used and the external supply 0V should be connected to pin 5 (0V).

If the encoder does not have complementary outputs, pins 2, 4 and 7 should be connected to a +2.5V bias voltage. This may be simply derived from a pair of 220 Ohm resistors in series with one end of the pair connected to 0v and the other end to +5V. The centre point of the pair will form approximately 2.5V.

If the encoder does not have a marker pulse, pins 6 and 7 may be left unconnected.

Voltage Output

The +/-10V output voltage to drive external servo amplifiers is generated between the V+ and V- pins. The voltage output is isolated and floating but if multiple servo daughter boards are fitted it should be noted that the boards share a common power supply for generation of the +/-10V. This means that the V- pins should not be referenced to different external voltages. Screened cable should be used for the voltage output connection and the screen connected to the metal case or backplate. Do not connect screens to the registration 0V terminal.

Registration Inputs

The two registration inputs are 24V dc input connected through high-speed opto-isolation into the encoder counter circuit. An alternative 5V input pin is available for R0 on the encoder port. The internal circuitry can be used to capture the position at which the registration input makes a transition from low to high or vice-versa. This function is accessed in software from the REGIST command. The input is measured relative to the 0V input on the servo daughter board which must be connected if the registration input is used. Note that this is the same 0V as the encoder port.

Registration Function

The board has two hardware position capture functions. One is available for both the Z input or a dedicated 24 Volt registration input, the second registration function is via a 24 Volt input only. Software access to the second registration input is by commands REGIST. See chapter 8 for further details.

Software Considerations:

The servo function can be switched on or off with the SERVO axis parameter:

>>SERVO =ON

When the servo function is OFF the value in the axis parameter DAC is written to the 16 bit digital to analogue converter:

>>DAC=32767 This will set +10 Volts on voltage output when servo is OFF

>>DAC=0 This will set 0 Volts on voltage output when servo is OFF

>>DAC=-32768 This will set -10 Volts on voltage output when servo is OFF

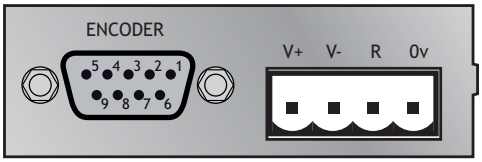
Note: To maintain compatibility with earlier products, the axis parameter DAC_SCALE is provided.

DAC_SCALE=16 Simulates the operation of a 12 bit DAC

DAC_SCALE=1 Uses the full resolution of the 16 bit DAC

Servo Encoder Daughter Board

Trio Product Code P200



Description: **ATYPE** parameter for Servo Encoder Daughter Board = 2

The servo daughter board provides the same functionality as the P201 but with differences in specification. These include a 12 bit DAC, lower frequency encoder port and 1 registration input. The information here shows the differences between the P201 and P200 and the P201 section should be referred to for the D connector pinout etc.

Analogue Output

The daughter board provides a 12 bit +/-10V voltage output to drive most servo-amplifiers. The voltage output is inverted for backward compatibility with older products.

>>DAC=2047	This will set -10 Volts on voltage output when servo is OFF
>>DAC=0	This will set 0 Volts on voltage output when servo is OFF
>>DAC=-2048	This will set 10 Volts on voltage output when servo is OFF

Encoder Inputs

The encoder port provides differential line receiver inputs capable of counting up to 2MHz edge rate. These inputs are opto-isolated to maximise the noise immunity of the system. The encoder port also provides a convenient 5V output for powering the encoder, simplifying wiring and eliminating external supplies.

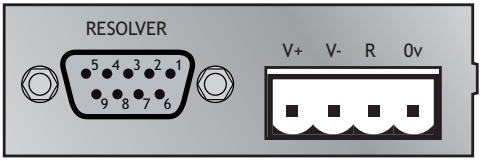
Registration Function

The board has one hardware position capture functions. This is available for either the Z input or a dedicated 24 Volt registration input.

Note: *The daughter board hardware inverts the voltage relative to the DAC parameter.*

Servo Resolver Daughter Board

Trio Product Code P210



Description: **ATYPE** parameter for Servo Resolver Daughter Board = 5

The resolver daughter board provides the interface to a DC or Brushless servo motor fitted with a resolver. The resolver port provides absolute position feedback within one motor turn. The resolver inputs are opto-isolated to maximise the noise immunity of the system. The resolver port also provides an oscillator output capable of driving many resolvers.

The resolver daughter board provides a hardware position capture function for both the zero marker input and a dedicated 24 Volt registration input. Transitions of either polarity on both these inputs can be used to record the position of the axis at the time of the event within less than 1 micro seconds. This practically eliminates time delays and avoids interrupting the processor frequently in multi-axis systems.

The resolver daughter board provides a 12 bit +/-10V voltage output to drive most servo-amplifiers. The voltage output is opto-isolated as standard to maximise the noise immunity of the system.

Connections: **Voltage Output**

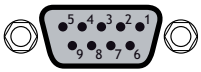
The +/-10V output voltage to drive external servo amplifiers is generated between the V+ and V- pins. The voltage output is isolated and floating but if multiple servo daughter boards are fitted it should be noted that the boards share a common power supply for generation of the +/-10V. This means that the V- pins should not be referenced to different external voltages.

Note: *The daughter board hardware inverts the voltage relative to the DAC parameter.*

Registration Input

The registration input is a 24V dc input connected through high-speed opto-isolation into the resolver circuit. An alternative 5V input pin is available on the encoder port. The internal circuitry can be used to capture the position at which the registration input makes a transition from low to high or vice-versa. This function is accessed in software from the REGIST command. The input is measured relative to the 0V input on the servo daughter board which must be connected if the registration input is used. Note that this is the same 0V as the resolver port.

Resolver Port Pinout



Pin	Function
1	SIN +
2	SIN -
3	COS +
4	COS -
5	0V
6	REF +
7	REF -
8	Analogue Velocity Output
9	Registration 5V Input

The reference oscillator runs at 2kHz and produces a +/- 2 Volt output.

The servo function can be switched on or off with the **SERVO** axis parameter:

>>SERVO =ON

When the servo function is OFF the value in the axis parameter **DAC** is written to the 12 bit digital to analogue converter.

Therefore:

>>DAC=2047 This will set -10 Volts on voltage output when servo is OFF

>>DAC=0 This will set 0 Volts on voltage output when servo is OFF

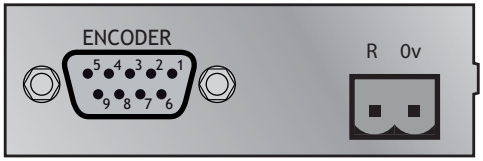
>>DAC=-2048 This will set +10 Volts on voltage output when servo is OFF

The measured position of the axis **MPOS** is not reset to zero on power up but reset to a value in the range 0-4095. All other software functions are similar to the servo daughter board. The resolver converter circuit uses a fixed 12 bit conversion. The motor resolution will therefore be 4096 “edges”/turn.

Note: *The daughter board hardware inverts the voltage relative to the DAC parameter.*

Reference Encoder Daughter Board

Trio Product Code P220



Description: **ATYPE** parameter for Encoder Daughter Board = 3

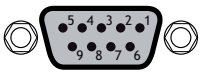
The encoder daughter board provides an encoder input without a servo feedback facility for measurement, registration and synchronization functions on conveyors, drums, flying shears, etc. The encoder port provides high speed differential receiver inputs. These inputs are opto-isolated to maximise the noise immunity of the system. The encoder port also provides an isolated 5Vv output capable of powering most encoders. This simplifies wiring and eliminates external power supplies.

The encoder daughter board provides a hardware position capture function for both the encoder Z input and the dedicated 24 Volt registration input. Transitions of either polarity on both these inputs can be used to record the position of the axis at the time of the event within less than 1 micro second. This practically eliminates time delays and avoids interrupting the processor frequently in multi-axis systems.

Connections: **Encoder Connections:**

The encoder is connected via a 9 pin 'D' type socket mounted on the front panel. The plug supplied should be cable mounted and wired as shown below.

The encoder port is designed for use with differential output 5 Volt encoders.



Pin.	function
1	channel A true
2	channel A complement
3	channel B true
4	channel B complement
5	0V
6	marker (Z) true
7	marker (Z) complement

Pin.	function
8	+5V (see Motion Coordinator for current rating)
9	Registration Input 5V Input pin
shell	protective ground

The encoder may be powered from the +5V supply output on the daughter board, provided it requires a current that is less than the rating of the Motion Coordinator encoder supply. If the encoder is situated so far from the module that the supply is inadequate an external supply should be used and regulated locally to the encoder. In this case the +5V connection from pin 8 should not be used and the external supply 0v should be connected to pin 5 (0V).

If the encoder does not have complementary outputs, pins 2, 4 and 7 should be connected to a +2.5V bias voltage. This may be simply derived from a pair of 220 Ohm resistors in series with one end of the pair connected to 0V and the other end to +5V. The centre point of the pair will form approximately 2.5V.

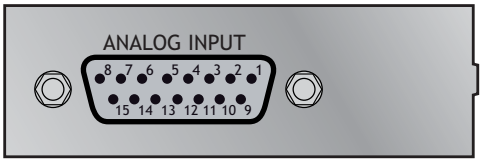
If the encoder does not have a marker pulse, pins 6 and 7 may be left unconnected.

Registration Input

The registration input is a 24V dc input connected through high-speed opto-isolation into the encoder counter circuit. An alternative 5V input pin is available on the encoder port. The internal circuitry can be used to capture the position at which the registration input makes a transition from low to high or vice-versa. This function is accessed in software from the **REGIST** command. The input is measured relative to the 0V input on the servo daughter board which must be connected if the registration input is used. Note that this is the same 0V as the encoder port.

Analogue Input Daughter Board

Trio Product Code P225

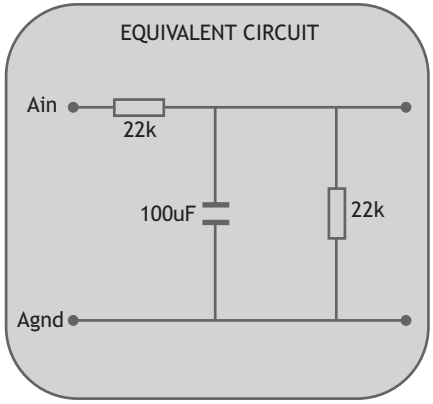


Description: **COMMSTYPE** parameter for Analogue Input Daughter Board = 28

The P225 analogue input daughter board provides 8 channels of 16 bit analogue inputs. By putting the analogue inputs on a daughter board they are especially useful for use as position feedback. The reading of the analogue inputs is synchronised with the servo loop of the *Motion Coordinator* at 1msec, 500usec or 250usec servo period.

Connections: The analogue inputs are connected via a 15 way "D" connector. The P225 has an isolation barrier between the analogue to digital converters and rest of the *Motion Coordinator*. However on *Motion Coordinator*s without an isolated external power supply, such as the Euro205x, the Euro209 and the MC206X the isolators will only isolate the data signals, not provide full isolation.

Pin.	function
1	Analogue Input 0
2	Analogue Input 1
3	Analogue Input 2
4	Analogue Input 3
5	Analogue Input 4
6	Analogue Input 5
7	Analogue Input 6
8	Analogue Input 7
9 .. 15	Analogue Ground (0V)
shell	protective ground

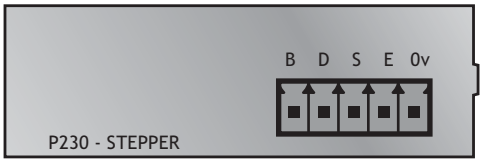


Programming: See the AIN() and AXIS_ADDRESS commands in chapter 8 for programming details.

Note: Not available on MC224 axis expander (P301).

Stepper Daughter Board

Trio Product Code P230



Description **ATYPE** parameter for Stepper Daughter Board = 1

The stepper daughter board generates pulses to drive an external stepper motor amplifier. Single step, half step and micro-stepping drives can be used with the board. All four output signals are opto-isolated on the stepper daughter board and each features overcurrent protection.

Specifications **Maximum Output Frequency**

In Single/Half step mode the stepper daughter board can generate pulses at up to 62 KHz.

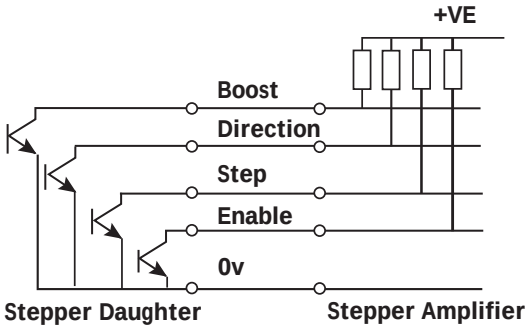
In microstep mode the stepper daughter can generate pulses at up to 250 KHz. See MICROSTEP command.

Connections

Pin	Function
B	Boost
D	Direction
S	Step
E	Enable
0v	0V reference for all connections

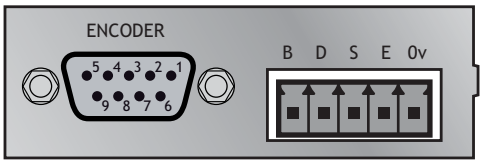
Each of the connections B, D, S, and E is an open-collector output. The outputs can be pulled up to 24V externally and can drive up to 100mA. Overcurrent protection is provided on the outputs.

Circuit


+VE
Boost
Direction
Step
Enable
0v
Stepper Daughter
Stepper Amplifier

Stepper Encoder Daughter

Trio Product Code P240



Description: **ATYPE** parameter for Stepper Encoder Daughter Board = 4

The stepper daughter board with position verification has all the features of the standard stepper daughter board. Position verification is added to a stepper axis by providing encoder feedback to check the position of the motor.

An encoder port on the daughter board allows the position of the motor to be checked on every servo cycle. If the difference between the demanded number of steps and the measured position exceeds the programmed limit, the *Motion Coordinator* can take undertake a programmed error sequence.

Connections: **Stepper Output**

Each of the connections B, D, S, and E is an open-collector output. The outputs can be pulled up to 24V externally and can drive up to 100mA. Overcurrent protection is provided on the outputs.

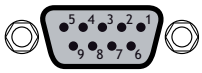
Pin	Function
B	Boost
D	Direction
S	Step
E	Enable
0V	0V reference for all connections

The circuit is identical to that of the P230 Stepper Daughter Board

Reference Encoder Input

The encoder is connected via a 9 pin 'D' type socket mounted on the front panel. The plug supplied should be cable mounted and wired as shown below.

The encoder port is designed for use with differential output 5 Volt encoders.



Pin.	function
1	channel A true
2	channel A complement
3	channel B true
4	channel B complement
5	0V
6	marker (Z) true
7	marker (Z) complement
8	+5V (see Motion Coordinator for current rating)
9	Registration Input 5V Input pin
shell	protective ground

The encoder may be powered from the +5V supply output on the daughter board, provided it requires a current that is less than the rating of the *Motion Coordinator* encoder supply. If the encoder is situated so far from the module that the supply is inadequate an external supply should be used and regulated locally to the encoder. In this case the +5V connection from pin 8 should not be used and the external supply 0V should be connected to pin 5 (0V).

If the encoder does not have a marker pulse, pins 6 and 7 may be left unconnected.

Choosing an encoder for position verification:

Stepper encoder daughter boards generate fewer pulses than the number of steps the controller considers the axis to be moving. The daughter board divides the number of steps the controller according to the axis parameter **MICROSTEP**:

MICROSTEP=OFF a factor of 16 (default mode)

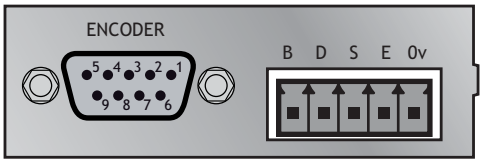
MICROSTEP=ON a factor of 2

The encoder for position verification should have a number of edges equal to the number of steps the controller moves by, or an integer factor higher. If a factor higher is used the **PP_STEP** axis parameter should be set.

Example: A stepper motor has 200 pulses/rev and is driven with **MICROSTEP=OFF**. The controller therefore moves a distance of 200*16=3200 counts to rotate the motor 1 turn. If an encoder is to be used for position verification the encoder would therefore need 3200, 6400, 9600 or 12800 etc.. edges/turn. As the encoder port will count 4 edges per encoder pulse, the ideal encoder would therefore have 800 pulses/rev or multiples thereof.

Hardware PSWITCH Daughter Board

Trio Product Code P242



ATYPE parameter for Hardware PSWITCH Daughter Board = 10

Description: The hardware PSWITCH daughter board allows 4 open-collector outputs to be switched ON and OFF at programmed positions. This function is similar to the software PSWITCH command which is implemented in the system software and allows outputs to be switched ON and OFF over position sectors. The Hardware PSWITCH daughter board performs the position comparison in electronics hardware on the daughter board. This allows the pulses generated to be very accurately timed.

Encoder Connections:

The encoder connections for a hardware PSWITCH daughter board are identical to those on the encoder port of a servo daughter board. The daughter board encoder input does NOT have registration facilities. The encoder edge rate for hardware PSWITCH functioning is limited to 500kHz.

Note: PP_STEP = -1 cannot be used to reverse the count direction on this card.

Output Connections:

The hardware PSWITCH daughter board is built as a Stepper Encoder daughter board with an alternative gate array fitted. The 5 way miniature disconnect connector is used to bring out the open-collector outputs:

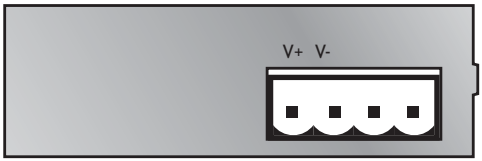
Pin	Function
B	Output Channel 0
D	Output Channel 1
S	Output Channel 2
E	Output Channel 3
0V	Common 0V for outputs

The open-collector outputs are protected by a resettable fuse. You can draw a total of 100mA from the 4 outputs.

Programming: See the PSWITCH command in chapter 8 for programming details.

Analogue Output Daughter Board

Trio Product Code P260



Description: **ATYPE** parameter for Voltage Output Daughter Board = 6.

The Analogue Output Daughter board provides a 12 bit +/-10v voltage output for driving inverters and other devices. The board is a simplified servo daughter board and the connections are similar. The encoder port does not function even if the connector is fitted.

Voltage Output

The +/-10V output voltage to drive external servo amplifiers is generated between the V+ and V- pins. The voltage output is isolated and floating but if multiple daughter boards are fitted it should be noted that the boards share a common power supply for generation of the +/-10V. This means that the V- pins should not be referenced to different external voltages.

The board functions like a servo daughter board with the SERVO= OFF the value in the axis parameter DAC is written to the 12 bit digital to analogue converter.

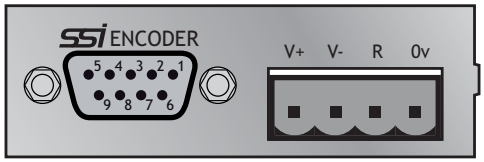
Therefore:

>>DAC=2047	This will set -10 Volts on voltage output
>>DAC=0	This will set 0 Volts on voltage output
>>DAC=-2048	This will set +10 Volts on voltage output

Note: *The daughter board hardware inverts the voltage relative to the DAC parameter.*

SSI Servo Encoder Daughter Board

Trio Product Code P270



Description: **ATYPE** parameter for Absolute Servo (SSI) Daughter Board = 7

The SSI daughter board provides the interface to a DC or Brushless servo motor fitted with an absolute SSI Gray Code encoder or encoder emulation. The encoder port provides high speed differential synchronous serial interface (SSI). This port is opto-isolated to maximise the noise immunity of the system.

The SSI port is programmable so that any number of bits from 1 to 24 can be clocked into the position registers.

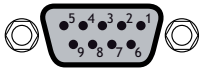
If the registration function is to be used then a minimum of 12 bits is required for correct operation.

The SSI daughter board provides a hardware position capture function for both a 5V differential input and a dedicated 24volt registration input. Transitions of either polarity on both these inputs can be used to record the position of the axis at the time of the event within less than 1 micro seconds. This practically eliminates time delays and avoids interrupting the processor frequently in multi-axis systems. It should be noted however that the SSI system overall does not support this level of accuracy due to delays in clocking data from the encoders.

The servo daughter board provides a 12 bit +/-10V Voltage output to drive most servo-amplifiers. The voltage output is opto-isolated as standard to maximise the noise immunity of the system.

Connections: **SSI Connections:**

The SSI encoder is connected via a 9 pin 'D' type socket mounted on the front panel. The socket supplied should be cable mounted and wired as shown below. The SSI encoder port is designed for use with differential output 5 Volt encoders.



Pin.	function
1	data true
2	data complement
3	clock true
4	clock complement
5	0V- must be connected even if an external PSU is used to power the encoder.
6	marker (Z) true - can be used as a second general purpose regist input.
7	marker (Z) complement - can be used as a second general purpose regist input.
8	+5V (see Motion Coordinator for current rating)
9	Registration Input 5v Input pin
shell	protective ground

The SSI encoder may be powered from the +5V supply output on the daughter board, provided it requires a current that is less than the rating of the *Motion Coordinator* encoder supply. If the SSI encoder requires a 24V supply then this must be provided externally. In this case the +5V connection from pin 8 should NOT be used and the external supply 0v should be connected to pin 5 (0V).

Voltage Output

The +/-10V output voltage to drive external servo amplifiers is generated between the V+ and V- pins. The voltage output is isolated and floating but if multiple servo daughter boards are fitted it should be noted that the boards share a common power supply for generation of the +/-10V. This means that the V- pins should not be referenced to different external voltages.

Registration Input

The registration input is a 24V dc input connected through high-speed opto-isolation into the encoder counter circuit. An alternative 5V input pin is available on the encoder port. The internal circuitry can be used to capture the position at which the registration input makes a transition from low to high or vice-versa. This function is accessed in software from the **REGIST** command. The input is measured relative to the 0V input on the servo daughter board which must be connected if the registration input is used. Note that this is the same 0v as the encoder port. Note: the Z pulse input normally used with incremental encoders is still available for use as a general purpose differential 5V regist input.

Software: The number of bits to be shifted in from the encoder attached to the SSI port is set using the **ENCODER_BITS** axis parameter. This parameter defaults to 0 on power up and this disables the reading of the encoder position into the MPOS parameter. As soon as **ENCODER_BITS** is set to a value in the range 1 - 24 the MPOS parameter will be set with the current position of the encoder and will then follow the position of the encoder until the controller is powered down or **ENCODER_BITS** is set to 0. For example if a 12 bit multi-turn encoder with 12 bits per turn is being used the command:

ENCODER_BITS=24
should be put at the start of the program or typed on the command line.

Binary operation.

Daughter boards fitted with FPGA version 1.2 are able to operate in either Bbinary or gray code data format. The **VERIFY** perameter is used for mode selection.

VERIFY ON = 'gray code
VERIFY OFF = 'Binary code
The SSI daughter board returns axis parameter ATYPE of 7. The servo function can be switched on or off with the **SERVO** axis parameter:

>>SERVO=ON
When the servo function is OFF the value in the axis parameter DAC is written to the 12 bit digital to analogue converter.

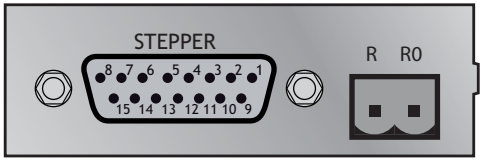
Therefore:

>>DAC=2047	This will set -10 Volts on voltage output when servo is OFF
>>DAC=0	This will set 0 volts on voltage output when servo is OFF
>>DAC=-2048	This will set +10 Volts on voltage output when servo is OFF

Note: *The daughter board hardware inverts the voltage relative to the DAC parameter.*

Differential Stepper Daughter Board

Trio Product Code P280



Description: **ATYPE** parameter for Differential Stepper Daughter Board = 4

The differential stepper daughter board is a stepper daughter board with the output signals provided as differential 5 Volt signals on a 15 way 'D' connector. The daughter board does not feature an encoder port for position verification, but does have a registration input to allow for capture of the number of step pulses when a registration signals arrives.

Connections: The differential stepper daughter board is fitted with a 15 way female 'D' connector:

Pin	Use
1	Step+
2	Direction+
3	Boost+
4	no connection
5	Fault input
6	no connection
7	no connection
8	Screen
9	Step-
10	Direction-
11	Enable+
12	Enable-
13	0V
14	0V
15	Boost-

All outputs are RS422 differential lines without terminating resistors. A 26LS31 line driver is employed. The fault input and registration inputs are single ended opto-isolated inputs that sink approximately 8mA.

WARNING: The Fault input and Registration input are designed for 5 Volt operation. Applying 24 Volts will damage the input circuit.

For 24 volt operation a 4k7 0.5Watt resistor must be added in series with the input.

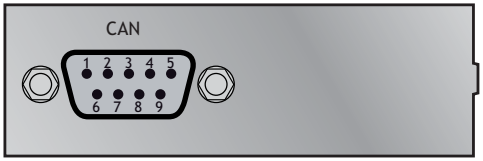
A 2 pin terminal connector is provided for the registration input.

Software Considerations

The differential daughter board uses the same axis gate array as a stepper encoder daughter board as is therefore recognised by the *Motion Coordinator* as this type (ATYPE=4). It does not however have an encoder inputs fitted so may only be used in the VERIFY=OFF mode where the stepper pulses are fed back into the encoder counter circuit.

CAN Daughter Board

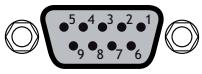
Trio Product Code P290



Description: **COMMSTYPE** parameter for CAN Daughter Board = 20

The CAN daughter board is particularly aimed at providing dedicated CAN channels for controlling servo amplifiers. It features opto-isolation and the ability to support communications at 1M Baud.

CAN Connections The CAN connection of the CAN daughter board is via a 9 way Male 'D' type connector. Pinout is compatible with that suggested by the CAN in AUTOMATION organisation:



Pin	Use
1	no connection
2	CAN_L
3	CAN_GND
4	no connection
5	Shield
6	no connection
7	CAN_H
8	no connection
9	no connection

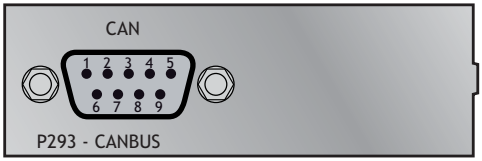
No terminating resistor is fitted internally to the CAN daughter board. A 120 ohm resistor must be fitted between pins 2 and 7 if at the end of the CAN network.

The daughter board CAN channel can be controlled using the Trio BASIC CAN command. The system software has dedicated communication software built-in to support particular communication protocols, such as that for INFRANOR SMT-BD CANbus drives and some CANopen drives.

Note: Not available on MC224 axis expander (P301).

Enhanced CAN Daughter Board

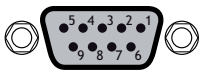
Trio Product Code P293



Description: **COMMSTYPE** parameter for Enhanced CAN Daughter Board = 29

The Enhanced CAN daughter board is particularly aimed at providing dedicated CAN channels for controlling servo amplifiers. It features the new OKI CAN controller, opto-isolation and the ability to support communications at 1M Baud.

CAN Connections The CAN connection of the CAN daughter board is via a 9 way Male 'D' type connector. Pinout is compatible with that suggested by the CAN in AUTOMATION organisation:



Pin	Use
1	no connection
2	CAN_L
3	CAN_GND
4	no connection
5	Shield
6	no connection
7	CAN_H
8	120 Ohm terminating resistor
9	no connection

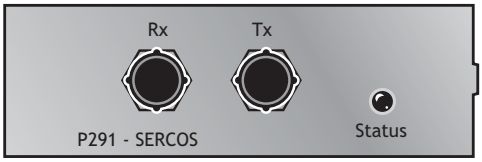
The terminating resistor, fitted internally to the CAN daughter board, is selected by joining pins 7 and 8 of the d-type connector.

The daughter board CAN channel can be controlled using the Trio BASIC CAN command. There is also dedicated communication software built into the *Motion Coordinator* system software for the support of CANbus drives using the CIA CanOpen protocol. Please contact Trio for a list of supported drive manufacturers.

Note: Not available on MC224 axis expander (P301).

SERCOS Daughter Board

Trio Product Code P291



Description: **COMMSTYPE** parameter for SERCOS Daughter Board = 24

The SERCOS daughter board is designed to control up to 8 servo amplifiers using the standard SERCOS fibre-optic ring. It has the benefit of full isolation from the drives and greatly reduces the wiring required.

SERCOS Connections SERCOS is connected by 1mm polymer or glass fibre optic cable terminated with 9mm FSMA connectors. The SERCOS ring is completed by connecting Tx to Rx in a series loop.

LED Indicator The red LED lights to indicate that the ring is open or there is excessive distortion in the signal.

SERCOS Interface **SE**rial **R**ealtime **CO**mmunications **S**ystem

IEC61491 / EN61491

SERCON 816 ASIC

2, 4, 8 and 16 Mbit/sec selectable by software

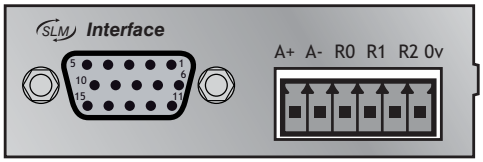
Software settable intensity

Up to 8 axes per ring at 250usec servo update

Note: Not available on MC224 axis expander (P301).

SLM Daughter Board

Trio Product Code P292



Description: **COMMSTYPE** parameter for SLM Daughter Board = 22

The SLM daughter board is aimed at providing digital control channels for servo drives utilising the SLM protocol of Control Techniques. This daughter board has the necessary circuits for controlling between 1 and 3 axes which can be individual drives or a single drive using the CT Multiax concept.

SLM Connections The SLM connector is a 15 way high-density D-type socket.

Pin	Use
1	Com axis 0
2	/Com axis 0
3	Hardware enable
4	0V external
5	24V output to supply SLM
6	Com axis 1
7	/Com axis 1
8	no connection
9	no connection
10	no connection
11	24V output to supply SLM
12	0V external
13	Com axis 2
14	/Com axis 2
15	Earth / Shield

Connect the cable screen to the plug shell (screen/cable clamp) as well as pin 15.

A 6-way terminal is provided for power and registration inputs.

Pin	Function
A+	24V supply for SLM
A-	0V supply for SLM
R0	Axis 0 24V registration capture input
R1	Axis 1 24V registration capture input
R2	Axis 2 24V registration capture input
0V	0V return for registration capture inputs

A 24 volt power source must be applied to A+ and A- to supply the SLM modules. This may be the same supply as is used for the *Motion Coordinator*.

The power requirements are:

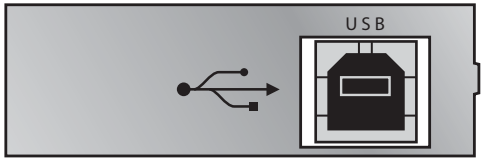
Supply voltage, 24V d.c. +/-10%.

Current consumption, 400mA in-rush, 100mA typical under normal running conditions.

Note: Not available on MC224 axis expander (P301).

USB Daughter Board

Trio Product Code P295



Description: **COMMSTYPE** parameter for USB Daughter Board = 21

The USB daughter board provides a very high speed Universal Serial Bus link between the *Motion Coordinator* and a host PC fitted with a USB port.

Support for this high speed interface is included in Trio's *Motion* Perfect 2 application and an ActiveX (OCX) software library is available which allows developers to include direct access to the *Motion Coordinator* within their own programs. Active X controls are supported by the majority of PC development platforms, including Visual Basic, Delphi, Visual C++, C++ Builder etc.

Note: MC206X and MC224 *Motion Coordinators* have USB port built-in as standard and so do not require this daughter board for USB operation.

Note: Not available on MC224 axis expander (P301).

Ethernet Daughter Board

Trio Product Code P296

Description: **COMMSTYPE** parameter for Ethernet Daughter Board = 25

The Ethernet daughter board provides a high speed link between the *Motion Coordinator* and a host PC via a factory or office local area network (LAN).

An industry standard Telnet terminal can be used to access the *Motion Coordinator's* command line over Ethernet.

The daughter board can run the Modbus TCP protocol as a slave, Thus allowing a Modbus master to read and write integer or floating point values to the global VRs and to access the I/O.

Software Support Support for Ethernet is included in Trio's *Motion* Perfect 2 application and an ActiveX (OCX) software library is available which allows developers to include direct access to the *Motion Coordinator* within their own programs. Active X controls are supported by the majority of PC development platforms, including Visual Basic, Delphi, Visual C++, C++ Builder etc.

Ethernet Interface Physical Layer: 10 Base-T

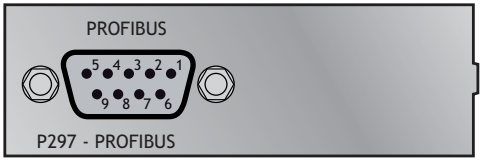
Connector: RJ-45

Protocols: Industry standard RFC compliant TCP/IP stack and protocol support for HTTP server, TCP, UDP, ARP, ICMP and IP.

Note: Not available on MC224 axis expander (P301).

Profibus Daughter Board

Trio Product Code P297



Description: **COMMSTYPE** parameter for Profibus Daughter Board = 23

PROFIBUS is a fieldbus system, which is in widespread use all over the world. With the P297 Profibus Daughter Board and appropriate software on the *Motion Coordinator*, it is possible to connect to a variety of third party Master devices using the Profibus DP protocol.

Connections:

Pin	Use
1	Not Connected
2	Not Connected
3	Data Line B
4	Request To Send
5	0V
6	+5V Output
7	Not Connected
8	Data Line A
9	Not Connected

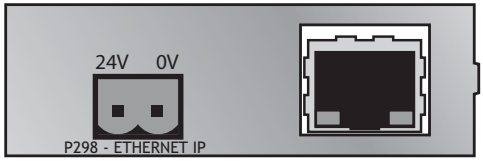
Example: A example Trio BASIC Profibus driver for cyclic data transfer is available from the Trio Web Site **www.triomotion.com** (in the **DOWNLOADS** section, under **Application Notes**).

This program sets up the SPC3 chip for transfer of 16 integers from the master and 16 integers to the master on a cyclic basis as determined by master unit.

Note: Not available on MC224 axis expander (P301).

Ethernet IP Daughter Board

Trio Product Code P298



Description: **COMMSTYPE** parameter for Ethernet Daughter Board = 30

The Ethernet IP daughter board provides an industry standard CIP interface to the *Motion Coordinator* via a factory or office local area network (LAN).

Based on the HMS Anybus® IC chip, the Ethernet IP daughter board has complete Ethernet/IP adaptor class with I/O server, message client and CIP message routing. Additional support is provided for Modbus-TCP V1.0 server.

The daughter board has an integrated FTP server and dynamic web server with SSI script capability. In addition there is an email client with SSI script support

Software Support Third party software must be used to access the functions in the Ethernet IP daughter board. For example, a CIP compliant interface, web browser or Modbus TCP client.

Ethernet Interface Physical Layer: 10 Base-T, 10/100 base-T

Connector: RJ-45

Protocols: Ethernet IP, Modbus TCP, HTML web browser, TCP/IP Socket interface and IT functions.

Note: Not available on MC224 axis expander (P301). Power Connector 24V must be applied to the power connector.