

MultiFlex ETH

1000 Series

Ethernet Motion Controller - Installation Manual

Revision 1.6 - May 2015



Precision MicroControl Corporation

2075-N Corte del Nogal
Carlsbad, CA 92011 * USA

Tel: +1-760-930-0101

Fax: +1-760-930-0222

www.pmccorp.com

Information: info@pmccorp.com

Technical Support: support@pmccorp.com

Limited WARRANTY

All products manufactured by Precision MicroControl Corporation (PMC) are guaranteed to be free from defects in material and workmanship, for a period of **2 years from the date of shipment**. Liability is limited to FOB Factory repair, or replacement, of the product. Other products supplied as part of the system carry the warranty of the manufacturer.

Precision MicroControl Corporation does not assume any liability for improper use or installation or consequential damage.

© Copyright Precision MicroControl Corporation, 2008-2015. All rights reserved.

Information in this document is subject to change without notice.

Intel is a registered trademark of Intel Corporation.

Microsoft, and Windows are registered trademarks of Microsoft Corporation.

Acrobat and Acrobat Reader are registered trademarks of Adobe Corporation.

Precision MicroControl Corp.

2075-N Corte del Nogal
Carlsbad, CA 92011-1415

Tel: +1-760-930-0101

Fax: +1-760-930-0222

Web: www.pmccorp.com

Email: Information: info@pmccorp.com

Technical support: support@pmccorp.com

Sales: sales@pmccorp.com

Table of Contents

Table of Contents	iii
List of Tables	iv
List of Figures	v
Introduction	6
Installation and Setup	7
Controller Installation	7
Ethernet Configuration	8
Network Setting Verification	10
Embedded Web Server	11
Embedded FTP Server	11
Software Installation	13
Installation from PMC's Motion CD	13
Motion Control API Components	13
Verifying Controller and MCAPI Installation	14
Connectors and Pin-Outs	17
Introduction	17
The Motion Controller Board	18
Connector Types and Functions	19
Power Connector J1	19
Push-Button Reset Connector J2	19
Watchdog Relay Connector J3	20
Ethernet and RS-232 Connectors J4 & J5	20
Motion Controller I/O Connectors J8 & J9	20
I/O Interconnection Boards	22
Interconnection board compatibility	23
Motion controller configuration files	24
ICN-100 SCSI Interconnection Board	25
ICN-120 D-Sub Interconnection Boards (ICN-120-0, ICN-120-1, ICN-120-3)	34
ICN-125 D-Sub Interconnection Board	41
ICN-126 D-Sub Interconnection Board	47
ICN-130 DB25 Screw Terminal Board	51
Specifications and Settings	52
Power	52
Optional Plug-On DC-to-DC Power Converter Module	53
Ethernet Interface	53
Serial Port Interface	54
Configuration DIP Switches	54
DIP Switch 2	54
DIP Switch 3	55
CE Compliance	58
RoHS Compliance	58
Mechanical Drawings & Dimensions	58

List of Tables

Table 1. Status LED Definitions	8
Table 2. Motion Controller Board Connectors – Type and Function.....	19
Table 3. Motion Controller Power Connector Signal Assignments – Connector J1	19
Table 4. Motion Controller Reset Signal Assignments – Connector J2	19
Table 5. Motion Controller Watchdog Relay Signal Assignments – Connector J3.....	20
Table 6. Recommended Cables	20
Table 7. Motion Controller Signal Assignments* - Connector J8.....	21
Table 8. Motion Controller Signal Assignments* - Connector J9.....	21
Table 9. Motion Controller & Interconnection Board Compatibility Matrix	23
Table 10. Default FPGA Configuration Files.....	24
Table 11. ICN-100 Connectors – Type and Function	26
Table 12. Recommended Extension Cables.....	26
Table 13. ICN-100 J1 & J2 Signal Assignments* When Used With MultiFlex ETH 1040.....	27
Table 14. ICN-100 J3 & J4 Signal Assignments* When Used With MultiFlex ETH 1040.....	28
Table 15. ICN-100 J1 & J2 Signal Assignments* When Used With MultiFlex ETH 1400.....	29
Table 16. ICN-100 J3 & J4 Signal Assignments* When Used With MultiFlex ETH 1400.....	30
Table 17. ICN-100 J1 & J2 Signal Assignments* When Used With MultiFlex ETH 1440.....	31
Table 18. ICN-100 J3 & J4 Signal Assignments* When Used With MultiFlex ETH 1440.....	32
Table 19. ICN-100 Signal Assignments – Connector J5	33
Table 20. ICN-100 Signal Assignments – Connector J6	33
Table 21. ICN-120 Model Variants – Installed Connectors.....	34
Table 22. ICN-120 Connectors – Type and Function	34
Table 23. Recommended D-sub Extension Cables.....	35
Table 24. ICN-120 Signal Assignments – Connectors J1-J8.....	36
Table 25. ICN-120/125 Analog Command Signal Assignments for AC Sine Commutation Axes – Connectors J1-J8.....	39
Table 26. ICN-120/125/126 Signal Assignments – Connector J9	40
Table 27. ICN-120/125/126 Signal Assignments – Connector J10	40
Table 28. ICN-125 Connectors – Type and Function	41
Table 29. Recommended D-sub Extension Cables.....	42
Table 30. ICN-125 Signal Assignments – Connectors J1-J8.....	43
Table 31. ICN-120/125 Analog Command Signal Assignments for AC Sine Commutation Axes – Connectors J1-J8.....	45
Table 32. ICN-120/125/126 Signal Assignments – Connector J9	46
Table 33. ICN-120/125/126 Signal Assignments – Connector J10	46
Table 34. ICN-126 Connectors – Type and Function	47
Table 35. Recommended D-sub Extension Cables.....	48
Table 36. ICN-126 Signal Assignments – Connectors J1-J8.....	49
Table 37. ICN-120/125/126 Signal Assignments – Connector J9	50
Table 38. ICN-120/125/126 Signal Assignments – Connector J10	50
Table 39. ICN-130 Signal Assignments	51
Table 40. Recommended D-sub Extension Cables.....	51
Table 41. Motion Controller Power Connector Signal Specifications – Connector J1.....	52
Table 42. PWR-100-24 – DC-to-DC Power Converter Module – Connector P1	53
Table 43. PWR-100-48 – DC-to-DC Power Converter Module – Connector P1	53
Table 44. DIP Switch 2 – Functions and Default Settings for all Controller Models.....	54
Table 45. DIP Switch 2 – Baud Rate Selection	55
Table 46. DIP Switch 3 – Functions & Factory Default Settings for MultiFlex ETH 1040, 1400, 1440.....	55
Table 47. DIP Switch 3 – Functions & Factory Default Switch Settings for MultiFlex ETH 1800 When Used With an ICN-125 Series Interconnection Board.....	56
Table 48. DIP Switch 3 – Functions & Factory Default Switch Settings for MultiFlex ETH 1800 When Used With an ICN-120 Series Interconnection Board.....	56
Table 49. DIP Switch 3 – Functions & Factory Default Switch Settings for MultiFlex ETH 1840 When Used With an ICN-125 Series Interconnection Board.....	57
Table 50. DIP Switch 3 – Functions & Factory Default Switch Settings for MultiFlex ETH 1840 When Used With an ICN-120 Series Interconnection Board.....	57

List of Figures

Figure 1. MultiFlex ETH 1000 Series Board Layout	7
Figure 2. Motion Controller Status Indicator LED's.....	8
Figure 3. Local Area Connection Properties	9
Figure 4. TCP/IP Properties.....	9
Figure 5. IPCONFIG query response.....	10
Figure 6. PING Test Response	11
Figure 7. MultiFlex ETH 1000 Series Web Server Home Page.....	12
Figure 8. MultiFlex ETH 1000 Series FTP Server File System.....	12
Figure 9. Motion Control Panel – Prior to Installation	14
Figure 10. Motion Control Panel – After Installation	15
Figure 11. Verifying Motion Controller Interface Properties.....	15
Figure 12. WinControl Session	16
Figure 13. MultiFlex ETH Motion Controllers with ICN-120-3 and ICN-100 Interconnection Boards.....	17
Figure 14. Motion Controller Board – Connectors, Switches and Indicator Lights	18
Figure 15. ICN-100 SCSI Interconnection Board and Connector layout	25
Figure 16. ADAM-3968 Wiring Terminal Board	25
Figure 17. ICN-120 D-sub Interconnection Board and Connector Layout.....	34
Figure 18. ICN-125 D-sub Interconnection Board and Connector Layout.....	41
Figure 19. ICN-126 D-sub Interconnection Board and Connector Layout.....	47
Figure 20. ICN-130 - DB25 Screw Terminal Board for ICN-120/125.....	51
Figure 21. PWR-522 - Triple Output Power Supply.....	52
Figure 22. Mounting Hole Dimensions.....	59
Figure 23. Connector Locations & Dimensions (with ICN-100 and PWR-100 power converter)	60
Figure 24. Vertical Dimensions	61

Introduction

This document provides installation and configuration instructions for the **MultiFlex ETH 1000 Series** Ethernet motion controllers. Documentation for this product series includes the following documents:

- **MultiFlex ETH 1000 Series Quick Start Guide**
- **MultiFlex ETH 1000 Series Installation Manual** (*this document*)
- **MultiFlex ETH 1000 Series User's Manual**
- **Motion Control API (programming) Reference Manual**
- **Motion Control Command Language (MCCL) Reference Manual**

The latest versions of these documents can be downloaded from the Support section of PMC's web site at: www.pmccorp.com/support/mfxeth1000.php.

This manual is intended to serve as an installation reference guide to help users install and initiate communication with the controller. See the **MultiFlex ETH 1000 Series User's Manual** for more detailed configuration, programming and application information.

This manual is divided in to three chapters:

- **Chapter 1: Installation and Setup** – Describes how to install the required PC software and initiate communication with the motion controller.
- **Chapter 2: Connectors and Pin** – Describes the available I/O interconnection options and associated connector pin-outs.
- **Chapter 3: Specifications and Settings** – Describes controller interface settings and specifications.

Installation and Setup

Controller Installation

MultiFlex ETH 1000 Series Ethernet/RS232 motion controllers can be installed and configured either before or after installation of PMC's Motion Control API (Application Programming Interface). A simple set of configuration steps is all that is required to enable communication between the motion controller and a host PC via the Ethernet interface. Once Ethernet communication is initiated, users have the option of commanding and configuring the controller either from a standard web browser or from a PC program via the Motion Control API. Note: In order to use the Motion Control API, you must first complete the steps outlined in the 'Software Installation' section of this manual.

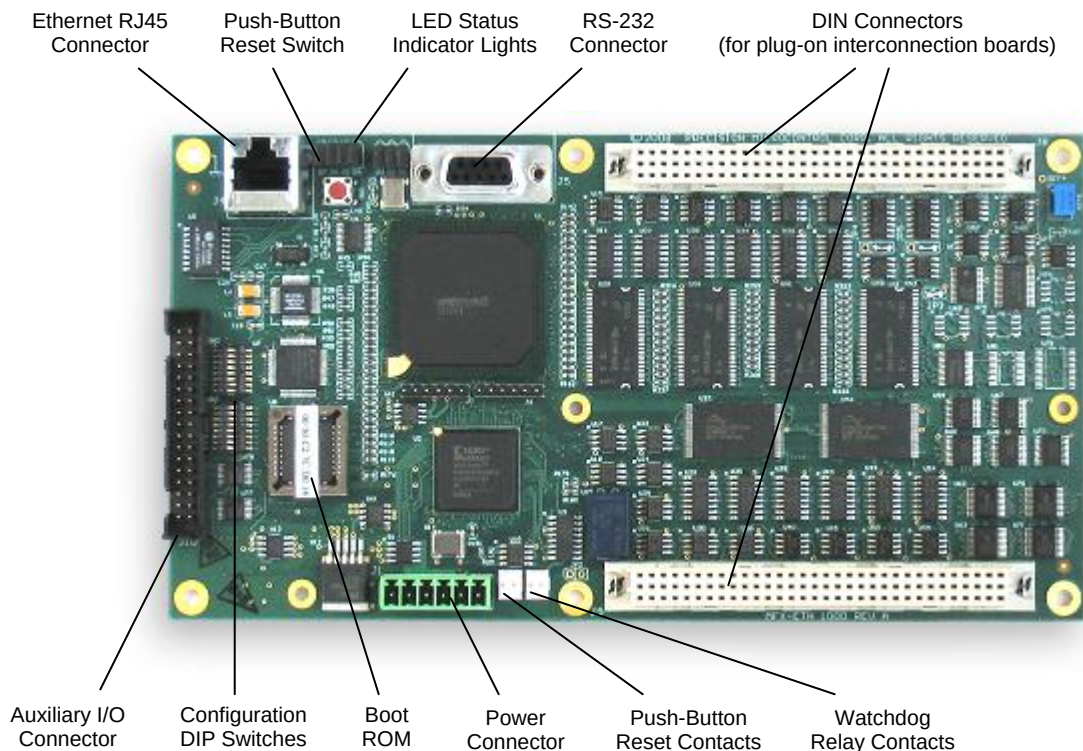


Figure 1. MultiFlex ETH 1000 Series Board Layout

Ethernet Configuration

To begin the installation of the controller, complete these preliminary steps:

- Place the controller near the host computer and apply power to the controller board by inserting a plug from the power supply¹ into connector J1. The **Power** status LED (see Figure 2. Motion Controller Status Indicator) should illuminate immediately and the **Run** status LED should illuminate after a 2-3 second delay which time you will also hear a “clicking” sound due to the closure of the watchdog relay. For power supply requirements, see the Specifications chapter of this manual. For connector and wiring information, see Table 2. Motion Controller Board Connectors – Type and Function.
- Attach a CAT5e Ethernet cable to the host computer network adaptor. **Do not attach the cable to the controller board at this point.**

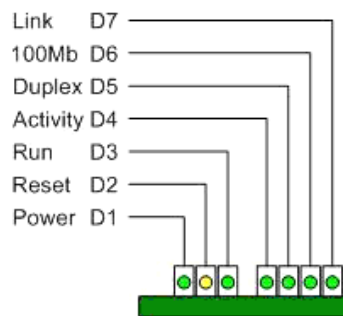


Figure 2. Motion Controller Status Indicator LED's

Table 1. Status LED Definitions

LED #	Color	Description
D1	Green	Board is powered, power OK
D2	Yellow	Reset (controller in Reset state, watchdog relay de-energized)
D3	Green	Run (controller successfully booted & executing code, watchdog relay energized)
D4	Green	Ethernet/TCP-IP packets being transmitted
D5	Green	Full Duplex is enabled
D6	Green	100 MB Fast Ethernet is enabled
D7	Green	Link-layer (physical) Ethernet connection established

To configure the Ethernet network on the host computer, complete the following steps:

- Open the **Windows Control Panel** and select **Network Connections**. Select the **Local Area Connection** with a status of “**Network cable unplugged**” since you have not yet attached the Ethernet cable to the controller board at this point.
- Scroll down in the Local Area Connection Properties list box and select **Internet Protocol (TCP/IP)** and then select the **Properties** button.

¹ If power is to be provided by any means other than the triple-output supply provided by PMC, consult the power requirements in the Specifications chapter of this document.



Figure 3. Local Area Connection Properties

- In the Internet Protocol (TCP/IP) Properties dialog box, check the “**Use the following IP Address**” button and enter the following data in the dialog box

IP address: 192.168.1.10
Subnet mask: 255.255.255.0

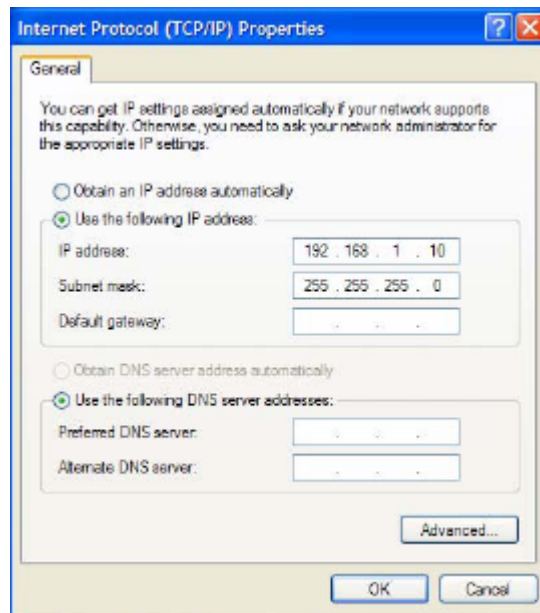


Figure 4. TCP/IP Properties

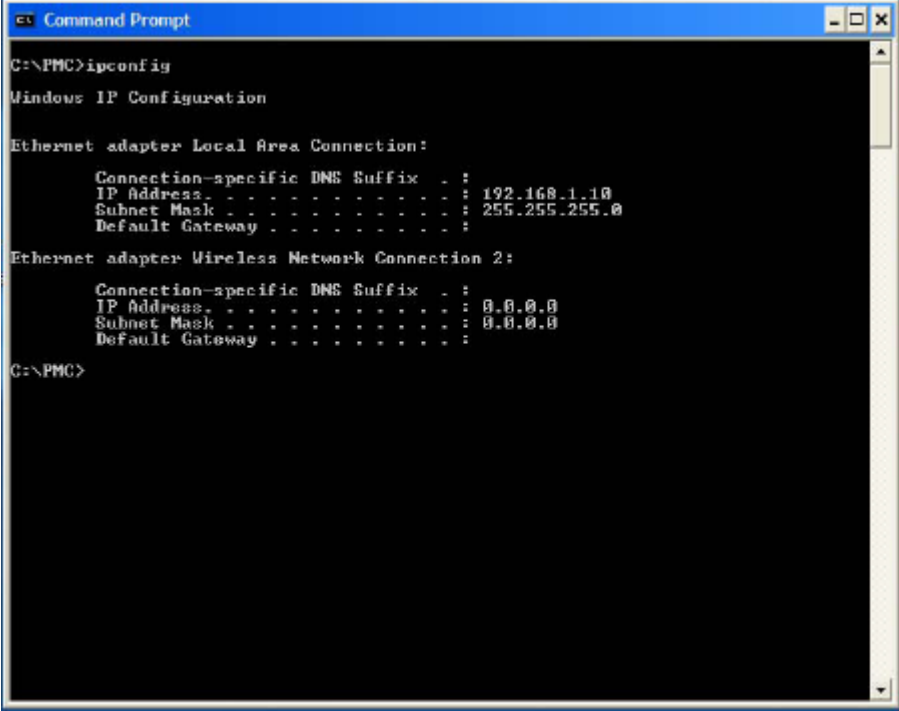
Following this step, all of the dialog boxes that have been opened to this point can be closed by selecting “OK”.

Network Setting Verification

After performing the steps outlined in the Network Configuration section, the controller can be connected to the host computer by inserting the CAT5e network cable into connector J4. After a short delay, the **Link** status LED on the controller should illuminate. Depending upon the characteristics of the host computer network, the **100Mb** and **Duplex** status LEDs may or may not be illuminated.

The network settings applied in the previous section can now be verified by performing the following steps.

- Open a DOS command prompt window on the host computer.
- Type "**ipconfig**" at the command prompt, followed by the return key.
- A response similar to that shown in Figure 5. IPCONFIG query responses should appear for the Local Area Connection, indicating correct setting of the static IP address and Subnet mask from the previous section.
- If this step results in a different network configuration response, repeat the steps indicated in the Network Configuration section.
- Communication with the controller over the network can be confirmed by typing "**ping 192.168.1.100**", followed by the return key.
- The result should be four ping packet responses from the controller as shown in Figure 5. IPCONFIG query response.
- If the ping response times out, check the network settings, cable connections and status LED indicators on the controller board.



```
C:\PMC>ipconfig

Windows IP Configuration

Ethernet adapter Local Area Connection:

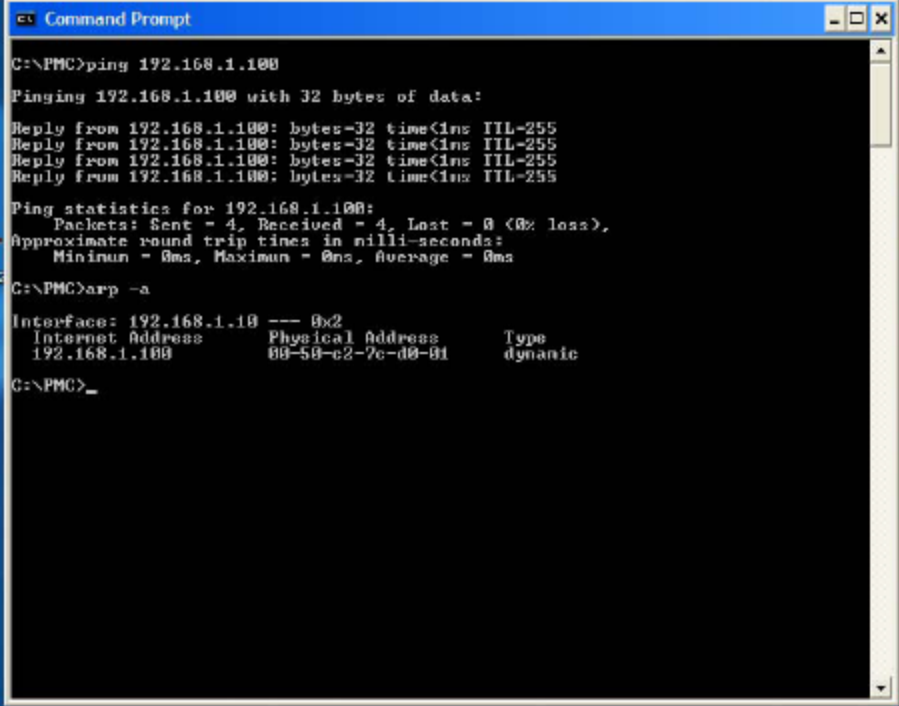
    Connection-specific DNS Suffix  . : 
    IP Address . . . . . : 192.168.1.10
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 

Ethernet adapter Wireless Network Connection 2:

    Connection-specific DNS Suffix  . : 
    IP Address . . . . . : 0.0.0.0
    Subnet Mask . . . . . : 0.0.0.0
    Default Gateway . . . . . : 

C:\PMC>
```

Figure 5. IPCONFIG query response



```

C:\PMC>ping 192.168.1.100
Pinging 192.168.1.100 with 32 bytes of data:
Reply from 192.168.1.100: bytes=32 time<1ms TTL=255
Reply from 192.168.1.100: bytes=32 time<1ms TTL=255
Reply from 192.168.1.100: bytes=32 time<1ms TTL=255
Reply from 192.168.1.100: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.1.100:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\PMC>arp -a
Interface: 192.168.1.10 --- 0x2
    Internet Address      Physical Address         Type
    192.168.1.100         00-50-c2-7c-d0-01       dynamic

C:\PMC>_

```

Figure 6. PING Test Response

Embedded Web Server

If the configuration and verification steps have been performed successfully, a web browser may now be opened on the host computer and communication with the controller's embedded web server can begin, by entering <http://192.168.1.100/index.html> in a web browser's URL address box.

The web pages served up by the controller's embedded web server provide the following basic functionality:

- Links to online support resources such as product downloads and documentation (if internet connectivity is available on the host computer)
- Basic motion control of servo and stepper axes
- System configuration utilities for:
 - o Network address management
 - o Firmware update installation
 - o Logic (fpga) update installation
 - o Controller board re-configuration utilities

More information about the above functions is found on the web pages themselves.

Embedded FTP Server

The controller provides an embedded FTP server for file transfer to and from the controller that can be accessed by a remote FTP client such as Filezilla (no username & no password required) by connecting to <ftp://192.168.1.100>. FTP file transfer can provide a fast and convenient alternative for updating controller configuration files and sharing data between the controller and a PC application.

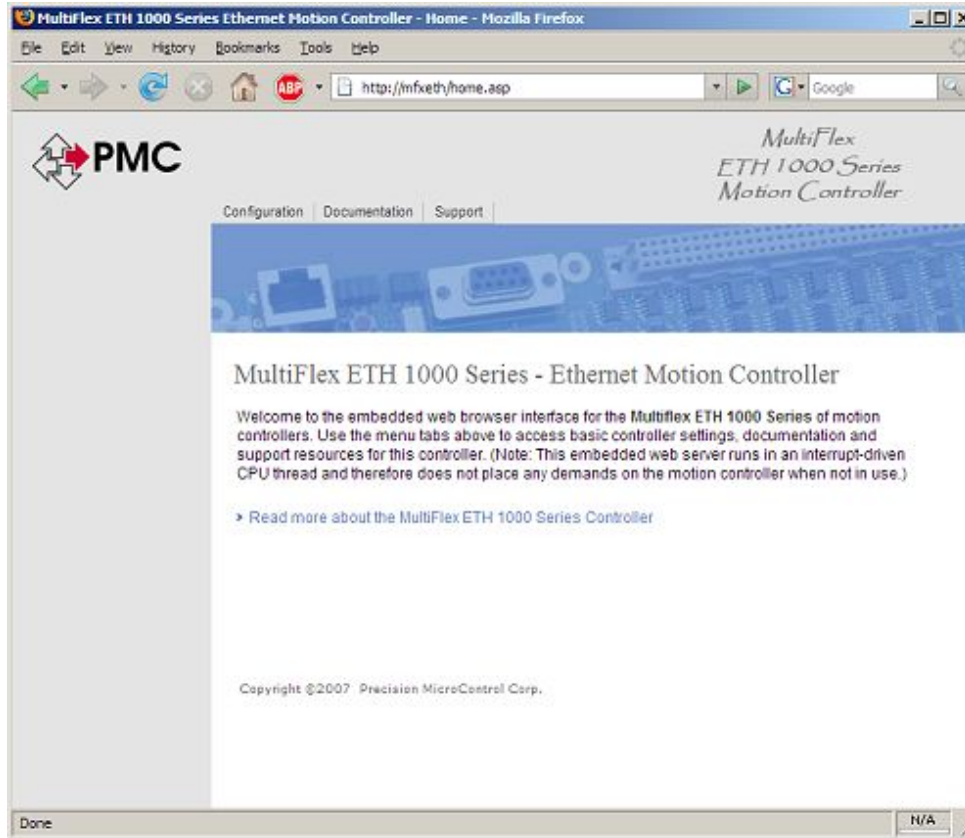


Figure 7. MultiFlex ETH 1000 Series Web Server Home Page

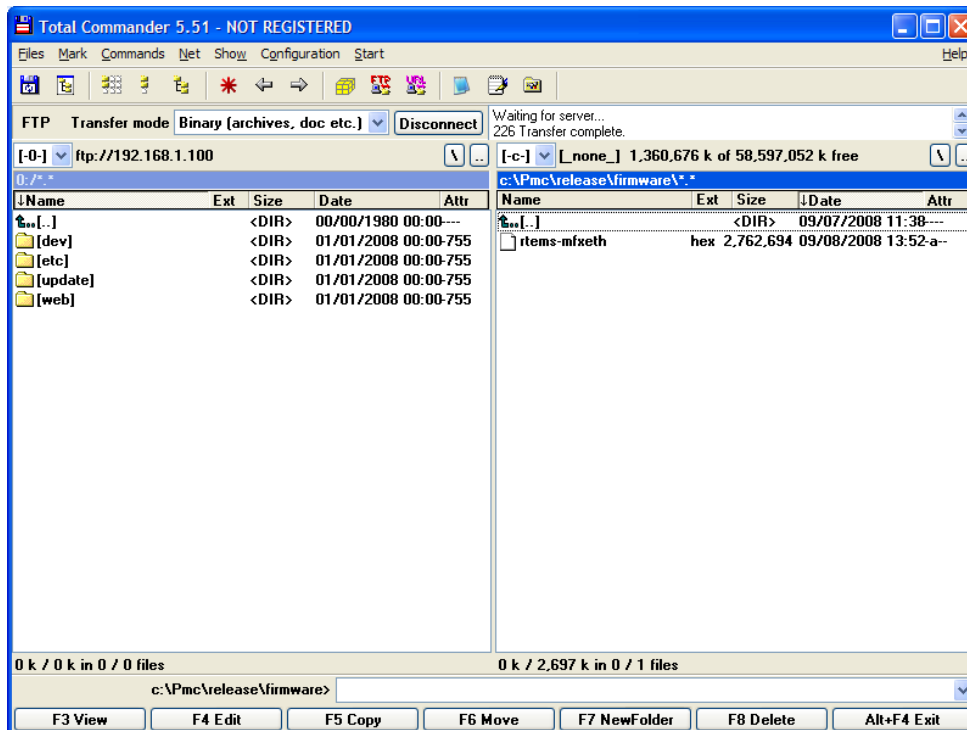


Figure 8. MultiFlex ETH 1000 Series FTP Server File System

Software Installation



Windows 7/XP/2000 systems - prior to installing PMC's **Motion Control API** (MCAPI) software and drivers, the **user must be logged on as the system administrator**.



The Motion Control API (MCAPI) software is available on PMC's **Motion CD**. The latest version of the MCAPI can be downloaded from the Support section of PMC's web site at:

www.pmccorp.com/support/mfxeth1000.php

Installation from PMC's Motion CD

To install the Motion Control API (MCAPI) software (which includes: device drivers, function library, controller setup utilities, communication utilities, and program samples), place the PMC Motion CD into the host computer's CD drive and wait for the CD menu to appear. If the CD menu does not appear within a few seconds, browse the CD and run the file STARTUP.EXE.



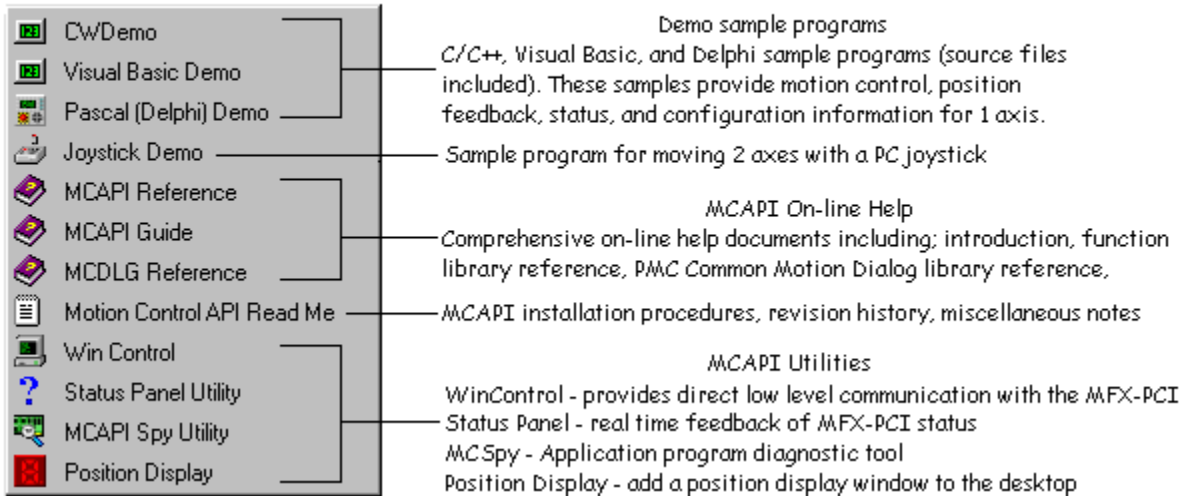
Prior to installing and configuring the controller and the MCAPI, the **user must be logged on as the system administrator**.

When the Motion CD menu appears, select "**Software & Drivers**" and proceed to the appropriate Motion Control API installation.

Motion Control API Components

Upon successful installation of PMC's Motion Control API, the Motion Control Panel will be available from the Windows Control Panel and the following components will be available from the Windows **Start** menu (Start \Programs\ Motion Control). For additional information on individual Motion Control API (MCAPI) components, please refer to the appropriate sections of the User Manual.

MCAPAPI Components



Note: The above components may appear in a different menu order than what is shown above. To rearrange the above menu items, simply drag the items to place them in the desired order.

Verifying Controller and MCAPAPI Installation

If the controller has previously been installed on this computer, proceed to the section titled **Installation Verification**.

Initial installation of motion controller

In the Windows Control Panel, select **Motion Control**. The following dialog box should appear, indicating that the controller has not been identified to the system yet. To install the controller, select the **Add** button to launch the New Controller Wizard which will lead you through the installation process.

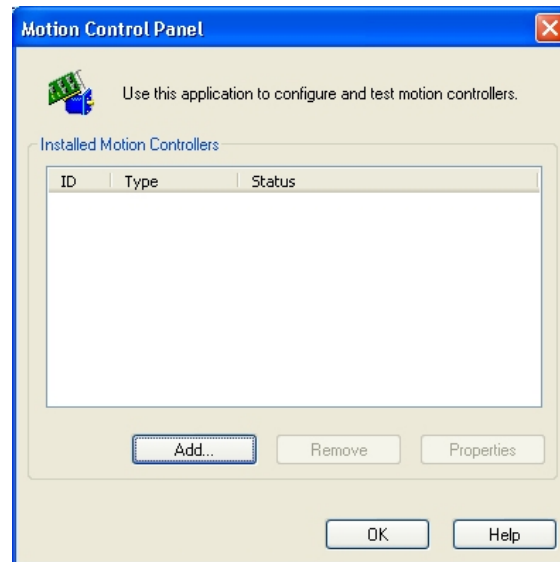


Figure 9. Motion Control Panel – Prior to Installation

Once installation is complete, the controller should appear in the Motion Control Panel as follows:

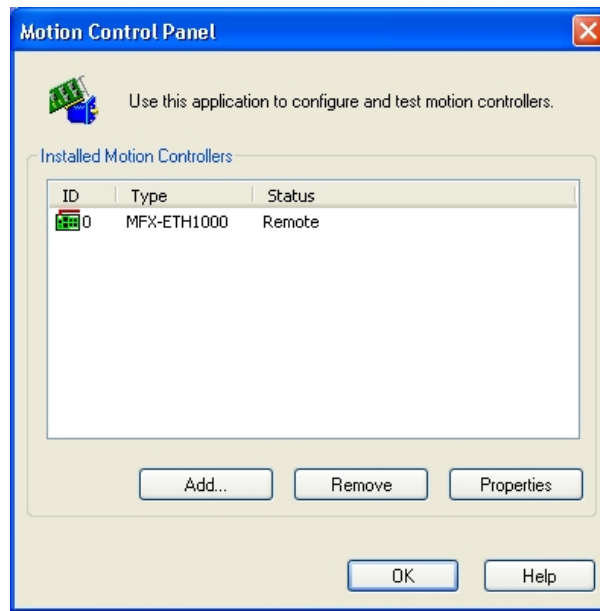


Figure 10. Motion Control Panel – After Installation

Installation verification

Once a MultiFlex ETH 1000 series controller has been installed, the network settings can be verified by clicking the **Properties** button in the Motion Control Panel and selecting the **Interface** tab. The following values should be reported, as shown in Figure 11.

IP address: **192.168.1.100**
 Ascii Socket #: **23**
 Binary Socket #: **9100**

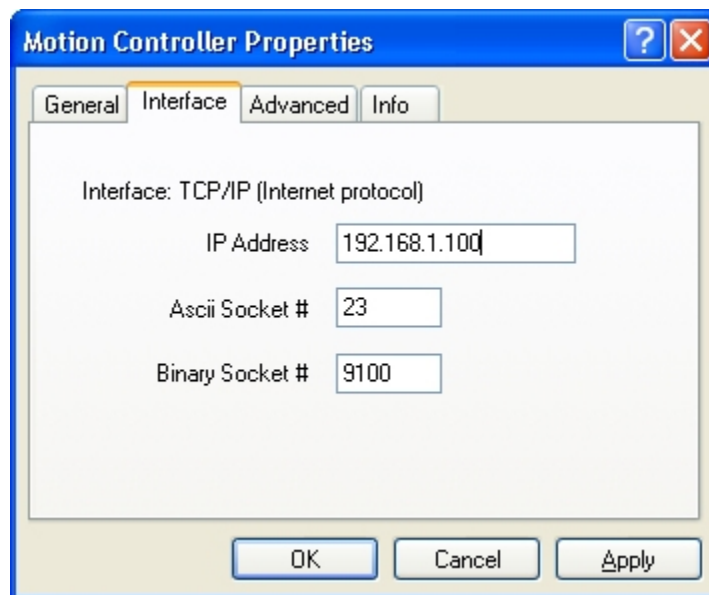


Figure 11. Verifying Motion Controller Interface Properties

The Motion Control API version information can likewise be verified by clicking the **Info** tab in the Motion Controller Properties dialog box.

Verification of PC-to-Controller Communication

The final step to verifying the installation of the controller is to launch one of the provided application programs and verify that it opens properly. From the Windows **Start** menu select:

\Programs\Motion Control\Motion Control API\Win Control

If the Motion Control API software has been properly installed and basic communication has been verified, the WinControl program should open and report the controller's firmware version.

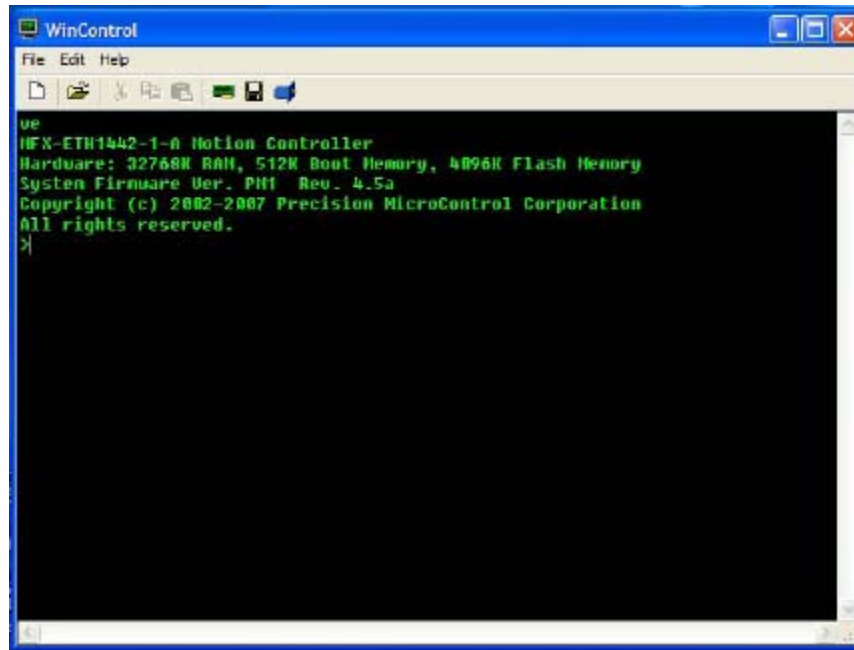
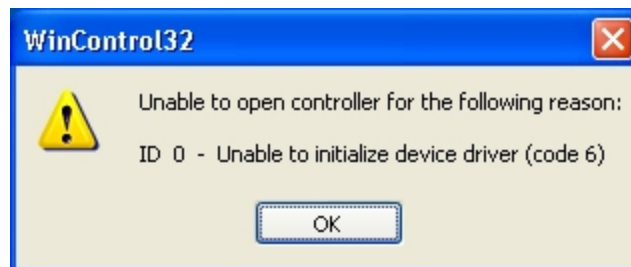


Figure 12. WinControl Session

If the following error message is displayed, either the computer or MCAPAPI or the controller is not communicating properly and you should contact PMC Technical Support.



Connectors and Pin-Outs

Introduction

A variety of interconnection options are available to connect MultiFlex ETH 1000 Series Ethernet motion controllers to drives, encoders and other external devices. PMC offers a series of plug-on interconnection boards which mount directly onto the controller board via two 96-pin DIN connectors. This design eliminates the need for cables between the controller and interconnection board, which enhances system robustness and reduces system cost and assembly time. Users also have the option of designing a custom interconnection board to meet their own unique interconnection requirements.

The **ICN-120/125/126** series D-sub interconnection boards allow the use of low-cost off-the-shelf or user-built D-sub cables. The **ICN-130** is a 25-position screw terminal board which provides users of ICN-120/125/126 with convenient screw terminal connections for initial prototyping or low-volume applications.

Another option is offered by the **ICN-100** SCSI interconnection board, which has high-density SCSI connectors that are pin-compatible with PMC's MultiFlex PCI 1000 series motion controllers. To maintain hardware compatibility across the MultiFlex product family, the ICN-100 allows users to swap equivalent MultiFlex Ethernet and PCI controller models without making any wiring changes. The **ADAM-3968** screw terminal board (also compatible with the MultiFlex PCI) provides ICN-100 users with convenient screw terminal connections.

The **I/O Interconnection Boards** section on the following pages contains more details and pin-out tables for each of the interconnection options described above.

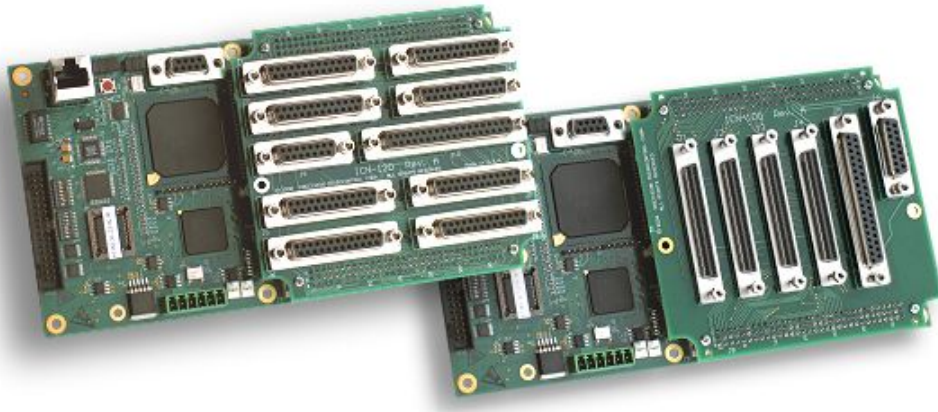


Figure 13. MultiFlex ETH Motion Controllers with ICN-120-3 and ICN-100 Interconnection Boards

The Motion Controller Board

Figure 14 illustrates the layout of the motion controller board and location and label for each of the major connectors, as well as the status LED indicators and configuration DIP switches.

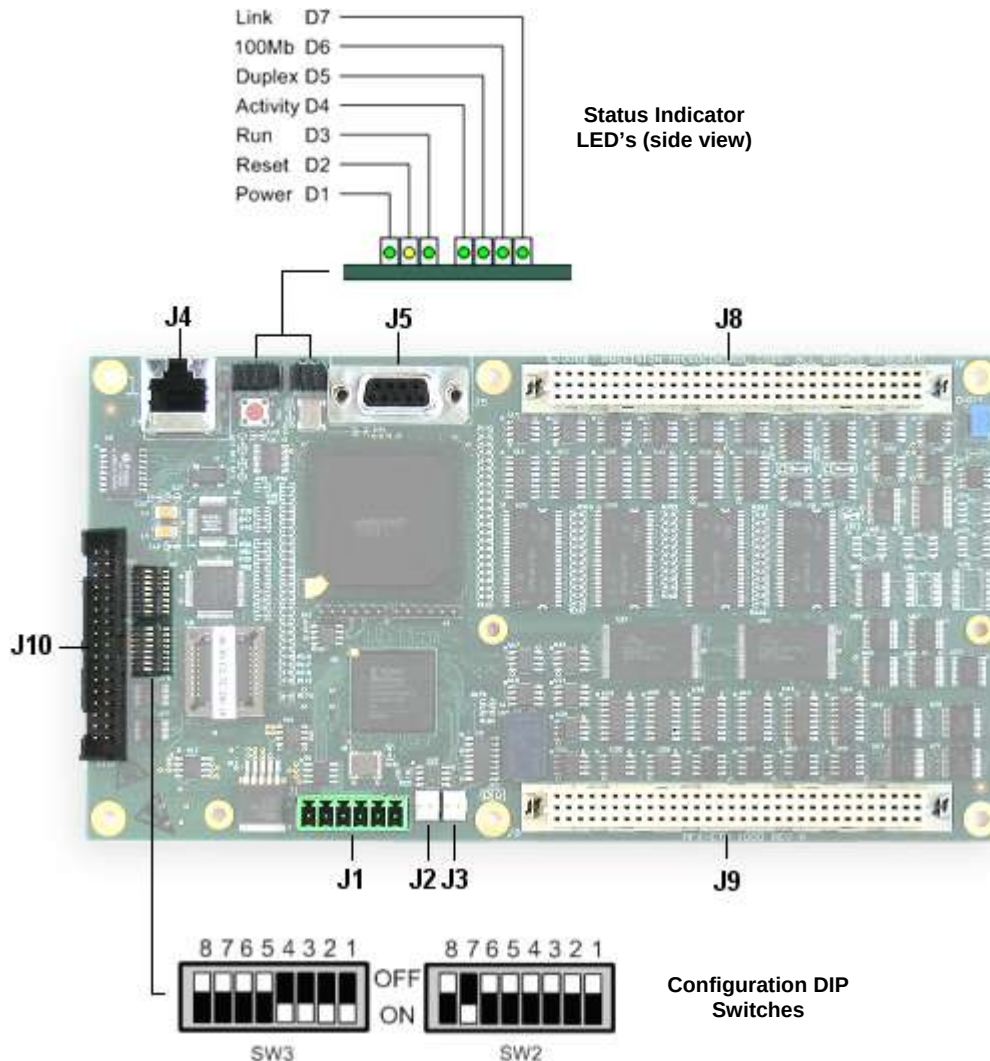


Figure 14. Motion Controller Board – Connectors, Switches and Indicator Lights

The functions and pin-outs for the connectors shown in Figure 14 are summarized in the following tables. The functions and settings for the DIP switches are described on page 54 in the **Specifications and Settings** chapter of this document.



For I/O schematics and other information about how to connect the controller's I/O signals to external devices, see the **MultiFlex ETH 1000 Series User's Manual**.

Connector Types and Functions

Table 2. Motion Controller Board Connectors – Type and Function

Connector	Type	Function
J1	6-position Phoenix power connector*	Power Input
J2	2-position header	Hardware reset (re-boot)
J3	2-position header	Watchdog relay
J4	RJ45 modular jack receptacle	10/100 Ethernet
J5	DB15 female	RS-232
J6	6-pin header	Reserved
J7	6-pin header	Reserved
J8	96 Pin DIN	Mates with J7 of ICN-100/120/125
J9	96 Pin DIN	Mates with J8 of ICN-100/120/125
J10	34-pin header	Auxiliary Digital I/O (reserved for custom use - contact factory)

Power Connector J1

Table 3. Motion Controller Power Connector Signal Assignments – Connector J1

Pin #	Signal	Specification
1	+12 V	+/- 5% 1A min.
2	-12 V	+/- 5% 1A min.
3	+5 V	+/- 5% 2A min.
4		
5	GND	
6		

Power Connector Mating Plug Type: 6-position 3.81mm (0.150") pitch Phoenix Contact P/N: 1803617 (PMC part number: CNN-006)

Push-Button Reset Connector J2

Table 4. Motion Controller Reset Signal Assignments – Connector J2

Pin #	Signal
1	Reset
2	GND

The motion controller will be reset (re-booted) when the two contact pins on connector J2 are shorted together (closed).

J2 Mating connector:

Pin Housing: Molex P/N 22-01-3027. Crimp pin: Molex P/N 08-50-0114

* Mating power connector: 6-position Phoenix power plug (3.81mm (0.150") pitch). PMC P/N **CNN-006**, Phoenix Contact P/N: **1803617**

Watchdog Relay Connector J3

Table 5. Motion Controller Watchdog Relay Signal Assignments – Connector J3

Pin #	Signal
1	Contact 1
2	Contact 2

The watchdog relay will be energized anytime the Run LED (D3) is on, indicating that the controller is operating and able to execute code. When this relay is energized, the normally open contact (J3 pin 1) will be connected with the relay 'common' (J3 pin 2). The user can bring these signals out to an external device to allow the external device to monitor the basic operating status of the motion controller.

J3 Mating connector:

Pin Housing: Molex P/N 22-01-3027

Crimp pin: Molex P/N 08-50-0114

Ethernet and RS-232 Connectors J4 & J5

Table 6. Recommended Cables

Connector	Signal	Type	Cable P/N ²
J4	Ethernet	RJ45	#15187
J5	RS-232	DB9	#25211

Motion Controller I/O Connectors J8 & J9

All motion controller I/O is available on connectors J8 and J9 whose pin-outs are listed in the following tables.

² Representative part numbers for cable assemblies from www.C2G.com (Cables-To-Go).

Table 7. Motion Controller Signal Assignments* - Connector J8

Pin #	Signal	Pin #	Signal	Pin #	Signal
A1	Analog Ground	B1	Axis 7 Analog Servo Command	C1	Axis 5 Analog Servo Command
A2	Analog Ground	B2	Axis 3 Analog Servo Command	C2	Axis 1 Analog Servo Command
A3	Analog Ground	B3	Axis 4 Analog Servo Command	C3	Axis 2 Analog Servo Command
A4	Analog Ground	B4	Axis 8 Analog Servo Command	C4	Axis 6 Analog Servo Command
A5	Analog Ground	B5	Analog In 7	C5	Analog In 8
A6	Analog Ground	B6	Analog In 5	C6	Analog In 6
A7	Analog Ground	B7	Analog In 3	C7	Analog In 4
A8	Analog Ground	B8	Analog In 1	C8	Analog In 2
A9	GND	B9	GND	C9	GND
A10	VCC	B10	VCC	C10	VCC
A11	+5V	B11	+5V	C11	+5V
A12	PIO6	B12	-12V	C12	+12V
A13	Axis 3/7 Amp Fault Return	B13	-12V	C13	+12V
A14	Axis 3/7 Home Return	B14	Axis 3/7 Amp Fault	C14	PIO7
A15	Axis 3/7 Limit- Return	B15	Axis 7 Home	C15	Axis 3 Home
A16	Axis 3/7 Limit+ Return	B16	Axis 7 Limit-	C16	Axis 3 Limit-
A17	Axis 1/5 Amp Fault Return	B17	Axis 7 Limit+	C17	Axis 3 Limit+
A18	Axis 1/5 Home Return	B18	Axis 1/5 Amp Fault Input	C18	PIO5
A19	Axis 1/5 Limit- Return	B19	Axis 5 Home	C19	Axis 1 Home
A20	Axis 1/5 Limit+ Return	B20	Axis 5 Limit-	C20	Axis 1 Limit-
A21	Axis 4 Encoder Z+	B21	Axis 5 Limit+	C21	Axis 1 Limit+
A22	Axis 4 Encoder Z-	B22	Axis 4 Encoder B+	C22	Axis 4 Encoder A+
A23	Axis 3 Encoder Z+	B23	Axis 4 Encoder B-	C23	Axis 4 Encoder A-
A24	Axis 3 Encoder Z-	B24	Axis 3 Encoder B+	C24	Axis 3 Encoder A+
A25	Axis 2 Encoder Z+	B25	Axis 3 Encoder B-	C25	Axis 3 Encoder A-
A26	Axis 2 Encoder Z-	B26	Axis 2 Encoder B+	C26	Axis 2 Encoder A+
A27	Axis 1 Encoder Z+	B27	Axis 2 Encoder B-	C27	Axis 2 Encoder A-
A28	Axis 1 Encoder Z-	B28	Axis 1 Encoder B+	C28	Axis 1 Encoder A+
A29	Axis 3 PWM or Axis 7 Half Current	B29	Axis 1 Encoder B-	C29	Axis 1 Encoder A-
A30	Axis 4 PWM or Axis 8 Half Current	B30	Axis 3/4 Encoder Reference	C30	Axis 1/2 Encoder Reference
A31	Axis 2 Amp Enable	B31	Axis 2 PWM or Axis 6 Half Current	C31	Axis 1 PWM or Axis 5 Half Current
A32	Axis 1 Amp Enable	B32	Axis 3 Amp Enable	C32	Axis 4 Amp Enable

* **Note:** Some signals are optional and are not available with all controller models

Table 8. Motion Controller Signal Assignments* - Connector J9

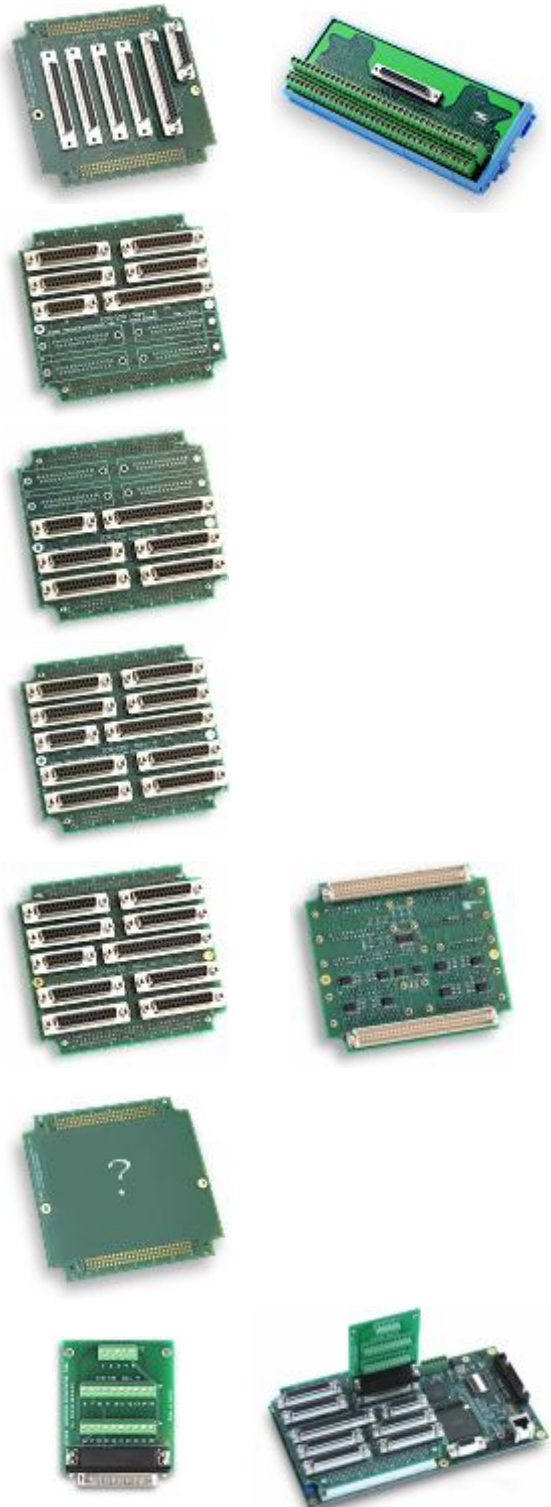
Pin #	Signal	Pin #	Signal	Pin #	Signal
A1	Axis 5 Driver Disable	B1	Axis 5 Dir/CCW Pulse Command	C1	Axis 5 Step/CW Pulse Command
A2	Axis 6 Driver Disable	B2	Axis 6 Dir/CCW Pulse Command	C2	Axis 6 Step/CW Pulse Command
A3	Axis 7 Driver Disable	B3	Axis 7 Dir/CCW Pulse Command	C3	Axis 7 Step/CW Pulse Command
A4	Axis 8 Driver Disable	B4	Axis 8 Dir/CCW Pulse Command	C4	Axis 8 Step/CW Pulse Command
A5	Axis 5 Encoder Z+	B5	Axis 5 Encoder B+	C5	Axis 5 Encoder A+
A6	Axis 5 Encoder Z-	B6	Axis 5 Encoder B-	C6	Axis 5 Encoder A-
A7	Axis 6 Encoder Z+	B7	Axis 6 Encoder B+	C7	Axis 6 Encoder A+
A8	Axis 6 Encoder Z-	B8	Axis 6 Encoder B-	C8	Axis 6 Encoder A-
A9	Axis 7 Encoder Z+	B9	Axis 7 Encoder B+	C9	Axis 7 Encoder A+
A10	Axis 7 Encoder Z-	B10	Axis 7 Encoder B-	C10	Axis 7 Encoder A-
A11	Axis 8 Encoder Z+	B11	Axis 8 Encoder B+	C11	Axis 8 Encoder A+
A12	Axis 8 Encoder Z-	B12	Axis 8 Encoder B-	C12	Axis 8 Encoder A-
A13	SPI Clock	B13	SPI Digital Input	C13	SPI Digital Output
A14	Axis 5/6 Encoder Reference	B14	Axis 2 Limit+	C14	Axis 6 Limit-
A15	Axis 7/8 Encoder Reference	B15	Axis 6 Limit+	C15	Axis 2 Limit-
A16	SPI Chip Select	B16	Axis 2/6 Limit+ Return	C16	Axis 2/6 Limit- Return
A17	Digital Out 0	B17	Digital In 0	C17	Axis 2 Home
A18	Digital Out 1	B18	Digital In 1	C18	Axis 6 Home
A19	Digital Out 2	B19	Digital In 2	C19	Axis 2/6 Home Return
A20	Digital Out 3	B20	Digital In 3	C20	Axis 2/6 Amp Fault
A21	Digital Out 4	B21	Digital In 4	C21	Axis 2/6 Amp Fault Return
A22	Digital Out 5	B22	Digital In 5	C22	Axis 4 Limit+
A23	Digital Out 6	B23	Digital In 6	C23	Axis 8 Limit+
A24	Digital Out 7	B24	Digital In 7	C24	Axis 4/8 Limit+ Return
A25	Digital Out 8	B25	Digital In 8	C25	Axis 8 Limit-
A26	Digital Out 9	B26	Digital In 9	C26	Axis 4 Limit-
A27	Digital Out 10	B27	Digital In 10	C27	Axis 4/8 Limit- Return
A28	Digital Out 11	B28	Digital In 11	C28	Axis 4 Home
A29	Digital Out 12	B29	Digital In 12	C29	Axis 8 Home
A30	Digital Out 13	B30	Digital In 13	C30	Axis 4/8 Home Return
A31	Digital Out 14	B31	Digital In 14	C31	Axis 4/8 Amp Fault
A32	Digital Out 15	B32	Digital In 15	C32	Axis 4/8 Amp Fault Return

* **Note:** Some signals are optional and are not available with all controller models

I/O Interconnection Boards

Below is a summary of the available interconnection boards. More detailed descriptions and connector pin-out tables are available on the following pages. **See Table 9 for a list of compatible controller models.**

- **ICN-100** – SCSI interconnection board provides 100% pin-compatibility with the MultiFlex PCI controller. To be used with ADAM-3968 wiring terminal board (shown at right) or any compatible SCSI breakout board.
- **ICN-120-0** – D-sub interconnection board for use with low-cost D-sub cables. Features a 6-connector assembly for applications with no more than 4 axes of closed-loop control.
- **ICN-120-1** – D-sub interconnection board for use with low-cost D-sub cables. Features a 6-connector assembly for applications with no more than 4 axes of closed-loop control.
- **ICN-120-3** – D-sub interconnection board for use with low-cost D-sub cables. Features a 10-connector assembly for applications with up to 8 axes of closed-loop control.
- **ICN-125, ICN-126** – D-sub interconnection boards are offered as an option to the ICN-120 boards to provide additional opto-isolated inputs and open-collector outputs for users of the 8 axis MultiFlex ETH 1080, 1440, 1800 models and 12 axis 1840 models.
- **ICN-1xxx** – Custom plug-on interconnection boards can be designed by PMC or a user to connect seamlessly to existing external devices and meet the particular needs of an application (contact PMC for details).
- **ICN-130** – DB25 screw terminal board provides convenient access to the 25-pin D-sub axis connectors on the ICN-120/125 series plug-on D-sub interconnection boards.



Interconnection board compatibility

Because of the wide range of capabilities offered by the different models within the MultiFlex ETH 1000 series, not all interconnection boards can be used with all controller models. Consult Table 9 and Table 10 to determine which interconnection boards are compatible with each controller model.

Table 9. Motion Controller & Interconnection Board Compatibility Matrix

Motion Controller Part Number	ICN-100 SCSI Interconnect Board	ICN-120-0 D-Sub Interconnect Board	ICN-120-1 D-Sub Interconnect Board	ICN-120-3 D-Sub Interconnect Board	ICN-125 D-Sub Interconnect Board	ICN-126 D-Sub Interconnect Board	ICN-xxx Custom Interconnect Board
MFX-ETH-1040-0	✓			✓			✓
MFX-ETH-1040-1	✓			✓			✓
MFX-ETH-1040-2	✓			✓			✓
MFX-ETH-1040-3	✓			✓			✓
MFX-ETH-1080-0				✓ ¹		✓	✓
MFX-ETH-1080-1				✓ ¹		✓	✓
MFX-ETH-1080-2				✓ ¹		✓	✓
MFX-ETH-1080-3				✓ ¹		✓	✓
MFX-ETH-1400-0	✓	✓		✓			✓
MFX-ETH-1400-2	✓	✓		✓			✓
MFX-ETH-1440-0	✓	✓		✓	✓ ²	✓ ²	✓
MFX-ETH-1440-1	✓			✓	✓ ²	✓ ²	✓
MFX-ETH-1440-2	✓	✓		✓	✓ ²	✓ ²	✓
MFX-ETH-1440-3	✓			✓	✓ ²	✓ ²	✓
MFX-ETH-1800-0				✓ ¹	✓		✓
MFX-ETH-1800-2				✓ ¹	✓		✓
MFX-ETH-1802-0	✓			✓ ¹	✓		✓
MFX-ETH-1802-2	✓			✓ ¹	✓		✓
MFX-ETH-1840-0				✓ ¹	✓		✓
MFX-ETH-1840-2				✓ ¹	✓		✓

¹ Requires the user to install the ICN-120 FPGA configuration file, see Table 10. Default FPGA Configuration Files, below. Also provides 16 fewer channels of opto-isolated I/O than the ICN-125 – see the resulting pin-outs in Table 24. ICN-120 Signal Assignments – Connectors J1-J8.

² Requires the user to install the ICN-125 or ICN-126 FPGA configuration file, see Table 10. Default FPGA Configuration Files, below.

Motion controller configuration files

Each type of model within the MultiFlex ETH 1000 series product range is shipped from the factory with a default FPGA configuration file loaded on the controller. Each MultiFlex ETH model has one or more distinct configuration files unique to that model. Not all PMC plug-on interconnection boards are compatible with every configuration file. For a list of the default configuration files and compatible interconnection boards, see **Table 10. Default FPGA Configuration Files** (below).



Changing the controller's FPGA configuration file is a one-time procedure that is fast and easy to do in the field. For detailed instructions and to confirm what configuration file is installed on your controller, click the "Configuration" menu tab of the controller's embedded web server described in Chapter 1 of this manual. The installed configuration file can be viewed from the "Configuration and Update Utilities" menu tab.

PMC Tech Note **TN1074 - MultiFlex ETH 1000 Series Configuration and Update Management** offers more detailed information about how to change the configuration file installed in your controller.

Table 10. Default FPGA Configuration Files

Motion Controller Part Number	Default FPGA Configuration File	For Use With Interconnection Board(s)	Optional FPGA Configuration File	For Use With Interconnection Board(s)
MFX-ETH-1040-0	Mfxeth1040_0_120.hex	ICN-100/120		
MFX-ETH-1040-1	Mfxeth1040_1_120.hex	ICN-100/120		
MFX-ETH-1040-2	Mfxeth1040_2_120.hex	ICN-100/120		
MFX-ETH-1040-3	Mfxeth1040_3_120.hex	ICN-100/120		
MFX-ETH-1080-0	Mfxeth1080_0_126.hex	ICN-126	Mfxeth1080_0_120.hex	ICN-120
MFX-ETH-1080-1	Mfxeth1080_1_126.hex	ICN-126	Mfxeth1080_0_120.hex	ICN-120
MFX-ETH-1080-2	Mfxeth1080_2_126.hex	ICN-126	Mfxeth1080_0_120.hex	ICN-120
MFX-ETH-1080-3	Mfxeth1080_3_126.hex	ICN-126	Mfxeth1080_0_120.hex	ICN-120
MFX-ETH-1400-0	Mfxeth1400_0_120.hex	ICN-100/120		
MFX-ETH-1400-2	Mfxeth1400_2_120.hex	ICN-100/120		
MFX-ETH-1440-0	Mfxeth1440_0_120.hex	ICN-100/120	Mfxeth1440_0_125.hex	ICN-125
MFX-ETH-1440-1	Mfxeth1440_1_120.hex	ICN-100/120	Mfxeth1440_1_125.hex	ICN-125
MFX-ETH-1440-2	Mfxeth1440_2_120.hex	ICN-100/120	Mfxeth1440_2_125.hex	ICN-125
MFX-ETH-1440-3	Mfxeth1440_3_120.hex	ICN-100/120	Mfxeth1440_3_125.hex	ICN-125
MFX-ETH-1800-0	Mfxeth1800_0_125.hex	ICN-125	Mfxeth1800_0_120.hex	ICN-120
MFX-ETH-1800-2	Mfxeth1800_2_125.hex	ICN-125	Mfxeth1800_2_120.hex	ICN-120
MFX-ETH-1802-0	Mfxeth1802_0_125.hex	ICN-125	Mfxeth1802_0_120.hex	ICN-120
MFX-ETH-1802-2	Mfxeth1802_2_125.hex	ICN-125	Mfxeth1802_2_120.hex	ICN-120
MFX-ETH-1840-0	Mfxeth1840_0_125.hex	ICN-125	Mfxeth1840_0_120.hex	ICN-120
MFX-ETH-1840-2	Mfxeth1840_2_125.hex	ICN-125	Mfxeth1840_2_120.hex	ICN-120

ICN-100 SCSI Interconnection Board

The ICN-100 plug-on SCSI interconnection board features four 68-pin high-density SCSI connectors that are 100% **pin-compatible with the MultiFlex PCI 1040, 1400 and 1440 motion controller pin-outs**. This allows users to freely swap the MultiFlex Ethernet and PCI controllers without making any wiring changes to an existing installation. ICN-100 users can also connect to external devices via the **ADAM-3968** wiring terminal board pictured below.

SCSI connectors J1-J4 are compatible with industry-standard SCSI cables such as PMC's **CBL-HH68-6**, which connects the ICN-100 to the ADAM-3968 wiring terminal board. The ICN-100 also features two auxiliary D-sub connectors, J5 and J6, which provide an additional way to access the controller's uncommitted digital TTL I/O (J5) and optional analog inputs (J6).

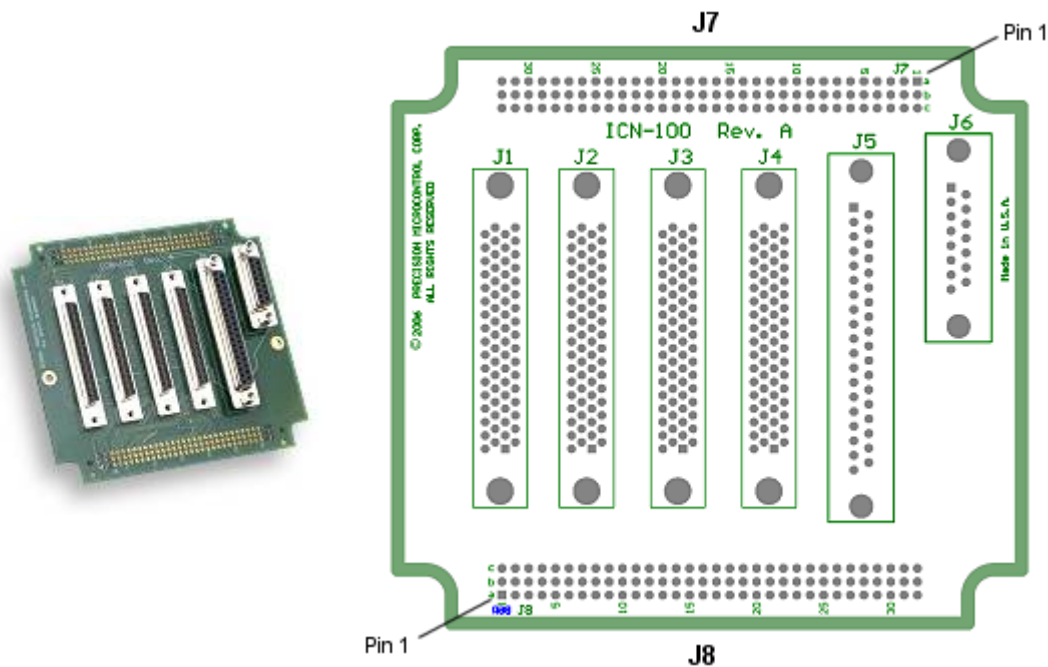


Figure 15. ICN-100 SCSI Interconnection Board and Connector layout



Figure 16. ADAM-3968 Wiring Terminal Board



The ADAM-3968 screw terminal numbers 1-68 correspond directly to pin numbers 1-68 on the ICN-100 SCSI Interconnection Board. One ADAM-3968 Screw Terminal Board is required for each ICN-100 SCSI connector used.

Table 11. ICN-100 Connectors – Type and Function

Connector	Type	Function
J1-J4	HD68 SCSI Female	Motor Control & Axis I/O
J5	DB37 Female	Auxiliary Connector for TTL Digital I/O
J6	DB15 Female	Auxiliary Connector for Optional Analog
J7	96 Pin DIN Male - Amp Tyco #650470-5	Mates with Controller Board J8
J8	96 Pin DIN Male - Amp Tyco #650470-5	Mates with Controller Board J9

Table 12. Recommended Extension Cables

Connector	Type	Recommended P/N ³
J1-J4	SCSI-3 male to HD68 male	#07859
J5	DB37 male to DB37 female	#02689
J6	DB15 male to DB37 female	#02637

³ Part numbers for 6 ft (~2M) cable assemblies from www.C2G.com (Cables-To-Go).

Table 13. ICN-100 J1 & J2 Signal Assignments* When Used With MultiFlex ETH 1040

Pin #	J1		J2	
	Signal	Type	Signal	Type
1				
35				
2				
36				
3				
37				
4				
38	+5 VDC		+5 VDC	
5				
39	+5 VDC		+5 VDC	
6	Axis 1 Full/Half Current	Open Collector Outputs & Power	Axis 3 Full/Half Current	Open Collector Outputs & Power
40	+5 VDC		+5 VDC	
7	Axis 2 Full/Half Current		Axis 4 Full/Half Current	
41	+5 VDC		+5 VDC	
8				
42				
9	+12 VDC		+12 VDC	
43	+12 VDC		+12 VDC	
10				
44				
11				
45				
12				
46				
13				
47				
14				
48				
15				
49				
16				
50				
17	Axis 1 Drive Fault input		Axis 3 Drive Fault input	
51	Axis 1 Drive Fault Supply / Return		Axis 3 Drive Fault Supply / Return	
18	Axis 2 Drive Fault input	Opto-Isolated Input/Return Pairs	Axis 4 Drive Fault input	Opto-Isolated Input/Return Pairs
52	Axis 2 Drive Fault Supply / Return		Axis 4 Drive Fault Supply / Return	
19	Digital Output 1 / Axis 1 - 4 Compare		Digital Output 5	
53	+5 VDC		+5 VDC	
20	Digital Output 2	TTL Outputs & Power	Digital Output 6	TTL Outputs & Power
54	+5 VDC		+5 VDC	
21	Digital Output 3		Digital Output 7	
55	+5 VDC		+5 VDC	
22	Digital Output 4		Digital Output 8	
56	+5 VDC		+5 VDC	
23	Digital Input 1 / Axis 1/2 Pos. Capture Latch		Digital Input 5 / Axis 3/4 Pos. Capture Latch	
57	Ground		Ground	
24	Digital Input 2	TTL Inputs & Ground	Digital Input 6	TTL Inputs & Ground
58	Ground		Ground	
25	Digital Input 3		Digital Input 7	
59	Ground		Ground	
26	Digital Input 4		Digital Input 8	
60	Ground		Ground	
27	Axis 1 Home		Axis 3 Home	
61	Axis 1 Home Supply / Return		Axis 3 Home Supply / Return	
28	Axis 2 Home		Axis 4 Home	
62	Axis 2 Home Supply / Return		Axis 4 Home Supply / Return	
29	Axis 1 Limit +		Axis 3 Limit +	
63	Axis 1 Limit + Supply / Return		Axis 3 Limit + Supply / Return	
30	Axis 2 Limit +		Axis 4 Limit +	
64	Axis 2 Limit + Supply / Return		Axis 4 Limit + Supply / Return	
31	Axis 1 Limit -		Axis 3 Limit -	
65	Axis 1 Limit - Supply / Return	ADC Inputs & Returns	Axis 3 Limit - Supply / Return	ADC Inputs & Returns
32	Axis 2 Limit -		Axis 4 Limit -	
66	Axis 2 Limit - Supply / Return		Axis 4 Limit - Supply / Return	
33	Analog Input 1		Analog Input 3	
67	Analog Input 1 Return / Analog Ground		Analog Input 3 Return / Analog Ground	
34	Analog Input 2		Analog Input 4	
68	Analog Input 2 Return / Analog Ground		Analog Input 4 Return / Analog Ground	

* **Note:** Encoder and analog inputs are optional and are not available on all MultiFlex ETH 1040 models.

Table 14. ICN-100 J3 & J4 Signal Assignments* When Used With MultiFlex ETH 1040

Pin #	J3		J4	
	Signal	Type	Signal	Type
1	Axis 1 Driver Disable	Open Collector Outputs & Power	Axis 3 Driver Disable	Open Collector Outputs & Power
35	+5 VDC		+5 VDC	
2	Axis 1 Step / CCW Pulse		Axis 3 Step / CCW Pulse	
36	+5 VDC		+5 VDC	
3	Axis 1 Direction / CW Pulse		Axis 3 Direction / CW Pulse	
37	+5 VDC		+5 VDC	
4	Axis 1 Full/Half Current		Axis 3 Full/Half Current	
38	+5 VDC		+5 VDC	
5	Axis 2 Full/Half Current		Axis 4 Full/Half Current	
39	+5 VDC		+5 VDC	
6	Axis 2 Driver Disable		Axis 4 Driver Disable	
40	+5 VDC		+5 VDC	
7	Axis 2 Step / CCW Pulse		Axis 4 Step / CCW Pulse	
41	+5 VDC		+5 VDC	
8	Axis 2 Direction / CW Pulse		Axis 4 Direction / CW Pulse	
42	+5 VDC		+5 VDC	
9	+12 VDC	Reference Voltage Outputs & Power	+12 VDC	Reference Voltage Outputs & Power
43	+12 VDC		+12 VDC	
10	Axis 1/2 Encoder Reference (1.5V)	Differential Encoder Input Pairs	Axis 3/4 Encoder Reference (1.5V)	Differential Encoder Input Pairs
44	Axis 1/2 Encoder Reference (1.5V)		Axis 3/4 Encoder Reference (1.5V)	
11	Axis 1 Encoder Phase A+		Axis 3 Encoder Phase A+	
45	Axis 1 Encoder Phase A-		Axis 3 Encoder Phase A-	
12	Axis 1 Encoder Phase B+		Axis 3 Encoder Phase B+	
46	Axis 1 Encoder Phase B-		Axis 3 Encoder Phase B-	
13	Axis 1 Encoder Phase Z+		Axis 3 Encoder Phase Z+	
47	Axis 1 Encoder Phase Z -		Axis 3 Encoder Phase Z -	
14	Axis 2 Encoder Phase A+		Axis 4 Encoder Phase A+	
48	Axis 2 Encoder Phase A-		Axis 4 Encoder Phase A-	
15	Axis 2 Encoder Phase B+		Axis 4 Encoder Phase B+	
49	Axis 2 Encoder Phase B-		Axis 4 Encoder Phase B-	
16	Axis 2 Encoder Phase Z+		Axis 4 Encoder Phase Z+	
50	Axis 2 Encoder Phase Z -		Axis 4 Encoder Phase Z -	
17	Axis 1 Drive Fault input	Opto-Isolated Input/Return Pairs	Axis 3 Drive Fault input	Opto-Isolated Input/Return Pairs
51	Axis 1 Drive Fault Supply / Return		Axis 3 Drive Fault Supply / Return	
18	Axis 2 Drive Fault input	TTL Outputs & Power	Axis 4 Drive Fault input	TTL Outputs & Power
52	Axis 2 Drive Fault Supply / Return		Axis 4 Drive Fault Supply / Return	
19	Digital Output 9 / Axis 1 - 4 Position Compare		Digital Output 13	
53	+5 VDC		+5 VDC	
20	Digital Output 10		Digital Output 14	
54	+5 VDC		+5 VDC	
21	Digital Output 11		Digital Output 15	
55	+5 VDC		+5 VDC	
22	Digital Output 12		Digital Output 16	
56	+5 VDC		+5 VDC	
23	Digital Input 9 / Axis 1 & 2 Position Capture Latch	TTL Inputs & Ground	Digital Input 13 / Axis 3 & 4 Position Capture Latch	TTL Inputs & Ground
57	Ground		Ground	
24	Digital Input 10		Digital Input 14	
58	Ground		Ground	
25	Digital Input 11		Digital Input 15	
59	Ground		Ground	
26	Digital Input 12	Opto-Isolated Input/Return Pairs	Digital Input 16	Opto-Isolated Input/Return Pairs
60	Ground		Ground	
27	Axis 1 Home		Axis 3 Home	
61	Axis 1 Home Supply / Return		Axis 3 Home Supply / Return	
28	Axis 2 Home		Axis 4 Home	
62	Axis 2 Home Supply / Return		Axis 4 Home Supply / Return	
29	Axis 1 Limit +		Axis 3 Limit +	
63	Axis 1 Limit + Supply / Return		Axis 3 Limit + Supply / Return	
30	Axis 2 Limit +		Axis 4 Limit +	
64	Axis 2 Limit + Supply / Return		Axis 4 Limit + Supply / Return	
31	Axis 1 Limit -	ADC Inputs & Returns	Axis 3 Limit -	ADC Inputs & Returns
65	Axis 1 Limit - Supply / Return		Axis 3 Limit - Supply / Return	
32	Axis 2 Limit -		Axis 4 Limit -	
66	Axis 2 Limit - Supply / Return		Axis 4 Limit - Supply / Return	
33	Analog Input 5	ADC Inputs & Returns	Analog Input 7	ADC Inputs & Returns
67	Analog Input 5 return / Analog Ground		Analog Input 7 return / Analog Ground	
34	Analog Input 6		Analog Input 8	
68	Analog Input 6 return / Analog Ground		Analog Input 8 return / Analog Ground	

* **Note:** Encoder and analog inputs are optional and are not available on all MultiFlex ETH 1040 models.

Table 15. ICN-100 J1 & J2 Signal Assignments* When Used With MultiFlex ETH 1400

Pin #	J1		J2	
	Signal	Type	Signal	Type
1	Axis 1 Analog Servo Command Out (+/- 10V)	+/-10V Analog Servo Command Signal & Return	Axis 3 Analog Servo Command Out (+/- 10V)	+/-10V Analog Servo Command Signal & Return
35	Axis 1 Return / Analog Ground		Axis 3 Return / Analog Ground	
2	Axis 2 Analog Servo Command Out (+/- 10V)		Axis 4 Analog Servo Command Out (+/- 10V)	
36	Axis 2 Return / Analog Ground		Axis 4 Return / Analog Ground	
3				
37				
4	Axis 2 Amp Enable Out	Open Collector Outputs & Power	Axis 4 Amp Enable Out	Open Collector Outputs & Power
38	+5 VDC		+5 VDC	
5	Axis 1 Amp Enable Out		Axis 3 Amp Enable Out	
39	+5 VDC		+5 VDC	
6	Axis 1 PWM Out		Axis 3 PWM Out	
40	+5 VDC		+5 VDC	
7	Axis 2 PWM Out		Axis 4 PWM Out	
41	+5 VDC		+5 VDC	
8				
42				
9	+12 VDC	Reference Voltage Outputs & Power	+12 VDC	Reference Voltage Outputs & Power
43	+12 VDC		+12 VDC	
10	Axis 1/2 Encoder Reference (1.5V)		Axis 3/4 Encoder Reference (1.5V)	
44	Axis 1/2 Encoder Reference (1.5V)		Axis 3/4 Encoder Reference (1.5V)	
11	Axis 1 Encoder A+	Differential Encoder Input Pairs	Axis 3 Encoder A+	Differential Encoder Input Pairs
45	Axis 1 Encoder A-		Axis 3 Encoder A-	
12	Axis 1 Encoder B+		Axis 3 Encoder B+	
46	Axis 1 Encoder B-		Axis 3 Encoder B-	
13	Axis 1 Encoder Z+		Axis 3 Encoder Z+	
47	Axis 1 Encoder Z -		Axis 3 Encoder Z -	
14	Axis 2 Encoder A+		Axis 4 Encoder A+	
48	Axis 2 Encoder A-		Axis 4 Encoder A-	
15	Axis 2 Encoder B+		Axis 4 Encoder B+	
49	Axis 2 Encoder B-		Axis 4 Encoder B-	
16	Axis 2 Encoder Z+		Axis 4 Encoder Z+	
50	Axis 2 Encoder Z -		Axis 4 Encoder Z -	
17	Axis 1 Amp Fault Input	Opto-Isolated Input/Return Pairs	Axis 3 Amp Fault Input	Opto-Isolated Input/Return Pairs
51	Axis 1 Amp Fault Supply / Return		Axis 4 Amp Fault Supply / Return	
18	Axis 2 Amp Fault Input		Axis 3 Amp Fault Input	
52	Axis 2 Amp Fault Supply / Return		Axis 4 Amp Fault Supply / Return	
19	Digital Output 1 / Axis 1 - 4 Compare	TTL Outputs & Power	Digital Output 5	TTL Outputs & Power
53	+5 VDC		+5 VDC	
20	Digital Output 2		Digital Output 6	
54	+5 VDC		+5 VDC	
21	Digital Output 3		Digital Output 7	
55	+5 VDC		+5 VDC	
22	Digital Output 4		Digital Output 8	
56	+5 VDC		+5 VDC	
23	Digital Input 1 / Axis 1/2 Pos. Capture Latch	TTL Inputs & Ground	Digital Input 5 / Axis 3/4 Pos. Capture Latch	TTL Inputs & Ground
57	Ground		Ground	
24	Digital Input 2		Digital Input 6	
58	Ground		Ground	
25	Digital Input 3		Digital Input 7	
59	Ground		Ground	
26	Digital Input 4		Digital Input 8	
60	Ground		Ground	
27	Axis 1 Home	Opto-Isolated Input/Return Pairs	Axis 3 Home	Opto-Isolated Input/Return Pairs
61	Axis 1 Home Supply / Return		Axis 3 Home Supply / Return	
28	Axis 2 Home		Axis 4 Home	
62	Axis 2 Home Supply / Return		Axis 4 Home Supply / Return	
29	Axis 1 Limit +		Axis 3 Limit +	
63	Axis 1 Limit + Supply / Return		Axis 3 Limit + Supply / Return	
30	Axis 2 Limit +		Axis 4 Limit +	
64	Axis 2 Limit + Supply / Return		Axis 4 Limit + Supply / Return	
31	Axis 1 Limit -		Axis 3 Limit -	
65	Axis 1 Limit - Supply / Return		Axis 3 Limit - Supply / Return	
32	Axis 2 Limit -		Axis 4 Limit -	
66	Axis 2 Limit - Supply / Return		Axis 4 Limit - Supply / Return	
33	Analog Input 1	ADC Inputs & Returns	Analog Input 3	ADC Inputs & Returns
67	Analog Input 1 Return / Analog Ground		Analog Input 3 Return / Analog Ground	
34	Analog Input 2		Analog Input 4	
68	Analog Input 2 Return / Analog Ground		Analog Input 4 Return / Analog Ground	

* **Note:** Analog inputs are optional and are not available on all MultiFlex ETH 1400 models.

Table 16. ICN-100 J3 & J4 Signal Assignments* When Used With MultiFlex ETH 1400

Pin #	J3		J4	
	Signal	Type	Signal	Type
1		Open Collector Outputs & Power		Open Collector Outputs & Power
35	+5 VDC		+5 VDC	
2				
36	+5 VDC		+5 VDC	
3				
37	+5 VDC		+5 VDC	
4				
38	+5 VDC		+5 VDC	
5				
39	+5 VDC		+5 VDC	
6				
40	+5 VDC		+5 VDC	
7				
41	+5 VDC		+5 VDC	
8				
42	+5 VDC	Power	+5 VDC	Power
9	+12 VDC		+12 VDC	
43	+12 VDC		+12 VDC	
10				
44				
11				
45				
12				
46				
13				
47				
14				
48				
15				
49				
16				
50				
17	Axis 1 Drive Fault input	Opto-Isolated Input/Return Pairs	Axis 3 Drive Fault input	Opto-Isolated Input/Return Pairs
51	Axis 1 Drive Fault Supply / Return		Axis 3 Drive Fault Supply / Return	
18	Axis 2 Drive Fault input		Axis 4 Drive Fault input	
52	Axis 2 Drive Fault Supply / Return		Axis 4 Drive Fault Supply / Return	
19	Digital Output 9 / Axis 5 - 8 Position Compare	TTL Outputs & Power	Digital Output 13	TTL Outputs & Power
53	+5 VDC		+5 VDC	
20	Digital Output 10		Digital Output 14	
54	+5 VDC		+5 VDC	
21	Digital Output 11		Digital Output 15	
55	+5 VDC		+5 VDC	
22	Digital Output 12		Digital Output 16	
56	+5 VDC	TTL Inputs & Ground	+5 VDC	TTL Inputs & Ground
23	Digital Input 9 / Axis 5/6 Position Capture Latch		Digital Input 13 / Axis 7/8 Position Capture Latch	
57	Ground		Ground	
24	Digital Input 10		Digital Input 14	
58	Ground		Ground	
25	Digital Input 11		Digital Input 15	
59	Ground		Ground	
26	Digital Input 12	Opto-Isolated Input/Return Pairs	Digital Input 16	Opto-Isolated Input/Return Pairs
60	Ground		Ground	
27	Axis 1 Home		Axis 3 Home	
61	Axis 1 Home Supply / Return		Axis 3 Home Supply / Return	
28	Axis 2 Home		Axis 4 Home	
62	Axis 2 Home Supply / Return		Axis 4 Home Supply / Return	
29	Axis 1 Limit +		Axis 3 Limit +	
63	Axis 1 Limit + Supply / Return		Axis 3 Limit + Supply / Return	
30	Axis 2 Limit +		Axis 4 Limit +	
64	Axis 2 Limit + Supply / Return		Axis 4 Limit + Supply / Return	
31	Axis 1 Limit -	ADC Inputs & Returns	Axis 3 Limit -	ADC Inputs & Returns
65	Axis 1 Limit - Supply / Return		Axis 3 Limit - Supply / Return	
32	Axis 2 Limit -		Axis 4 Limit -	
66	Axis 2 Limit - Supply / Return		Axis 4 Limit - Supply / Return	
33	Analog Input 5	ADC Inputs & Returns	Analog Input 7	ADC Inputs & Returns
67	Analog Input 5 return / Analog Ground		Analog Input 7 return / Analog Ground	
34	Analog Input 6		Analog Input 8	
68	Analog Input 6 return / Analog Ground		Analog Input 8 return / Analog Ground	

* **Note:** Analog inputs are optional and are not available on all MultiFlex ETH 1400 models.

Table 17. ICN-100 J1 & J2 Signal Assignments* When Used With MultiFlex ETH 1440

Pin #	J1		J2	
	Signal	Type	Signal	Type
1	Axis 1 Analog Servo Command Out (+/- 10V)	+/-10V Analog Servo Command Signal & Return	Axis 3 Analog Servo Command Out (+/- 10V)	+/-10V Analog Servo Command Signal & Return
35	Axis 1 Return / Analog Ground		Axis 3 Return / Analog Ground	
2	Axis 2 Analog Servo Command Out (+/- 10V)		Axis 4 Analog Servo Command Out (+/- 10V)	
36	Axis 2 Return / Analog Ground		Axis 4 Return / Analog Ground	
3				
37				
4	Axis 2 Amp Enable Out	Open Collector Outputs & Power	Axis 4 Amp Enable Out	Open Collector Outputs & Power
38	+5 VDC		+5 VDC	
5	Axis 1 Amp Enable Out		Axis 3 Amp Enable Out	
39	+5 VDC		+5 VDC	
6	Axis 1 PWM Out or Axis 5 Full/Half Current		Axis 3 PWM Out or Axis 7 Full/Half Current	
40	+5 VDC		+5 VDC	
7	Axis 2 PWM Out or Axis 6 Full/Half Current		Axis 4 PWM Out or Axis 8 Full/Half Current	
41	+5 VDC		+5 VDC	
8				
42				
9	+12 VDC	Reference Voltage Outputs & Power	+12 VDC	Reference Voltage Outputs & Power
43	+12 VDC		+12 VDC	
10	Axis 1/2 Encoder Reference (1.5V)		Axis 3/4 Encoder Reference (1.5V)	
44	Axis 1/2 Encoder Reference (1.5V)		Axis 3/4 Encoder Reference (1.5V)	
11	Axis 1 Encoder A+	Differential Encoder Input Pairs	Axis 3 Encoder A+	Differential Encoder Input Pairs
45	Axis 1 Encoder A-		Axis 3 Encoder A-	
12	Axis 1 Encoder B+		Axis 3 Encoder B+	
46	Axis 1 Encoder B-		Axis 3 Encoder B-	
13	Axis 1 Encoder Z+		Axis 3 Encoder Z+	
47	Axis 1 Encoder Z -		Axis 3 Encoder Z -	
14	Axis 2 Encoder A+		Axis 4 Encoder A+	
48	Axis 2 Encoder A-		Axis 4 Encoder A-	
15	Axis 2 Encoder B+		Axis 4 Encoder B+	
49	Axis 2 Encoder B-		Axis 4 Encoder B-	
16	Axis 2 Encoder Z+		Axis 4 Encoder Z+	
50	Axis 2 Encoder Z -		Axis 4 Encoder Z -	
17	Axis 1 Amp Fault Input / Axis 5 Drive Fault Input	Opto-Isolated Input/Return Pairs	Axis 3 Amp Fault Input / Axis 7 Amp Fault Input	Opto-Isolated Input/Return Pairs
51	Axis 1/5 Amp Fault Supply / Return		Axis 4/8 Amp Fault Supply / Return	
18	Axis 2 Amp Fault Input / Axis 6 Drive Fault Input		Axis 3 Amp Fault Input / Axis 8 Amp Fault Input	
52	Axis 2/6 Amp Fault Supply / Return		Axis 4/8 Amp Fault Supply / Return	
19	Digital Output 1 / Axis 1 - 4 Compare	TTL Outputs & Power	Digital Output 5	TTL Outputs & Power
53	+5 VDC		+5 VDC	
20	Digital Output 2		Digital Output 6	
54	+5 VDC		+5 VDC	
21	Digital Output 3		Digital Output 7	
55	+5 VDC		+5 VDC	
22	Digital Output 4		Digital Output 8	
56	+5 VDC		+5 VDC	
23	Digital Input 1 / Axis 1/2 Pos. Capture Latch	TTL Inputs & Ground	Digital Input 5 / Axis 3/4 Pos. Capture Latch	TTL Inputs & Ground
57	Ground		Ground	
24	Digital Input 2		Digital Input 6	
58	Ground		Ground	
25	Digital Input 3		Digital Input 7	
59	Ground		Ground	
26	Digital Input 4		Digital Input 8	
60	Ground		Ground	
27	Axis 1 Home / Axis 5 Home	Opto-Isolated Input/Return Pairs	Axis 3 Home / Axis 7 Home	Opto-Isolated Input/Return Pairs
61	Axis 1/5 Home Supply / Return		Axis 3/7 Home Supply / Return	
28	Axis 2 Home / Axis 6 Home		Axis 4 Home / Axis 8 Home	
62	Axis 2/6 Home Supply / Return		Axis 4/8 Home Supply / Return	
29	Axis 1 Limit + / Axis 5 Limit +		Axis 3 Limit + / Axis 7 Limit +	
63	Axis 1/5 Limit + Supply / Return		Axis 3/7 Limit + Supply / Return	
30	Axis 2 Limit + / Axis 6 Limit +		Axis 4 Limit + / Axis 8 Limit +	
64	Axis 2/6 Limit + Supply / Return		Axis 4/8 Limit + Supply / Return	
31	Axis 1 Limit - / Axis 5 Limit -		Axis 3 Limit - / Axis 7 Limit -	
65	Axis 1/5 Limit - Supply / Return		Axis 3/7 Limit - Supply / Return	
32	Axis 2 Limit - / Axis 6 Limit -		Axis 4 Limit - / Axis 8 Limit -	
66	Axis 2/6 Limit - Supply / Return		Axis 4/8 Limit - Supply / Return	
33	Analog Input 1	ADC Inputs & Returns	Analog Input 3	ADC Inputs & Returns
67	Analog Input 1 Return / Analog Ground		Analog Input 3 Return / Analog Ground	
34	Analog Input 2		Analog Input 4	
68	Analog Input 2 Return / Analog Ground		Analog Input 4 Return / Analog Ground	

* **Note:** Analog inputs and encoders for the pulse command axes #5-8 are optional and are not available on all MultiFlex ETH 1440 models.

Table 18. ICN-100 J3 & J4 Signal Assignments* When Used With MultiFlex ETH 1440

Pin #	J3		J4	
	Signal	Type	Signal	Type
1	Axis 5 Driver Disable	Open Collector Outputs & Power	Axis 7 Driver Disable	Open Collector Outputs & Power
35	+5 VDC		+5 VDC	
2	Axis 5 Step / CCW Pulse		Axis 7 Step / CCW Pulse	
36	+5 VDC		+5 VDC	
3	Axis 5 Direction / CW Pulse		Axis 7 Direction / CW Pulse	
37	+5 VDC		+5 VDC	
4	Axis 5 Full/Half Current or Axis 1 PWM Out		Axis 7 Full/Half Current or Axis 3 PWM Out	
38	+5 VDC		+5 VDC	
5	Axis 6 Full/Half Current or Axis 2 PWM Out		Axis 8 Full/Half Current or Axis 4 PWM Out	
39	+5 VDC		+5 VDC	
6	Axis 6 Driver Disable		Axis 8 Driver Disable	
40	+5 VDC		+5 VDC	
7	Axis 6 Step / CCW Pulse		Axis 8 Step / CCW Pulse	
41	+5 VDC		+5 VDC	
8	Axis 6 Direction / CW Pulse		Axis 8 Direction / CW Pulse	
42	+5 VDC		+5 VDC	
9	+12 VDC	Reference Voltage Outputs & Power	+12 VDC	Reference Voltage Outputs & Power
43	+12 VDC		+12 VDC	
10	Axis 5/6 Encoder Reference (1.5V)		Axis 7/8 Encoder Reference (1.5V)	
44	Axis 5/6 Encoder Reference (1.5V)		Axis 7/8 Encoder Reference (1.5V)	
11	Axis 5 Encoder Phase A+	Differential Encoder Input Pairs	Axis 7 Encoder Phase A+	Differential Encoder Input Pairs
45	Axis 5 Encoder Phase A-		Axis 7 Encoder Phase A-	
12	Axis 5 Encoder Phase B+		Axis 7 Encoder Phase B+	
46	Axis 5 Encoder Phase B-		Axis 7 Encoder Phase B-	
13	Axis 5 Encoder Phase Z+		Axis 7 Encoder Phase Z+	
47	Axis 5 Encoder Phase Z -		Axis 7 Encoder Phase Z -	
14	Axis 6 Encoder Phase A+		Axis 8 Encoder Phase A+	
48	Axis 6 Encoder Phase A-		Axis 8 Encoder Phase A-	
15	Axis 6 Encoder Phase B+		Axis 8 Encoder Phase B+	
49	Axis 6 Encoder Phase B-		Axis 8 Encoder Phase B-	
16	Axis 6 Encoder Phase Z+	Opto-Isolated Input/Return Pairs	Axis 8 Encoder Phase Z+	Opto-Isolated Input/Return Pairs
50	Axis 6 Encoder Phase Z -		Axis 8 Encoder Phase Z -	
17	Axis 5 Amp Fault input / Axis 1 Amp Fault Input		Axis 7 Amp Fault input / Axis 3 Amp Fault Input	
51	Axis 1/5 Amp Fault Supply / Return		Axis 3/7 Amp Fault Supply / Return	
18	Axis 6 Amp Fault input / Axis 2 Amp Fault Input	TTL Outputs & Power	Axis 8 Amp Fault input / Axis 4 Amp Fault Input	TTL Outputs & Power
52	Axis 2/6 Amp Fault Supply / Return		Axis 4/8 Amp Fault Supply / Return	
19	Digital Output 9 / Axis 5 - 8 Position Compare		Digital Output 13	
53	+5 VDC		+5 VDC	
20	Digital Output 10		Digital Output 14	
54	+5 VDC		+5 VDC	
21	Digital Output 11		Digital Output 15	
55	+5 VDC		+5 VDC	
22	Digital Output 12	TTL Inputs & Ground	Digital Output 16	TTL Inputs & Ground
56	+5 VDC		+5 VDC	
23	Digital Input 9 / Axis 5/6 Position Capture Latch		Digital Input 13 / Axis 7/8 Position Capture Latch	
57	Ground		Ground	
24	Digital Input 10		Digital Input 14	
58	Ground		Ground	
25	Digital Input 11		Digital Input 15	
59	Ground		Ground	
26	Digital Input 12	Opto-Isolated Input/Return Pairs	Digital Input 16	Opto-Isolated Input/Return Pairs
60	Ground		Ground	
27	Axis 5 Home / Axis 1 Home		Axis 7 Home / Axis 3 Home	
61	Axis 1/5 Home Supply / Return		Axis 3/7 Home Supply / Return	
28	Axis 6 Home / Axis 2 Home		Axis 8 Home / Axis 4 Home	
62	Axis 2/6 Home Supply / Return		Axis 4/8 Home Supply / Return	
29	Axis 5 Limit + / Axis 1 Limit +		Axis 7 Limit + / Axis 3 Limit +	
63	Axis 1/5 Limit + Supply / Return		Axis 3/7 Limit + Supply / Return	
30	Axis 6 Limit + / Axis 2 Limit +		Axis 8 Limit + / Axis 4 Limit +	
64	Axis 2/6 Limit + Supply / Return		Axis 4/8 Limit + Supply / Return	
31	Axis 5 Limit - / Axis 1 Limit -	ADC Inputs & Returns	Axis 7 Limit - / Axis 3 Limit -	ADC Inputs & Returns
65	Axis 1/5 Limit - Supply / Return		Axis 3/7 Limit - Supply / Return	
32	Axis 6 Limit - / Axis 2 Limit -		Axis 8 Limit - / Axis 4 Limit -	
66	Axis 2/6 Limit - Supply / Return		Axis 4/8 Limit - Supply / Return	
33	Analog Input 5	ADC Inputs & Returns	Analog Input 7	ADC Inputs & Returns
67	Analog Input 5 return / Analog Ground		Analog Input 7 return / Analog Ground	
34	Analog Input 6		Analog Input 8	
68	Analog Input 6 return / Analog Ground		Analog Input 8 return / Analog Ground	

* **Note:** Analog inputs and encoders for the pulse command axes #5-8 are optional and are not available on all MultiFlex ETH 1440 models.

Table 19. ICN-100 Signal Assignments – Connector J5

Pin #	Signal	Pin #	Signal
1	GND	20	GND
2	VCC	21	+5V
3	+12V	22	Digital Out 16
4	Digital Out 15	23	Digital Out 14
5	Digital Out 13	24	Digital Out 12
6	Digital Out 11	25	Digital Out 10
7	Digital Out 9	26	Digital Out 8
8	Digital Out 7	27	Digital Out 6
9	Digital Out 5	28	Digital Out 4
10	Digital Out 3	29	Digital Out 2
11	Digital Out 1	30	Digital In 16
12	Digital In 15	31	Digital In 14
13	Digital In 13	32	Digital In 12
14	Digital In 11	33	Digital In 10
15	Digital In 9	34	Digital In 8
16	Digital In 7	35	Digital In 6
17	Digital In 5	36	Digital In 4
18	Digital In 3	37	Digital In 2
19	Digital In 1		

Table 20. ICN-100 Signal Assignments – Connector J6

Pin #	Signal	Pin #	Signal
1	Analog Input 8	9	-12
2	Analog Input 7	10	+12
3	Analog Input 6	11	Analog Ground
4	Analog Input 5	12	Analog Ground
5	Analog Input 4	13	Analog Ground
6	Analog Input 3	14	Analog Ground
7	Analog Input 2	15	Analog Ground
8	Analog Input 1		

ICN-120 D-Sub Interconnection Boards (*ICN-120-0, ICN-120-1, ICN-120-3*)

The **ICN-120** series D-sub interconnection boards allow the use of low-cost off-the-shelf or user-built D-sub cables. Three ICN-120 model variants are available: The ICN-120-3 is fully populated with 10 D-sub connectors for up to 8 axes of closed-loop control. Models **ICN-120-0** and **ICN-120-1** have 6 D-sub connectors and provide a more cost-effective alternative for applications that require no more than 4 axes of closed-loop control. See Table 9. Motion Controller & Interconnection Board Compatibility Matrix” for motion controller model compatibility.

Table 21. ICN-120 Model Variants – Installed Connectors

Part #	J1	J2	J3	J4	J5	J6	J7	J8	J9	J10	J11	J12
ICN-120-0	✓	✓	✓	✓					✓	✓	✓	✓
ICN-120-1					✓	✓	✓	✓	✓	✓	✓	✓
ICN-120-3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

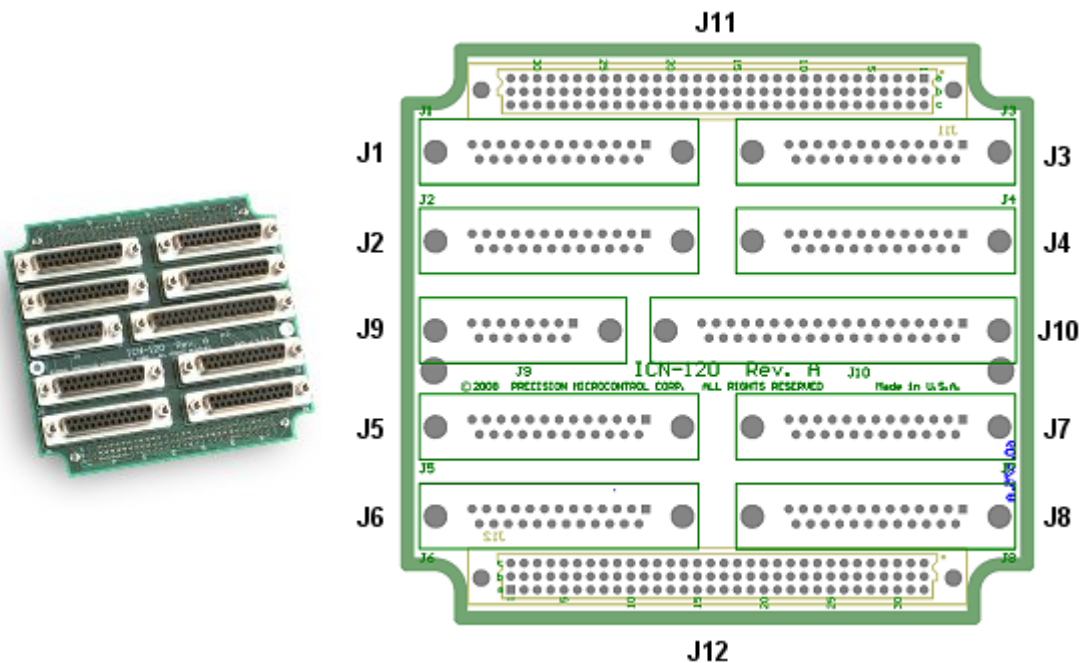


Figure 17. ICN-120 D-sub Interconnection Board and Connector Layout

Table 22. ICN-120 Connectors – Type and Function

Connector	Type	Function
J1-J8	DB25 Female	Motor Control & Axis I/O
J9	DB37 Female	Auxiliary Connector for TTL Digital I/O
J10	DB15 Female	Auxiliary Connector for Optional Analog Inputs
J11	96 Pin DIN Male - Amp Tyco #650470-5	Mates with Controller Board J8
J12	96 Pin DIN Male - Amp Tyco #650470-5	Mates with Controller Board J9

Table 23. Recommended D-sub Extension Cables

Connector	Type	Recommended P/N ⁴
J1-J8	DB25 male to DB25 female	#02655
J9	DB37 male to DB37 female	#02689
J10	DB15 male to DB15 female	#02637



An optional 25-pin D-sub to screw terminal board, the **ICN-130** (Figure 20) provides ICN-120/125/126 users with convenient screw terminal connections for fast wiring and bench-top prototyping.

⁴ Part numbers for 6 ft (~2M) cable assemblies from www.C2G.com (Cables-To-Go).

Table 24. ICN-120 Signal Assignments – Connectors J1-J8

Pin #	When Used with MultiFlex ETH 1040	J1	J2	J3	J4	J5	J6	J7	J8
1									
2									
3	Step/CW Command	Axis 1	Axis 2	Axis 3	Axis 4	Axis 1	Axis 2	Axis 3	Axis 4
4	Full/Half Current	Axis 1	Axis 2	Axis 3	Axis 4	Axis 1	Axis 2	Axis 3	Axis 4
5	+12V	✓	✓	✓	✓	✓	✓	✓	✓
6	Encoder Reference Voltage					Axis 1	Axis 2	Axis 3	Axis 4
7	Encoder A-					Axis 1	Axis 2	Axis 3	Axis 4
8	Encoder B-					Axis 1	Axis 2	Axis 3	Axis 4
9	Encoder Z-					Axis 1	Axis 2	Axis 3	Axis 4
10	Amp/Drive Fault Return	Axis 1	Axis 2	Axis 3	Axis 4	Axis 1	Axis 2	Axis 3	Axis 4
11	Home Return	Axis 1	Axis 2	Axis 3	Axis 4	Axis 1	Axis 2	Axis 3	Axis 4
12	Limit+ Return	Axis 1	Axis 2	Axis 3	Axis 4	Axis 1	Axis 2	Axis 3	Axis 4
13	Limit- Return	Axis 1	Axis 2	Axis 3	Axis 4	Axis 1	Axis 2	Axis 3	Axis 4
14	Analog Ground	✓	✓	✓	✓	✓	✓	✓	✓
15	+5V	✓	✓	✓	✓	✓	✓	✓	✓
16	Dir/CCW Command	Axis 1	Axis 2	Axis 3	Axis 4	Axis 1	Axis 2	Axis 3	Axis 4
17	Drive Disable	Axis 1	Axis 2	Axis 3	Axis 4	Axis 1	Axis 2	Axis 3	Axis 4
18	Digital Ground	✓	✓	✓	✓	✓	✓	✓	✓
19	Encoder A+					Axis 1	Axis 2	Axis 3	Axis 4
20	Encoder B+					Axis 1	Axis 2	Axis 3	Axis 4
21	Encoder Z+					Axis 1	Axis 2	Axis 3	Axis 4
23	Amp/Drive Fault	Axis 1	Axis 2	Axis 3	Axis 4	Axis 1	Axis 2	Axis 3	Axis 4
23	Home	Axis 1	Axis 2	Axis 3	Axis 4	Axis 1	Axis 2	Axis 3	Axis 4
24	Limit+	Axis 1	Axis 2	Axis 3	Axis 4	Axis 1	Axis 2	Axis 3	Axis 4
25	Limit-	Axis 1	Axis 2	Axis 3	Axis 4	Axis 1	Axis 2	Axis 3	Axis 4

Pin #	When Used with MultiFlex ETH 1400	J1	J2	J3	J4	J5	J6	J7	J8
1	Analog Command	Axis 1	Axis 2	Axis 3	Axis 4				
2	Amp Enable	Axis 1	Axis 2	Axis 3	Axis 4				
3									
4	PWM Command	Axis 1	Axis 2	Axis 3	Axis 4				
5	+12V	✓	✓	✓	✓	✓	✓	✓	✓
6	Encoder Reference Voltage	Axis 1	Axis 2	Axis 3	Axis 4				
7	Encoder A-	Axis 1	Axis 2	Axis 3	Axis 4				
8	Encoder B-	Axis 1	Axis 2	Axis 3	Axis 4				
9	Encoder Z-	Axis 1	Axis 2	Axis 3	Axis 4				
10	Amp/Drive Fault Return	Axis 1	Axis 2	Axis 3	Axis 4				
11	Home Return	Axis 1	Axis 2	Axis 3	Axis 4				
12	Limit+ Return	Axis 1	Axis 2	Axis 3	Axis 4				
13	Limit- Return	Axis 1	Axis 2	Axis 3	Axis 4				
14	Analog Ground	✓	✓	✓	✓	✓	✓	✓	✓
15	+5V	✓	✓	✓	✓	✓	✓	✓	✓
16									
17									
18	Digital Ground	✓	✓	✓	✓	✓	✓	✓	✓
19	Encoder A+	Axis 1	Axis 2	Axis 3	Axis 4				
20	Encoder B+	Axis 1	Axis 2	Axis 3	Axis 4				
21	Encoder Z+	Axis 1	Axis 2	Axis 3	Axis 4				
22	Amp/Drive Fault	Axis 1	Axis 2	Axis 3	Axis 4				
23	Home	Axis 1	Axis 2	Axis 3	Axis 4				
24	Limit+	Axis 1	Axis 2	Axis 3	Axis 4				
25	Limit-	Axis 1	Axis 2	Axis 3	Axis 4				

ICN-120 Signal Assignments – Connectors J1-J8 (Continued)

Pin #	When Used with MultiFlex ETH 1440	J1	J2	J3	J4	J5	J6	J7	J8
1	Analog Command	Axis 1	Axis 2	Axis 3	Axis 4				
2	Amp Enable	Axis 1	Axis 2	Axis 3	Axis 4				
3	Step/CW Command	Axis 5	Axis 6	Axis 7	Axis 8	Axis 5	Axis 6	Axis 7	Axis 8
4	PWM (Axis 1-4) or Full/Half Current (Axis 5-8)	Axis 1 or 5	Axis 2 or 6	Axis 3 or 7	Axis 4 or 8	Axis 5	Axis 6	Axis 7	Axis 8
5	+12V	✓	✓	✓	✓	✓	✓	✓	✓
6	Encoder Ref. Voltage	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
7	Encoder A-	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
8	Encoder B-	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
9	Encoder Z-	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
10	Amp/Drive Fault Return	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8
11	Home Return	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8
12	Limit+ Return	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8
13	Limit- Return	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8
14	Analog Ground	✓	✓	✓	✓	✓	✓	✓	✓
15	+5V	✓	✓	✓	✓	✓	✓	✓	✓
16	Dir/CCW Command	Axis 5	Axis 6	Axis 7	Axis 8	Axis 5	Axis 6	Axis 7	Axis 8
17	Drive Disable	Axis 5	Axis 6	Axis 7	Axis 8	Axis 5	Axis 6	Axis 7	Axis 8
18	Digital Ground	✓	✓	✓	✓	✓	✓	✓	✓
19	Encoder A+	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
20	Encoder B+	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
21	Encoder Z+	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
22	Amp/Drive Fault	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8
23	Home	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8
24	Limit+	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8
25	Limit-	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8

Pin #	When Used with MultiFlex ETH 1800*	J1	J2	J3	J4	J5	J6	J7	J8
1	Analog Command	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
2	Amp Enable	Axis 1	Axis 2	Axis 3	Axis 4				
3	PWM					Axis 5	Axis 6	Axis 7	Axis 8
4	PWM	Axis 1	Axis 2	Axis 3	Axis 4				
5	+12V	✓	✓	✓	✓	✓	✓	✓	✓
6	Encoder Ref. Voltage	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
7	Encoder A-	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
8	Encoder B-	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
9	Encoder Z-	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
10	Amp/Drive Fault Return	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8
11	Home Return	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8
12	Limit+ Return	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8
13	Limit- Return	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8
14	Analog Ground	✓	✓	✓	✓	✓	✓	✓	✓
15	+5V	✓	✓	✓	✓	✓	✓	✓	✓
16									
17	Amp Enable	Axis 5	Axis 6	Axis 7	Axis 8	Axis 5	Axis 6	Axis 7	Axis 8
18	Digital Ground	✓	✓	✓	✓	✓	✓	✓	✓
19	Encoder A+	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
20	Encoder B+	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
21	Encoder Z+	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
22	Amp/Drive Fault	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8
23	Home	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8
24	Limit+	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8
25	Limit-	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8

* MultiFlex ETH 1080/1800/1802/1840 controller models must have the appropriate firmware configuration file loaded to be compatible with the ICN-120 interconnection board. See Table 9. Motion Controller & Interconnection Board Compatibility Matrix, and Table 10. Default FPGA Configuration Files.

ICN-120 Signal Assignments – Connectors J1-J8 (Continued)

Pin #	When Used with MultiFlex ETH 1802*	J1	J2	J3	J4	J5	J6	J7	J8
1									
2	Amp Enable	Axis 1	Axis 2	Axis 3	Axis 4				
3	PWM					Axis 5	Axis 6	Axis 7	Axis 8
4	PWM	Axis 1	Axis 2	Axis 3	Axis 4				
5	+12V	✓	✓	✓	✓	✓	✓	✓	✓
6	Encoder Ref. Voltage	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
7	Encoder A-	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
8	Encoder B-	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
9	Encoder Z-	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
10	Amp/Drive Fault Return	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8
11	Home Return	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8
12	Limit+ Return	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8
13	Limit- Return	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8
14	Analog Ground	✓	✓	✓	✓	✓	✓	✓	✓
15	+5V	✓	✓	✓	✓	✓	✓	✓	✓
16									
17	Amp Enable	Axis 5	Axis 6	Axis 7	Axis 8	Axis 5	Axis 6	Axis 7	Axis 8
18	Digital Ground	✓	✓	✓	✓	✓	✓	✓	✓
19	Encoder A+	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
20	Encoder B+	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
21	Encoder Z+	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
22	Amp/Drive Fault	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8
23	Home	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8
24	Limit+	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8
25	Limit-	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8

Pin #	When Used with MultiFlex ETH 1840*	J1	J2	J3	J4	J5	J6	J7	J8
1	Analog Command	Axis 1	Axis 2	Axis 3	Axis 4	Axis 9	Axis 10	Axis 11	Axis 12
2	Amp Enable	Axis 1	Axis 2	Axis 3	Axis 4				
3	Step/CW Command	Axis 5	Axis 6	Axis 7	Axis 8	Axis 5	Axis 6	Axis 7	Axis 8
4	PWM (Axis 1-4) or Full/Half Current (Axis 5-8)	Axis 1 or 5	Axis 2 or 6	Axis 3 or 7	Axis 4 or 8	Axis 5	Axis 6	Axis 7	Axis 8
5	+12V	✓	✓	✓	✓	✓	✓	✓	✓
6	Encoder Ref. Voltage	Axis 1	Axis 2	Axis 3	Axis 4	Axis 9	Axis 10	Axis 11	Axis 12
7	Encoder A-	Axis 1	Axis 2	Axis 3	Axis 4	Axis 9	Axis 10	Axis 11	Axis 12
8	Encoder B-	Axis 1	Axis 2	Axis 3	Axis 4	Axis 9	Axis 10	Axis 11	Axis 12
9	Encoder Z-	Axis 1	Axis 2	Axis 3	Axis 4	Axis 9	Axis 10	Axis 11	Axis 12
10	Amp/Drive Fault Return	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 9	Axis 10	Axis 11	Axis 12
11	Home Return	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 9	Axis 10	Axis 11	Axis 12
12	Limit+ Return	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 9	Axis 10	Axis 11	Axis 12
13	Limit- Return	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 9	Axis 10	Axis 11	Axis 12
14	Analog Ground	✓	✓	✓	✓	✓	✓	✓	✓
15	+5V	✓	✓	✓	✓	✓	✓	✓	✓
16	Dir/CCW Command	Axis 5	Axis 6	Axis 7	Axis 8	Axis 5	Axis 6	Axis 7	Axis 8
17	Drive Disable	Axis 5	Axis 6	Axis 7	Axis 8	Axis 5	Axis 6	Axis 7	Axis 8
18	Digital Ground	✓	✓	✓	✓	✓	✓	✓	✓
19	Encoder A+	Axis 1	Axis 2	Axis 3	Axis 4	Axis 9	Axis 10	Axis 11	Axis 12
20	Encoder B+	Axis 1	Axis 2	Axis 3	Axis 4	Axis 9	Axis 10	Axis 11	Axis 12
21	Encoder Z+	Axis 1	Axis 2	Axis 3	Axis 4	Axis 9	Axis 10	Axis 11	Axis 12
22	Amp/Drive Fault	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8				
23	Home	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8				
24	Limit+	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8				
25	Limit-	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8				

* MultiFlex ETH 1080/1800/1802/1840 controller models must have the appropriate firmware configuration file loaded to be compatible with the ICN-120 interconnection boards. See Table 9. Motion Controller & Interconnection Board Compatibility Matrix, and Table 10. Default FPGA Configuration Files.



AC sine commutation: Two channels of analog command output are required for each axis configured for sine commutation of brushless or linear motors. Therefore MultiFlex ETH 1400 and 1440 models can provide up to 2 axes of sine commutation, and MultiFlex ETH 1800 and 1840 models can provide up to 4 axes of sine commutation.

When using PMC's ICN-120/125 plug-on D-sub interconnection boards, each of the two analog command signals required for each sine commutation axis are located on separate connectors as shown in the diagram below..

Table 25. ICN-120/125 Analog Command Signal Assignments for AC Sine Commutation Axes – Connectors J1-J8

Pin #	When Used w/ MultiFlex ETH 1400/1440	J1	J2	J3	J4	J5	J6	J7	J8
1	Analog Command	Axis 1 Phase U	Axis 1 Phase V	Axis 3 Phase U	Axis 3 Phase V				
Pin #	When Used w/ MultiFlex ETH 1800/1840	J1	J2	J3	J4	J5	J6	J7	J8
1	Analog Command	Axis 1 Phase U	Axis 2 Phase U	Axis 3 Phase U	Axis 4 Phase U	Axis 1 Phase V	Axis 2 Phase V	Axis 3 Phase V	Axis 4 Phase V

Table 26. ICN-120/125/126 Signal Assignments – Connector J9

Pin #	Signal	Pin #	Signal
1	Analog Input 8	9	-12
2	Analog Input 7	10	+12
3	Analog Input 6	11	Analog Ground
4	Analog Input 5	12	Analog Ground
5	Analog Input 4	13	Analog Ground
6	Analog Input 3	14	Analog Ground
7	Analog Input 2	15	Analog Ground
8	Analog Input 1		

Table 27. ICN-120/125/126 Signal Assignments – Connector J10

Pin #	Signal	Pin #	Signal
1	GND	20	GND
2	VCC	21	+5V
3	+12V	22	Digital Out 16
4	Digital Out 15	23	Digital Out 14
5	Digital Out 13	24	Digital Out 12
6	Digital Out 11	25	Digital Out 10
7	Digital Out 9	26	Digital Out 8
8	Digital Out 7	27	Digital Out 6
9	Digital Out 5	28	Digital Out 4
10	Digital Out 3	29	Digital Out 2
11	Digital Out 1	30	Digital In 16
12	Digital In 15	31	Digital In 14
13	Digital In 13	32	Digital In 12
14	Digital In 11	33	Digital In 10
15	Digital In 9	34	Digital In 8
16	Digital In 7	35	Digital In 6
17	Digital In 5	36	Digital In 4
18	Digital In 3	37	Digital In 2
19	Digital In 1		

ICN-125 D-Sub Interconnection Board

The **ICN-125** D-sub interconnection board connections are mechanically identical to the ICN-120 and ICN-126, but the ICN-125 is designed to provide users of MultiFlex ETH 1440, 1800 and 1840 models with additional I/O. The ICN-125 provides an additional 16 opto-isolated inputs and 4 open-collector outputs for axis I/O functions such as Home, +/- Limits, Amp Fault inputs and Amp/Drive Enable outputs. Like the ICN-120 and ICN-126, the ICN-125 is designed to be used with low-cost off-the-shelf or user-built D-sub cables.

See Table 9. Motion Controller & Interconnection Board Compatibility Matrix” for compatible motion controller models.

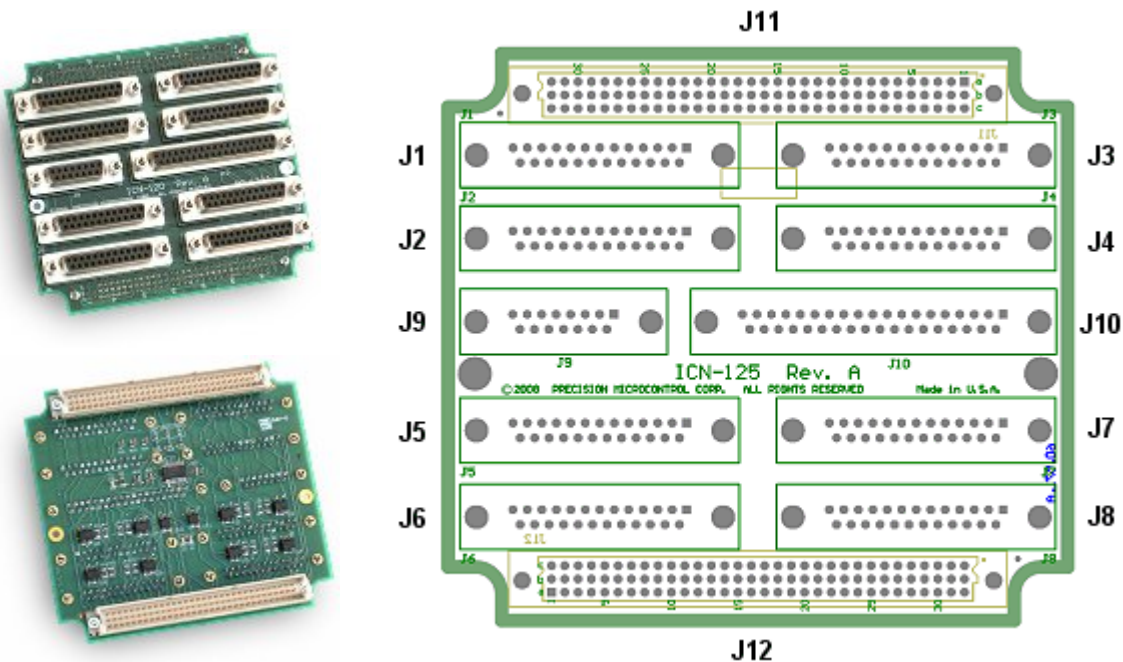


Figure 18. ICN-125 D-sub Interconnection Board and Connector Layout

Table 28. ICN-125 Connectors – Type and Function

Connector	Type	Function
J1-J8	DB25 Female	Motor Control & Axis I/O
J9	DB37 Female	Auxiliary Connector for TTL Digital I/O
J10	DB15 Female	Auxiliary Connector for Optional Analog Inputs
J11	96 Pin DIN Male - Amp Tyco #650470-5	Mates with Controller Board J8
J12	96 Pin DIN Male - Amp Tyco #650470-5	Mates with Controller Board J9

Table 29. Recommended D-sub Extension Cables

Connector	Type	Recommended P/N ⁵
J1-J8	DB25 male to DB25 female	#02655
J9	DB37 male to DB37 female	#02689
J10	DB15 male to DB15 female	#02637



An optional 25-pin D-sub to screw terminal board, the **ICN-130** (Figure 20) provides ICN-120/125/126 users with convenient screw terminal connections for fast wiring and bench-top prototyping.

⁵ Part numbers for 6 ft (~2M) cable assemblies from www.C2G.com (Cables-To-Go).

Table 30. ICN-125 Signal Assignments – Connectors J1-J8

Pin #	When Used with MultiFlex ETH 1800	J1	J2	J3	J4	J5	J6	J7	J8
1	Analog Command	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
2	Amp Enable	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
3	PWM Command					Axis 5	Axis 6	Axis 7	Axis 8
4	PWM Command	Axis 1	Axis 2	Axis 3	Axis 4				
5	+12V	✓	✓	✓	✓	✓	✓	✓	✓
6	Encoder Ref. Voltage	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
7	Encoder A-	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
8	Encoder B-	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
9	Encoder Z-	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
10	Amp/Drive Fault Return	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
11	Home Return	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
12	Limit+ Return	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
13	Limit- Return	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
14	Analog Ground	✓	✓	✓	✓	✓	✓	✓	✓
15	+5V	✓	✓	✓	✓	✓	✓	✓	✓
16									
17									
18	Digital Ground	✓	✓	✓	✓	✓	✓	✓	✓
19	Encoder A+	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
20	Encoder B+	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
21	Encoder Z+	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
22	Amp/Drive Fault	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
23	Home	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
24	Limit+	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
25	Limit-	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8

Pin #	When Used with MultiFlex ETH 1802	J1	J2	J3	J4	J5	J6	J7	J8
1									
2	Amp Enable	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
3	PWM Command					Axis 5	Axis 6	Axis 7	Axis 8
4	PWM Command	Axis 1	Axis 2	Axis 3	Axis 4				
5	+12V	✓	✓	✓	✓	✓	✓	✓	✓
6	Encoder Ref. Voltage	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
7	Encoder A-	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
8	Encoder B-	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
9	Encoder Z-	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
10	Amp/Drive Fault Return	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
11	Home Return	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
12	Limit+ Return	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
13	Limit- Return	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
14	Analog Ground	✓	✓	✓	✓	✓	✓	✓	✓
15	+5V	✓	✓	✓	✓	✓	✓	✓	✓
16									
17									
18	Digital Ground	✓	✓	✓	✓	✓	✓	✓	✓
19	Encoder A+	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
20	Encoder B+	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
21	Encoder Z+	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
22	Amp/Drive Fault	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
23	Home	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
24	Limit+	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
25	Limit-	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8

ICN-125 Signal Assignments – Connectors J1-J8 (Continued)

Pin #	When Used with MultiFlex ETH 1840	J1	J2	J3	J4	J5	J6	J7	J8
1	Analog Command	Axis 1	Axis 2	Axis 3	Axis 4	Axis 9	Axis 10	Axis 11	Axis 12
2	Amp Enable	Axis 1	Axis 2	Axis 3	Axis 4	Axis 9	Axis 10	Axis 11	Axis 12
3	Step/CW Command	Axis 5	Axis 6	Axis 7	Axis 8	Axis 5	Axis 6	Axis 7	Axis 8
4	PWM (Axis 1-4) or Full/Half Current (Axis 5-8)	Axis 1 or 5	Axis 2 or 6	Axis 3 or 7	Axis 4 or 8	Axis 5	Axis 6	Axis 7	Axis 8
5	+12V	✓	✓	✓	✓	✓	✓	✓	✓
6	Encoder Ref. Voltage	Axis 1	Axis 2	Axis 3	Axis 4	Axis 9	Axis 10	Axis 11	Axis 12
7	Encoder A-	Axis 1	Axis 2	Axis 3	Axis 4	Axis 9	Axis 10	Axis 11	Axis 12
8	Encoder B-	Axis 1	Axis 2	Axis 3	Axis 4	Axis 9	Axis 10	Axis 11	Axis 12
9	Encoder Z-	Axis 1	Axis 2	Axis 3	Axis 4	Axis 9	Axis 10	Axis 11	Axis 12
10	Amp/Drive Fault Return	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 9	Axis 10	Axis 11	Axis 12
11	Home Return	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 9	Axis 10	Axis 11	Axis 12
12	Limit+ Return	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 9	Axis 10	Axis 11	Axis 12
13	Limit– Return	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 9	Axis 10	Axis 11	Axis 12
14	Analog Ground	✓	✓	✓	✓	✓	✓	✓	✓
15	+5V	✓	✓	✓	✓	✓	✓	✓	✓
16	Dir/CCW Command	Axis 5	Axis 6	Axis 7	Axis 8	Axis 5	Axis 6	Axis 7	Axis 8
17	Drive Disable	Axis 5	Axis 6	Axis 7	Axis 8	Axis 5	Axis 6	Axis 7	Axis 8
18	Digital Ground	✓	✓	✓	✓	✓	✓	✓	✓
19	Encoder A+	Axis 1	Axis 2	Axis 3	Axis 4	Axis 9	Axis 10	Axis 11	Axis 12
20	Encoder B+	Axis 1	Axis 2	Axis 3	Axis 4	Axis 9	Axis 10	Axis 11	Axis 12
21	Encoder Z+	Axis 1	Axis 2	Axis 3	Axis 4	Axis 9	Axis 10	Axis 11	Axis 12
22	Amp/Drive Fault	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 9	Axis 10	Axis 11	Axis 12
23	Home	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 9	Axis 10	Axis 11	Axis 12
24	Limit+	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 9	Axis 10	Axis 11	Axis 12
25	Limit-	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 9	Axis 10	Axis 11	Axis 12

Pin #	When Used with MultiFlex ETH 1440*	J1	J2	J3	J4	J5	J6	J7	J8
1	Analog Command	Axis 1	Axis 2	Axis 3	Axis 4				
2	Amp Enable	Axis 1	Axis 2	Axis 3	Axis 4				
3	Step/CW Command	Axis 5	Axis 6	Axis 7	Axis 8	Axis 5	Axis 6	Axis 7	Axis 8
4	PWM (Axis 1-4) or Full/Half Current (Axis 5-8)	Axis 1 or 5	Axis 2 or 6	Axis 3 or 7	Axis 4 or 8	Axis 5	Axis 6	Axis 7	Axis 8
5	+12V	✓	✓	✓	✓	✓	✓	✓	✓
6	Encoder Ref. Voltage	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
7	Encoder A-	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
8	Encoder B-	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
9	Encoder Z-	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
10	Amp/Drive Fault Return	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8
11	Home Return	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8
12	Limit+ Return	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8
13	Limit– Return	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8
14	Analog Ground	✓	✓	✓	✓	✓	✓	✓	✓
15	+5V	✓	✓	✓	✓	✓	✓	✓	✓
16	Dir/CCW Command	Axis 5	Axis 6	Axis 7	Axis 8	Axis 5	Axis 6	Axis 7	Axis 8
17	Drive Disable	Axis 5	Axis 6	Axis 7	Axis 8	Axis 5	Axis 6	Axis 7	Axis 8
18	Digital Ground	✓	✓	✓	✓	✓	✓	✓	✓
19	Encoder A+	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
20	Encoder B+	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
21	Encoder Z+	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
22	Amp/Drive Fault	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 5	Axis 6	Axis 7	Axis 8
23	Home	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 5	Axis 6	Axis 7	Axis 8
24	Limit+	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 5	Axis 6	Axis 7	Axis 8
25	Limit-	Axis 1 & 5	Axis 2 & 6	Axis 3 & 7	Axis 4 & 8	Axis 5	Axis 6	Axis 7	Axis 8

* MultiFlex ETH 1440 controller models must have the appropriate firmware configuration file loaded to be compatible with the ICN-125 interconnection board. See Table 9. Motion Controller & Interconnection Board Compatibility Matrix, and Table 10. Default FPGA Configuration Files.



AC sine commutation: Two channels of analog command output are required for each axis configured for sine commutation of brushless or linear motors. Therefore MultiFlex ETH 1400 and 1440 models can provide up to 2 axes of sine commutation, and MultiFlex ETH 1800 and 1840 models can provide up to 4 axes of sine commutation.

When using PMC's ICN-120/125 plug-on D-sub interconnection boards, each of the two analog command signals required for each sine commutation axis are located on separate connectors as shown in the diagram below.

Table 31. ICN-120/125 Analog Command Signal Assignments for AC Sine Commutation Axes – Connectors J1-J8

Pin #	When Used w/ MultiFlex ETH 1400/1440	J1	J2	J3	J4	J5	J6	J7	J8
1	Analog Command	Axis 1 Phase U	Axis 1 Phase V	Axis 3 Phase U	Axis 3 Phase V				
Pin #	When Used w/ MultiFlex ETH 1800/1840	J1	J2	J3	J4	J5	J6	J7	J8
1	Analog Command	Axis 1 Phase U	Axis 2 Phase U	Axis 3 Phase U	Axis 4 Phase U	Axis 1 Phase V	Axis 2 Phase V	Axis 3 Phase V	Axis 4 Phase V

Table 32. ICN-120/125/126 Signal Assignments – Connector J9

Pin #	Signal	Pin #	Signal
1	Analog Input 8	9	-12
2	Analog Input 7	10	+12
3	Analog Input 6	11	Analog Ground
4	Analog Input 5	12	Analog Ground
5	Analog Input 4	13	Analog Ground
6	Analog Input 3	14	Analog Ground
7	Analog Input 2	15	Analog Ground
8	Analog Input 1		

Table 33. ICN-120/125/126 Signal Assignments – Connector J10

Pin #	Signal	Pin #	Signal
1	GND	20	GND
2	VCC	21	+5V
3	+12V	22	Digital Out 16
4	Digital Out 15	23	Digital Out 14
5	Digital Out 13	24	Digital Out 12
6	Digital Out 11	25	Digital Out 10
7	Digital Out 9	26	Digital Out 8
8	Digital Out 7	27	Digital Out 6
9	Digital Out 5	28	Digital Out 4
10	Digital Out 3	29	Digital Out 2
11	Digital Out 1	30	Digital In 16
12	Digital In 15	31	Digital In 14
13	Digital In 13	32	Digital In 12
14	Digital In 11	33	Digital In 10
15	Digital In 9	34	Digital In 8
16	Digital In 7	35	Digital In 6
17	Digital In 5	36	Digital In 4
18	Digital In 3	37	Digital In 2
19	Digital In 1		

ICN-126 D-Sub Interconnection Board

The **ICN-126** D-sub interconnection board connections are mechanically identical to the ICN-120 and ICN-125, but the ICN-126 is designed to provide users of MultiFlex ETH 1080 models with additional I/O. The ICN-126 provides an additional 16 opto-isolated inputs and 4 open-collector outputs for axis I/O functions such as Home, +/- Limits, Amp Fault inputs and Amp/Drive Enable outputs. Like the ICN-120 and ICN-125, the ICN-126 is designed to be used with low-cost off-the-shelf or user-built D-sub cables.

See Table 9. Motion Controller & Interconnection Board Compatibility Matrix” for compatible motion controller models.

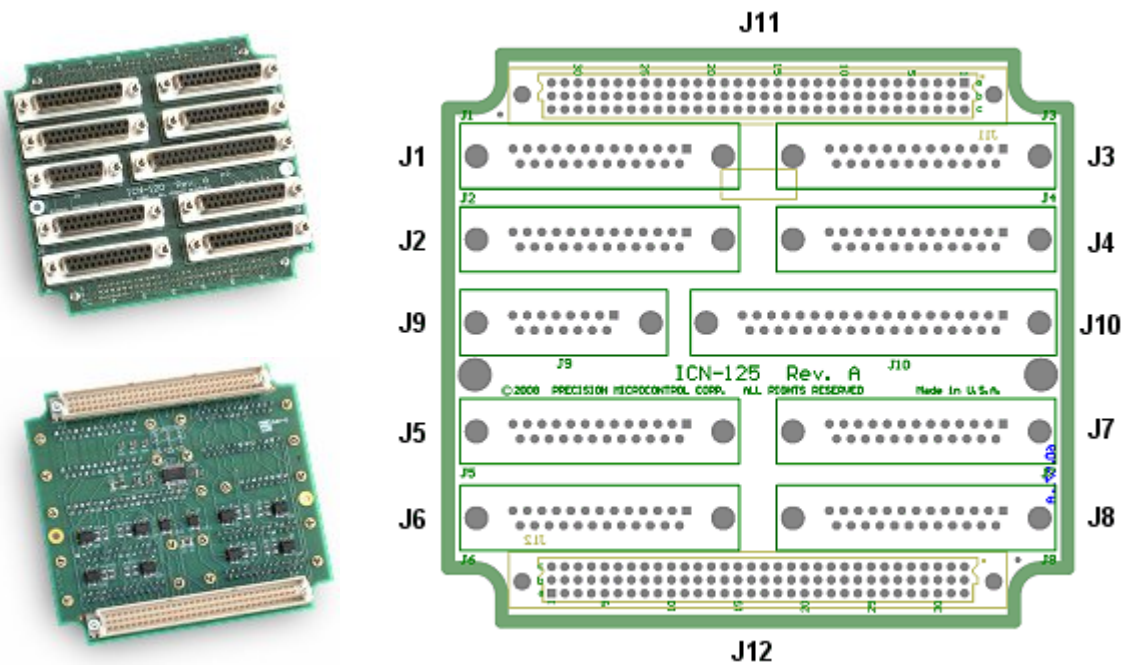


Figure 19. ICN-126 D-sub Interconnection Board and Connector Layout

Table 34. ICN-126 Connectors – Type and Function

Connector	Type	Function
J1-J8	DB25 Female	Motor Control & Axis I/O
J9	DB37 Female	Auxiliary Connector for TTL Digital I/O
J10	DB15 Female	Auxiliary Connector for Optional Analog Inputs
J11	96 Pin DIN Male - Amp Tyco #650470-5	Mates with Controller Board J8
J12	96 Pin DIN Male - Amp Tyco #650470-5	Mates with Controller Board J9

Table 35. Recommended D-sub Extension Cables

Connector	Type	Recommended P/N ⁶
J1-J8	DB25 male to DB25 female	#02655
J9	DB37 male to DB37 female	#02689
J10	DB15 male to DB15 female	#02637



An optional 25-pin D-sub to screw terminal board, the **ICN-130** (Figure 20) provides ICN-120/125/126 users with convenient screw terminal connections for fast wiring and bench-top prototyping.

⁶ Part numbers for 6 ft (~2M) cable assemblies from www.C2G.com (Cables-To-Go).

Table 36. ICN-126 Signal Assignments – Connectors J1-J8

Pin #	When Used with MultiFlex ETH 1080	J1	J2	J3	J4	J5	J6	J7	J8
1									
2									
3	Step/CW Command	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
4	Full/Half Current	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
5	+12V	✓	✓	✓	✓	✓	✓	✓	✓
6	Encoder Reference Voltage	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
7	Encoder A-	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
8	Encoder B-	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
9	Encoder Z-	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
10	Amp/Drive Fault Return	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
11	Home Return	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
12	Limit+ Return	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
13	Limit- Return	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
14	Analog Ground	✓	✓	✓	✓	✓	✓	✓	✓
15	+5V	✓	✓	✓	✓	✓	✓	✓	✓
16	Dir/CCW Command	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
17	Drive Disable	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
18	Digital Ground	✓	✓	✓	✓	✓	✓	✓	✓
19	Encoder A+	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
20	Encoder B+	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
21	Encoder Z+	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
23	Amp/Drive Fault	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
23	Home	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
24	Limit+	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
25	Limit-	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8

Table 37. ICN-120/125/126 Signal Assignments – Connector J9

Pin #	Signal	Pin #	Signal
1	Analog Input 8	9	-12
2	Analog Input 7	10	+12
3	Analog Input 6	11	Analog Ground
4	Analog Input 5	12	Analog Ground
5	Analog Input 4	13	Analog Ground
6	Analog Input 3	14	Analog Ground
7	Analog Input 2	15	Analog Ground
8	Analog Input 1		

Table 38. ICN-120/125/126 Signal Assignments – Connector J10

Pin #	Signal	Pin #	Signal
1	GND	20	GND
2	VCC	21	+5V
3	+12V	22	Digital Out 16
4	Digital Out 15	23	Digital Out 14
5	Digital Out 13	24	Digital Out 12
6	Digital Out 11	25	Digital Out 10
7	Digital Out 9	26	Digital Out 8
8	Digital Out 7	27	Digital Out 6
9	Digital Out 5	28	Digital Out 4
10	Digital Out 3	29	Digital Out 2
11	Digital Out 1	30	Digital In 16
12	Digital In 15	31	Digital In 14
13	Digital In 13	32	Digital In 12
14	Digital In 11	33	Digital In 10
15	Digital In 9	34	Digital In 8
16	Digital In 7	35	Digital In 6
17	Digital In 5	36	Digital In 4
18	Digital In 3	37	Digital In 2
19	Digital In 1		

ICN-130 DB25 Screw Terminal Board

The **ICN-130**, provides ICN-120/125 users with the convenience of screw terminal connections for testing and bench-top prototyping. The ICN-130 features a Male DB25 connector broken out to 25 individual screw terminals. The DB25 connector allows direct connection to the ICN-120 and ICN-125 plug-on interconnection boards. The ICN-130 can either be plugged directly onto the interconnection boards as shown in Figure 20 below, or it can be connected via a DB25 extension cable such as the one recommended in Table 40.



Figure 20. ICN-130 - DB25 Screw Terminal Board for ICN-120/125

Table 39. ICN-130 Signal Assignments

ICN-130 Screw Terminal #	ICN-120/125 J1-J8 Pin #
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11
12	12
13	13
14	14
15	15
16	16
17	17
18	18
19	19
20	20
21	21
22	22
23	23
24	24
25	25

Table 40. Recommended D-sub Extension Cables

Connector	Type	Recommended P/N ⁷
J1-J8	DB25 male to DB25 female	#02655

⁷ Part numbers for 6 ft (~2M) cable assemblies from www.C2G.com (Cables-To-Go).

Specifications and Settings

Power

The controller requires 3 different voltages to operate: +/- 12V and +5V. These voltages can be provided directly from an external triple-output power supply into the 6 position power connector J1 (see pin-out in Table 41 below). For our customers' convenience, PMC offers a triple-output power supply (P/N PWR-522) pictured below, but any high-quality triple-output power supply that meets the specifications listed in Table 41 can be used to power to the controller.

Table 41. Motion Controller Power Connector Signal Specifications – Connector J1

Pin #	Signal	Specification
1	+12 V	+/- 5% 1A min.
2	-12 V	+/- 5% 1A min.
3	+5 V	+/- 5% 2A min.
4		
5	GND	
6		

Power Connector Mating Plug Type: 6-position 3.81mm (0.150") pitch Phoenix Contact P/N: **1803617** (PMC P/N: **CNN-006**). Included with all PMC "Starter Kits" and PWR-522 triple-output-power supplies, otherwise must be purchased separately.

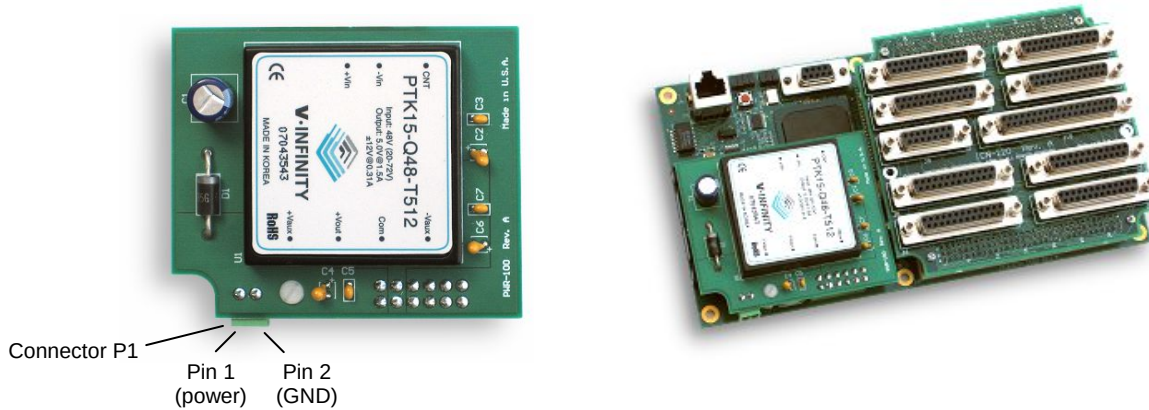


Figure 21. PWR-522 - Triple Output Power Supply

The PWR-522 triple-output power supply converts AC mains input (100-120/200-240VAC) to triple DC outputs (+5 & ±12 VDC) required to power the MultiFlex Ethernet controller. It includes a wire harness with a mating CNN-006, 6-position power connector plug.

Optional Plug-On DC-to-DC Power Converter Module

For added convenience and flexibility, the controller can optionally be powered by a **single** external DC voltage of between 12 and 70 Volts. This option requires the use of one of PMC's optional Plug-on DC-to-DC Power Converter Modules (pictured below). Choose part number **PWR-100-24** if your external power source provides 12-36 Volts, or part number **PWR-100-48** if your power source provides 24-70 Volts.



PWR-100 Plug-on DC-to-DC Power Converter Module (left), and module plugged onto the controller (right). Note: the mating power plug (2-position 3.81mm (0.150") pitch Phoenix Contact) is included with every PWR-100 converter module.

Table 42. PWR-100-24 – DC-to-DC Power Converter Module – Connector P1

Pin #	Input Signal
1	+12-36 VDC
2	GND

Table 43. PWR-100-48 – DC-to-DC Power Converter Module – Connector P1

Pin #	Input Signal
1	+24-70 VDC
2	GND

Ethernet Interface

The Ethernet interface supports most common 10/100 Mb network interface cards, switches and routers. It provides the following capabilities on power-up:

- Full IEEE 802.3 compliance
- 10Base-T or 100Base-Tx Auto Negotiate
- Auto-Negotiate on or off (DIP switch selectable)
- 10Base-T or 100Base-Tx (DIP switch selectable if auto negotiate is off)
- Full / Half duplex (DIP switch selectable if auto-negotiate is off)
- Auto-MDI/MDI-X cable crossover
- Far-end-fault detection

Serial Port Interface

The serial port is provided primarily for manufacturing configuration and diagnostic purposes, but it can also be used as an ASCII command interface to send MCCL motion commands to the motion controller via any suitable terminal emulation program such as HyperTerminal or PuTTY.



The serial communications port and the Telnet interface that is available on the Ethernet port share a common command processor on the controller. To avoid conflicts, we do not recommend using both of these ports simultaneously.

The RS-232 serial interface on the controller defaults to the following line characteristics:

- Baud rate DIP switch selectable* (9600, 19200, 38400 and 115200 baud)
- Data bits 8
- Stop bits 1
- Parity bits N

* For Baud rate DIP switch settings, see the following section - “**Configuration DIP Switches**”

Configuration DIP Switches

The controller has 16 DIP individual switches arranged in two groups of 8, labeled SW2 and SW3 (“DIP Switch 2” and “DIP Switch 3”). These switches allow you to change the default behavior of controller functions such as the Baud rate of the serial port and the polarity of the amp/drive enable open-collector output circuits. The functions and settings for each switch are listed in the diagrams below.

DIP Switch 2

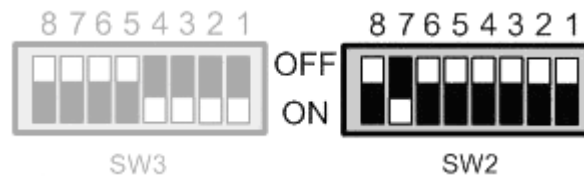


Table 44. DIP Switch 2 – Functions and Default Settings for all Controller Models

Position	Function	On State	Off State	Default
8	RS-232 Baud Rate Select (1)	bs(1) = 0	bs(1) = 1	Off
7	RS-232 Baud Rate Select (0)	bs(0) = 0	bs(0) = 1	On
6	Fast (16 kHz) Servo Rate Mode	Enable	Disable	Off
5	Macro 0 Power-on Execution	Enable	Disable	Off
4	Ethernet PHY auto-negotiate*	Disable	Enable	Off
3	Ethernet PHY speed*	10 Mbps	100 Mbps	Off
2	Ethernet PHY duplex*	Half Duplex	Full Duplex	Off
1	Boot Selector	Boot PMON	Boot RTEMS	Off

* **Note:** It is unlikely that you will need to change the default Ethernet DIP switch settings (positions 2, 3 and 4). Most modern Ethernet adapters support the default settings.

Table 45. DIP Switch 2 – Baud Rate Selection

Position	Baud Rate			
	9600	19,200	38,400	115,200
8	Off	Off	On	On
7	Off	On	Off	On

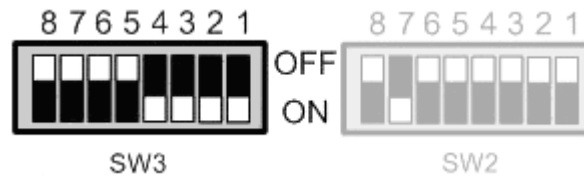
DIP Switch 3

Switch settings on DIP switch 3 determine the polarity (Active Low or Active High) of amp/drive enable open-collector outputs. The following diagrams show the factory default switch positions and settings for each controller model.



Active Low – Means that the Amp Enable or Drive Disable output signal voltage will go to a **Low** state when a “Motor oN” (MN) command is issued.

Active High – Means that the Amp Enable or Drive Disable output signal voltage will go to a **High** state when a “Motor oN” (MN) command is issued.

**Table 46. DIP Switch 3 – Functions & Factory Default Settings for MultiFlex ETH 1040, 1400, 1440**

Position	Function	MultiFlex ETH Model			On State	Off State	Default
		1040	1400	1440			
8	Amp/Drive Enable Polarity		Axis 1	Axis 1	Active High	Active Low	Off
7	Amp/Drive Enable Polarity		Axis 2	Axis 2	Active High	Active Low	Off
6	Amp/Drive Enable Polarity		Axis 3	Axis 3	Active High	Active Low	Off
5	Amp/Drive Enable Polarity		Axis 4	Axis 4	Active High	Active Low	Off
4	Amp/Drive Enable Polarity	Axis 1		Axis 5	Active High	Active Low	On
3	Amp/Drive Enable Polarity	Axis 2		Axis 6	Active High	Active Low	On
2	Amp/Drive Enable Polarity	Axis 3		Axis 7	Active High	Active Low	On
1	Amp/Drive Enable Polarity	Axis 4		Axis 8	Active High	Active Low	On

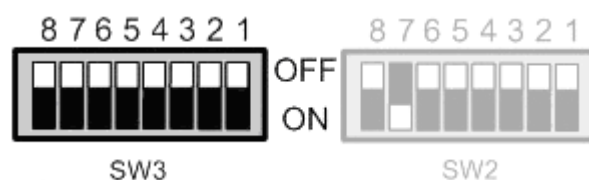


Table 47. DIP Switch 3 – Functions & Factory Default Switch Settings for MultiFlex ETH 1800 When Used With an ICN-125 Series Interconnection Board

Position	Function		On State	Off State	Default
		MultiFlex ETH Model			
		1800			
8	Amp/Drive Enable Polarity	Axis 1	Active High	Active Low	Off
7	Amp/Drive Enable Polarity	Axis 2	Active High	Active Low	Off
6	Amp/Drive Enable Polarity	Axis 3	Active High	Active Low	Off
5	Amp/Drive Enable Polarity	Axis 4	Active High	Active Low	Off
4	Amp/Drive Enable Polarity	Axis 5	Active Low*		Off
3	Amp/Drive Enable Polarity	Axis 6	Active Low*		Off
2	Amp/Drive Enable Polarity	Axis 7	Active Low*		Off
1	Amp/Drive Enable Polarity	Axis 8	Active Low*		Off

* When used with the ICN-125, the Amp/Drive Enable signal polarities for axes 5 – 8 are not selectable – they are fixed as **Active Low**.

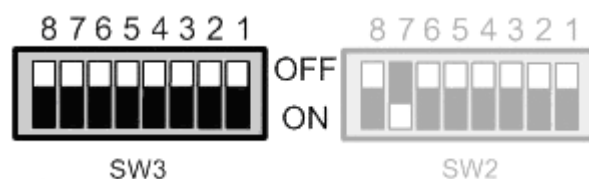


Table 48. DIP Switch 3 – Functions & Factory Default Switch Settings for MultiFlex ETH 1800 When Used With an ICN-120 Series Interconnection Board

Position	Function		On State	Off State	Default
		MultiFlex ETH Model			
		1800			
8	Amp/Drive Enable Polarity	Axis 1	Active High	Active Low	Off
7	Amp/Drive Enable Polarity	Axis 2	Active High	Active Low	Off
6	Amp/Drive Enable Polarity	Axis 3	Active High	Active Low	Off
5	Amp/Drive Enable Polarity	Axis 4	Active High	Active Low	Off
4	Amp/Drive Enable Polarity	Axis 5	Active High	Active Low	Off
3	Amp/Drive Enable Polarity	Axis 6	Active High	Active Low	Off
2	Amp/Drive Enable Polarity	Axis 7	Active High	Active Low	Off
1	Amp/Drive Enable Polarity	Axis 8	Active High	Active Low	Off

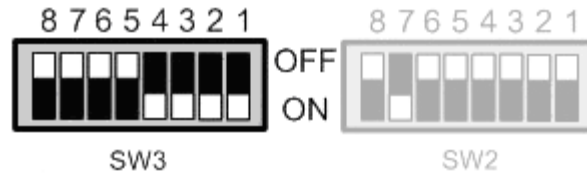


Table 49. DIP Switch 3 – Functions & Factory Default Switch Settings for MultiFlex ETH 1840 When Used With an ICN-125 Series Interconnection Board

Position	Function		On State	Off State	Default
		MultiFlex ETH Model			
		1840			
8	Amp/Drive Enable Polarity	Axis 1	Active High	Active Low	Off
7	Amp/Drive Enable Polarity	Axis 2	Active High	Active Low	Off
6	Amp/Drive Enable Polarity	Axis 3	Active High	Active Low	Off
5	Amp/Drive Enable Polarity	Axis 4	Active High	Active Low	Off
4	Amp/Drive Enable Polarity	Axis 5	Active High	Active Low	On
3	Amp/Drive Enable Polarity	Axis 6	Active High	Active Low	On
2	Amp/Drive Enable Polarity	Axis 7	Active High	Active Low	On
1	Amp/Drive Enable Polarity	Axis 8	Active High	Active Low	On
	Amp/Drive Enable Polarity	Axes 9-12	Active Low*		

* When used with the ICN-125 Interconnection Board, the Amp/Drive Enable signal polarities for analog servo axes 9-12 are not selectable – they are fixed as **Active Low**.

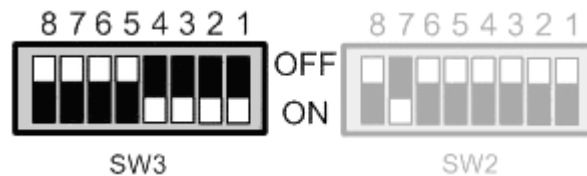


Table 50. DIP Switch 3 – Functions & Factory Default Switch Settings for MultiFlex ETH 1840 When Used With an ICN-120 Series Interconnection Board

Position	Function		On State	Off State	Default
		MultiFlex ETH Model			
		1840			
8	Amp/Drive Enable Polarity	Axis 1	Active High	Active Low	Off
7	Amp/Drive Enable Polarity	Axis 2	Active High	Active Low	Off
6	Amp/Drive Enable Polarity	Axis 3	Active High	Active Low	Off
5	Amp/Drive Enable Polarity	Axis 4	Active High	Active Low	Off
4	Amp/Drive Enable Polarity	Axis 5 / 9*	Active High	Active Low	On
3	Amp/Drive Enable Polarity	Axis 6 / 10*	Active High	Active Low	On
2	Amp/Drive Enable Polarity	Axis 7 / 11*	Active High	Active Low	On
1	Amp/Drive Enable Polarity	Axis 8 / 12*	Active High	Active Low	On

* When used with the ICN-120, axes 5-8 and axes 9-12 share Amp/Drive Enable output signals. Therefore, whatever polarity is selected via the DIP switch will apply to both axes in each shared pair.

CE Compliance

PMC motion controllers are designed, manufactured and intended for incorporation into machinery or “apparatus” by a professional manufacturers, therefore they are **not** required to be CE marked for the purposes of the European Community’s EMC Directive 2004/108/EEC (formerly 89/336/EEC). However, the EMC Directive requires that relevant instructions for use must be provided by the component’s manufacturer to help the manufacturer or assembler of the final apparatus solve foreseeable EMC problems within the final apparatus. PMC provides relevant EMC guidelines in a separate document titled: “**Designing for EMC –Installation Guidelines for Electromagnetic Compatibility**” available on the Support section of PMC’s web site at: www.pmccorp.com/support/mfxeth1000.php

RoHS Compliance

To comply with the requirements of the EU’s “Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2008” (implemented with EU Directive 2002/95, the “RoHS Regulations”), all motion controllers in the MultiFlex product family are manufactured with RoHS compliant components, lead-free solder and lead-free assembly processes, and are certified to be RoHS compliant.

Mechanical Drawings & Dimensions

(See following pages)

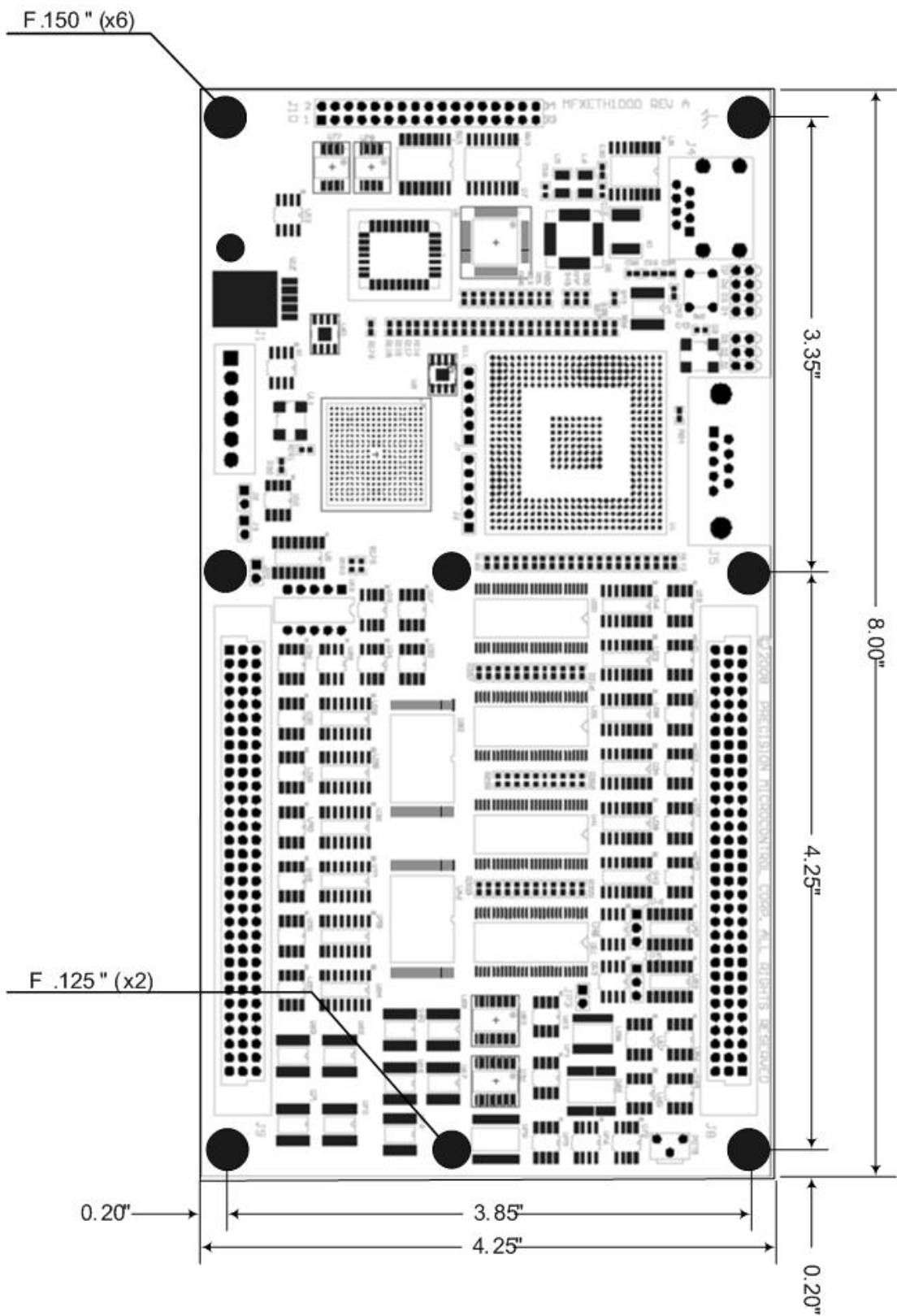


Figure 22. Mounting Hole Dimensions

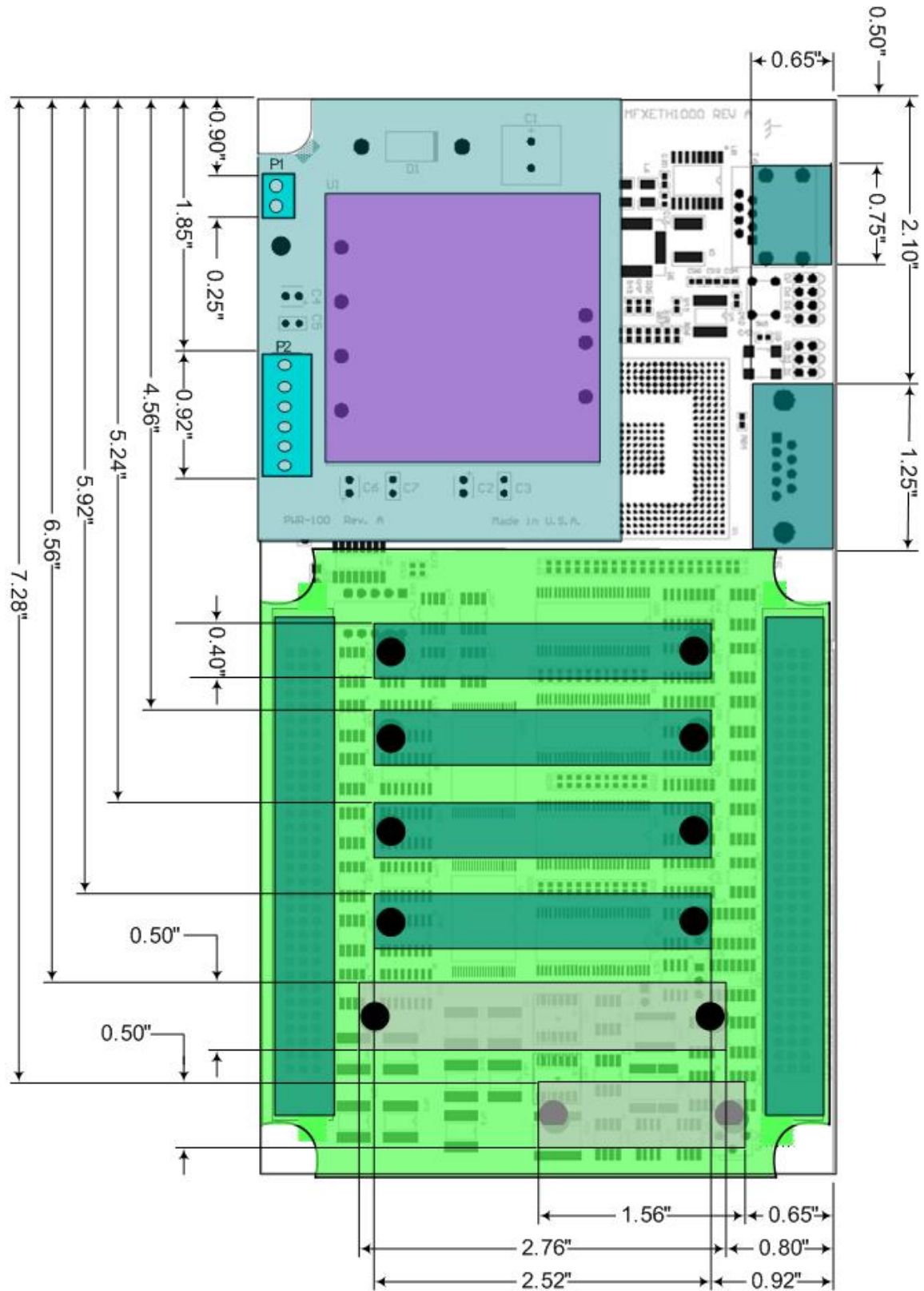


Figure 23. Connector Locations & Dimensions (with ICN-100 and PWR-100 power converter)

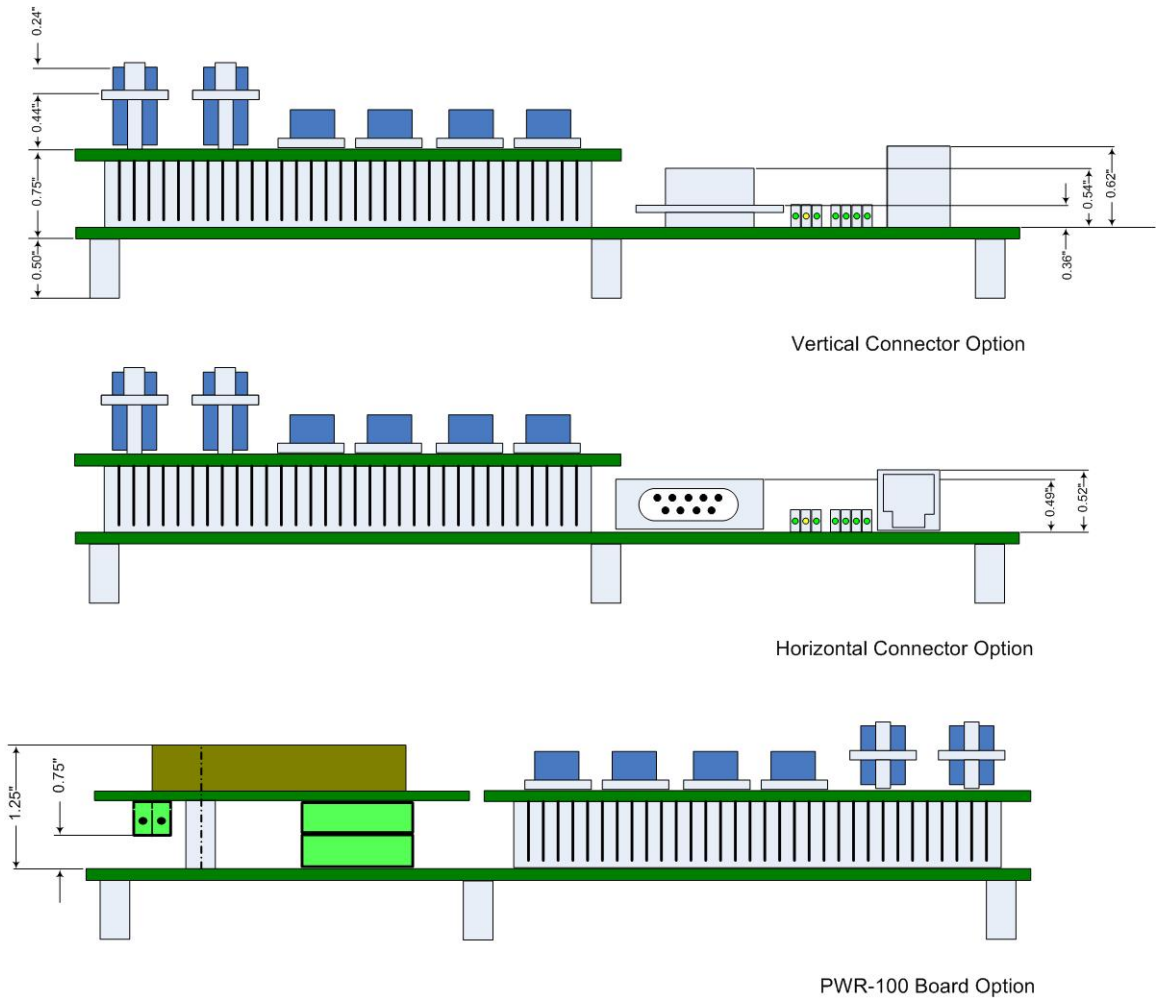


Figure 24. Vertical Dimensions



Precision MicroControl Corporation

2075-N Corte del Nogal
Carlsbad, CA 92011 * USA

Tel: +1-760-930-0101

Fax: +1-760-930-0222

www.pmccorp.com

Information: info@pmccorp.com
Technical Support: support@pmccorp.com