IB-20B001

EMC SERIES MOTION CONTROLLER **MARCH 2001**

EMERALD
EMC-2000

INSTRUCTION BOOK

INDUSTRIAL INDEXING SYSTEMS, Inc.

Revision - 0
Approved By:

ER-6038

ERRATA SHEET, IB-20B001 Rev. 0 — MAY 2004

Date	Rev.	ECN No.	DR	CHK	CHK
10/23/01	0	ECN-01-371 (See Note 1)	KY	SM	
2/26/02	A	ECN-02-075 (See Note 2)	KY	SM	
5/28/02	B	ECN-02-080 (See Note 3)	KY	SM	
9/19/02	C	ECN-02-263 (See Note 4)	KY	TO	
10/22/02	D	ECN-02-339 (See Note 5)	KY	KW	
1/31/03	E	ECN-03-030 (See Note 6)	KY	JC/SM	
10/28/03	F	ECN-03-427 (See Note 7)	KY	WES	
5/12/04	H	ECN-04-154 (See Note 8)	KY	JPW	
7/23/04	J	ECN-04-294 (See Note 9)	KY	TO	

Notes:

1) Pages 3-1, 4-1 and 4-3, dated October 2001, supersede pages 3-1, 4-1 and 4-3, dated March 2001.

2) Table of Contents, page iii, dated February 2002, supersedes Table of Contents, page iii, dated March 2001.
Section 3, pages 3-1 & 3-2, dated February 2002, supersede Section 3, pages 3-1 & 3-2, dated March 2001.

3) Table of Contents, List of Illustrations, Introduction and Section 5, page 5-1, dated May 2002, supersede Table of Contents, List of Illustrations, Introduction and Section 5, page 5-1, dated March 2002.
Added Appendix A and Appendix B.

4) Page 2-1, dated September 2002 supersedes page 2-1, dated March 2001.

5) Table of Contents, page v, dated October 2002, supersedes Table of Contents, page v, dated May 2002. Appendix B, added pages B-8, B-9 and B-10, dated October 2002.

6) Table of Contents, pages v-vi, dated January 2003, supersedes Table of Contents, pages v-vi, dated October 2002. List of Illustrations, dated January 2003, supersedes List of Illustrations, dated May 2002. Added Appendix C, Appendix D and Appendix E.

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ER-6038

ERRATA SHEET, IB-20B001 Rev. 0 OCTOBER 2003

Notes:

7) Appendix C, page C-1, dated October 2003, supersedes Appendix C, page C-1, dated January 2003.

8) Table of Contents, page vi, dated May 2004, supersedes Table of Contents, page vi, dated January 2003.
List of Illustrations, page viii, dated May 2004, supersedes List of Illustrations, page viii, dated January 2003.
Appendix A, dated May 2004, supersedes Appendix A, dated May 2002.
Appendix B, dated May 2004, supersedes Appendix B, dated October 2002.
Appendix C, dated May 2004, supersedes Appendix C, dated October 2003.
Appendix D, dated May 2004, supersedes Appendix D, dated January 2003.
Appendix E, dated May 2004, supersedes Appendix E, dated January 2003.
Added Appendix F.

9) Table of Contents, page iv, dated July 2004, supersedes Table of Contents, page iv, dated May 2004.
Appendix A, pages A-6 and A-7, dated July 2004, supersedes Appendix A, pages A-6 and A-7, dated May 2004.

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INTRODUCTION

Thank you for selecting Industrial Indexing Systems' Emerald Series products. You join many other companies around the world in your choice of these powerful, flexible motion control products.

The EMC-2000 embodies a blend of open architecture features with a true real-time operating system. The result is a state-of-the art performance and superior connectivity to other systems and network components.

The EMC-2000 has a wide array of features, including a 64-bit MIPS processor, SERCOS Interface™, DeviceNet/CanBus port, two RS-232 ports, Encoder master follower input, programmmable limit switch (PLS) Functions, 2 software simulated motors (pacers), failsafe watchdog timer and high visibility status displays. The EMC-2000 also offers 2 PCI Mezzanine slots (PMC) for interfacing a large selection of optional features, including a master follower resolver, Ethernet, removable memory, embedded PC and modem.

The controller is programmed using our friendly **E**merald **M**otion **P**rogramming **L**anguage (EML) and powerful new **E**merald **D**evelopment **E**nvironment (EDE) software tools for the PC.

SECTION 1 - OVERVIEW

This manual is organized so that information is easy to find and easy to use. It begins by detailing how to identify the EMC-2000 Controller and its options. This section is followed by a general description of the product and its components. Next, a comprehensive hardware specification is provided followed by connector wiring diagrams. The section that follows documents the controller status displays. Sections on EMC-2000 installation guidelines and cables drawings round out the manual.

1.1 IDENTIFYING THE EMERALD CONTROLLER

Emerald Controller packages can be identified as follows.

Your EMERALD Controller model number uses this designation:

EMC-2000XXX

WHERE:

XXX = option list in alphabetical order

- E = Ethernet Single Slot PMC Card
- B = Removable memory port single slot PMC card
- R = Master resolver single slot PMC card
- P = Embedded PC dual slot PMC card
- M = Modem single slot PMC card
- S = DeviceNet Scanner Software

Example: EMC-2000ERS

SECTION 2 - DESCRIPTION

The Emerald EMC-2000 product is a SERCOS Master servo motion controller, with the ability to command up to 8 SERCOS Slave Devices. The application program that operates the controller is created on a PC using the EDE software tools and sent serially to the controller via an RS-232 link.

NOTE

All commands used by the EMERALD are part of the Emerald Motion Language (EML). Refer to the Emerald Development Environment (EDE) PC tools online help for detailed information on the commands and their proper usage.

The external connections that exist on the Emerald are shown in **Figure 2.1**, and consist of 2 RS-232 ports, DeviceNet/Can Bus port, Master Encoder Input, SERCOS Transmitter and Receiver, as well as a Hardware Watchdog and power connections.

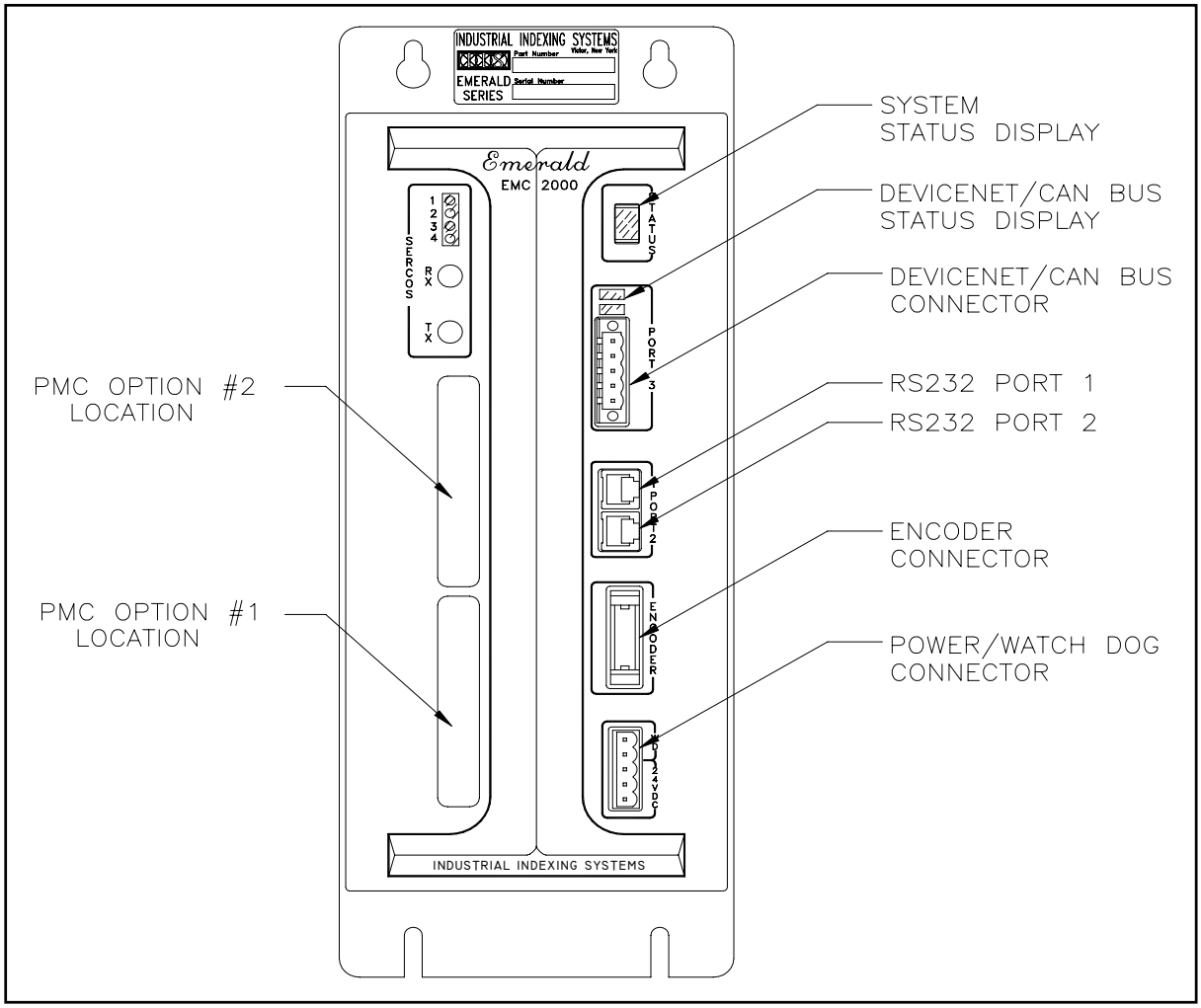


Figure 2.1 - Emerald Layout

2.1 COMPONENTS

2.1.1 STATUS INDICATORS

NOTE
For indicator status information, refer to Section 5 - Status & Error Codes.

1. Controller Status Display - This single seven-segment LED display with decimal point provides status information of various operating conditions.

2. SERCOS Status LEDs - This 4 LED Array indicates the status of the SERCOS Interface™.

3. DeviceNet Status LEDs - The combination of these 2 bi-color LEDs indicates the status of DeviceNet network or Can Bus.

2.1.2 CONNECTORS

NOTE
For proper pinouts for each connector refer to Section 4 - Emerald Wiring.

1. PORT 1 - This 6-pin RJ-11 connector is an RS-232 serial communication port. It uses a custom protocol to communicate with the EDE software tools on a PC. This port also facilitates firmware download.

2. PORT 2 - This 6-pin RJ-11 connector is an RS-232 serial communication port. It can be used to communicate with the IIS OPI-50 or similar RS-232 type device. The protocol is selectable through the EML programming language. This port does default to the custom protocol for communicating with the EDE software tools on a PC.

3. PORT 3 - This 5-pin header is a DeviceNet/Can Bus interface port. The Emerald can operate as both a slave (standard) and master scanner (optional) on a DeviceNet network. EML program data and EMERALD System Status Flags can be sent or monitored over this Network

4. ENCODER - This 10-pin header is a high-speed master encoder pulse input.

5. WD/24V - This connector is used to connect the required 24VDC external power supply. This connector also provides a normally open hardware watchdog output for external monitoring of the EMERALD operation. The watchdog output contact will be closed when the Motion Application is executing.

6. RX - This SMA style interface port is the SERCOS Fiber Optic Receiver. This is return connection for SERCOS Interface Ring.

7. TX - This SMA style interface port is the SERCOS Fiber Optic Transmitter. This connection is the start of the SERCOS Interface Ring.

SECTION 3 - EMERALD SPECIFICATIONS

3.1 GENERAL

Weight	5.8 lbs / 2.2 Kgs
Dimensions	Width 4.80 in (121.9 mm) Height 12.5 in (317.4 mm) Depth 7.28 in (184.8 mm)
Recommended Panel Depth	12.00 in (304.8 mm) (See **Section 6 - Installation Guidelines**)

3.2 POWER REQUIREMENT

Supply Voltage	24 volts DC ± 10%, Class 2 power supply
Supply Current	.75 amps max. with no PMC option cards installed.

3.3 SERCOS INTERFACE

Interface Version	V01.02
Topology	Multi drop fiber optic ring
Transmission Rates	2, 4, 8 and 16 MB/second

3.4 ENVIRONMENT

Storage Temperature	-10 to 70°C/14-158°F
Operating Temperature	0 to 50°C/32-131°F
Humidity	35 to 90% Relative Humidity, non-condensing
Shock and Vibration	1 G or less
Operating Conditions	Free of dust, liquids, metallic particles and corrosive gases. Use in a pollution degree 2 environment.

3.5 COMMUNICATION PORTS

Port 1	Classification: RS-232 Data Transfer: EMC Packet protocol Protocol: 38400 baud, 1 stop bit, 8 data bits, No parity
Port 2	Classification: RS-232 Data Transfer: EMC Packet protocol (default), Programmable Protocol: Configurable
DeviceNet / CAN Bus	Classification: CAN bus DeviceNet: Data Transfer and Protocol are defined by the DeviceNet specifications. OR CAN Bus: IIS unique software protocol for easy to use multidrop control. **Reference IB-11B023**.
Fiber Optic Transmitter/ Receiver	Classification: SMA style - SERCOS compatible Fiber Optics SERCOS: Data Transfer and Protocol are define by the SERCOS Specification (IEC-61491 or EN-61491).

3.6 ENCODER INTERFACE

A quad B with marker	Three differential Inputs. Input Frequency DC to 1.5 MHz. ON: 5V±5% @ 20mA max. OFF: 1V±5% less than 1mA.
Trap	Input for trapping encoder's 32 bit signed position. 24V±10% @ 10 mA max. Max. Trap Rate 1 kHz. Trap Register is updated on falling edge of input. Consult factory for availability of rising edge Trap Input.

3.7 WATCHDOG PROTECTION

Contact Type	Relay normally open dry contact
Rating	Up to 28 VAC/VDC, 1.0 Amp Maximum

SECTION 4 - EMERALD WIRING

This section details the pinouts of the external connectors on the EMERALD controller. Refer to **Section 7 INTERFACE CABLES** for part numbers of cables to interface to these connectors.

4.1 PORT 1 & PORT 2

The ports are used for communication and use RJ-11 connectors to interface to respective devices. The port 1 & port 2 pinouts are shown in **Figure 4.1**.

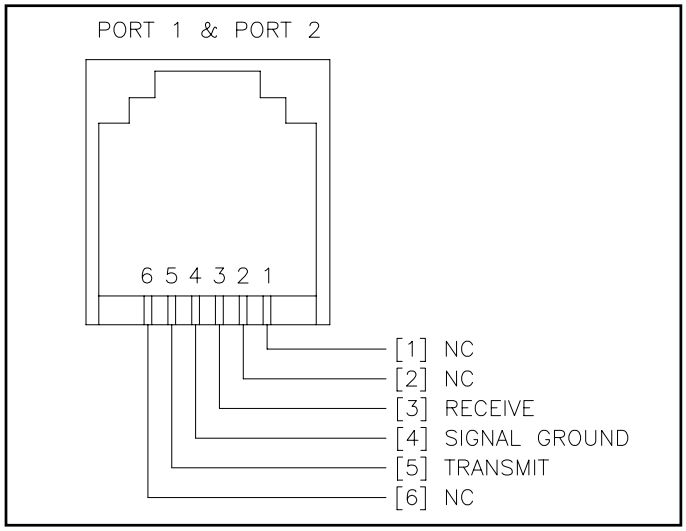


Figure 4.1 - Port 1 & Port 2

4.2 PORT 3 (DeviceNet/Can Bus)

DeviceNet/Can Bus is to be powered by a 12 to 24 volt, Class 2 power supply.

The DeviceNet/Can Bus pinouts are shown in **Figure 4.2**.

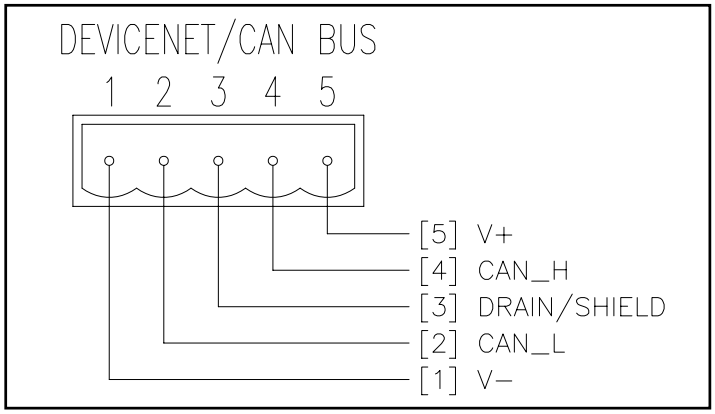


Figure 4.2 - DeviceNet/CAN Bus

4.3 ENCODER INTERFACE

The Encoder interface connector pinouts are shown in **Figure 4.3**.

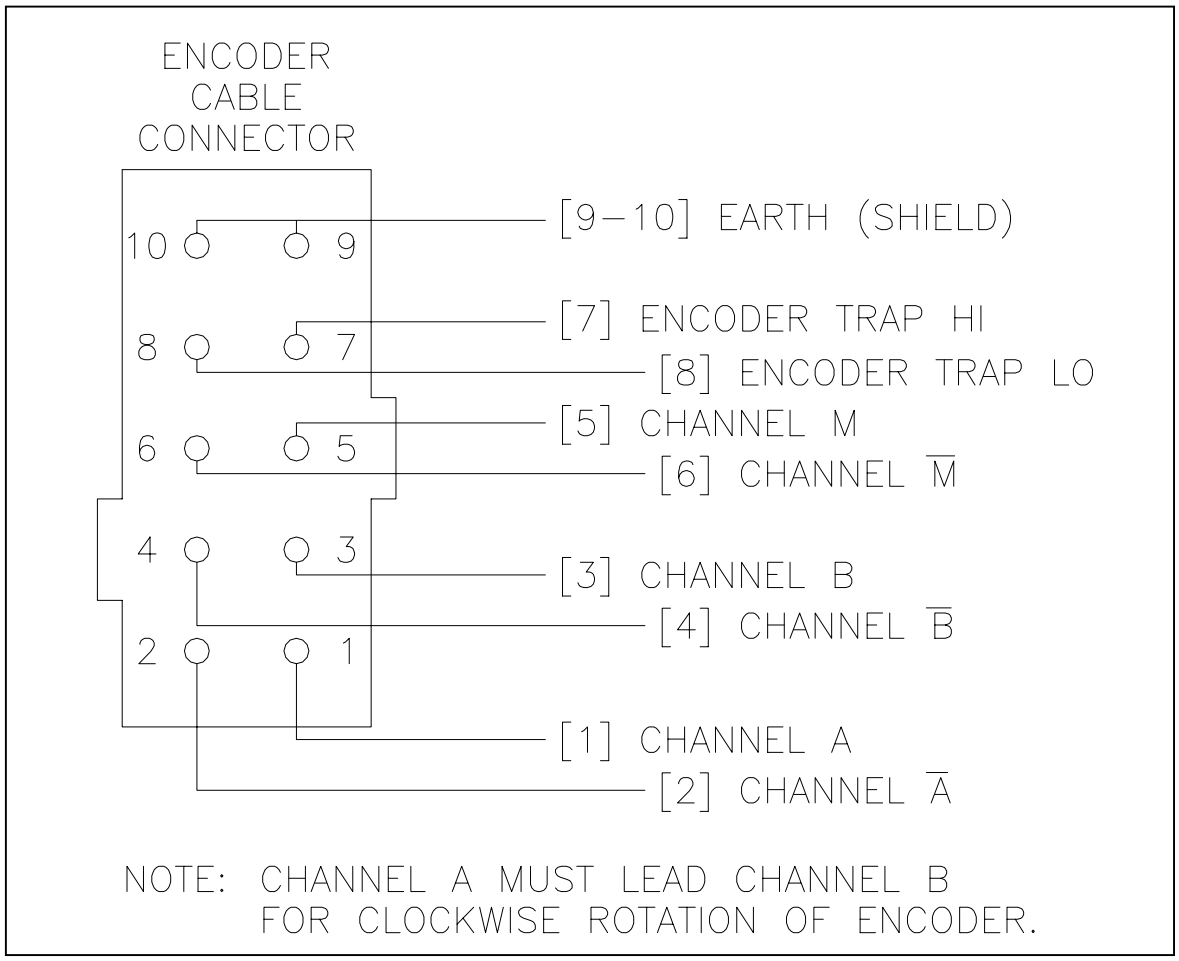


Figure 4.3 - Encoder Interface Connector Pinouts

4.4 POWER AND WATCHDOG CONNECTER

The 24-volt, Class 2 power supply is to be used to power the EMC-2000.

The pinouts of the WD/24V connector are shown in **Figure 4.4**.

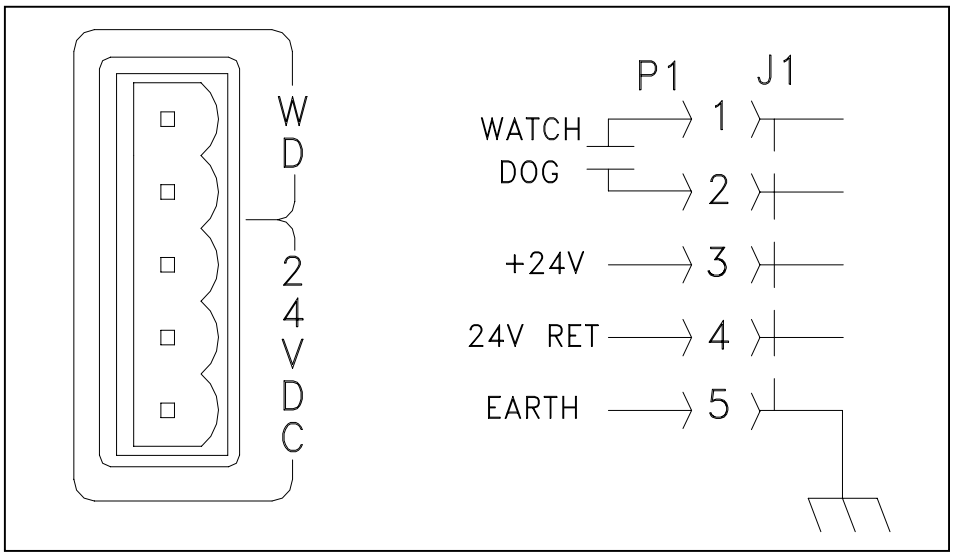


Figure 4.4 - Power and Watchdog Connection

4.5 SERCOS INTERFACE TX/RX

The SERCOS Interface™ is a multi-drop fiber-optic ring with 1 Master Controller command multiple Slave devices. The EMERALD acts as the Master Controller in this arrangement.

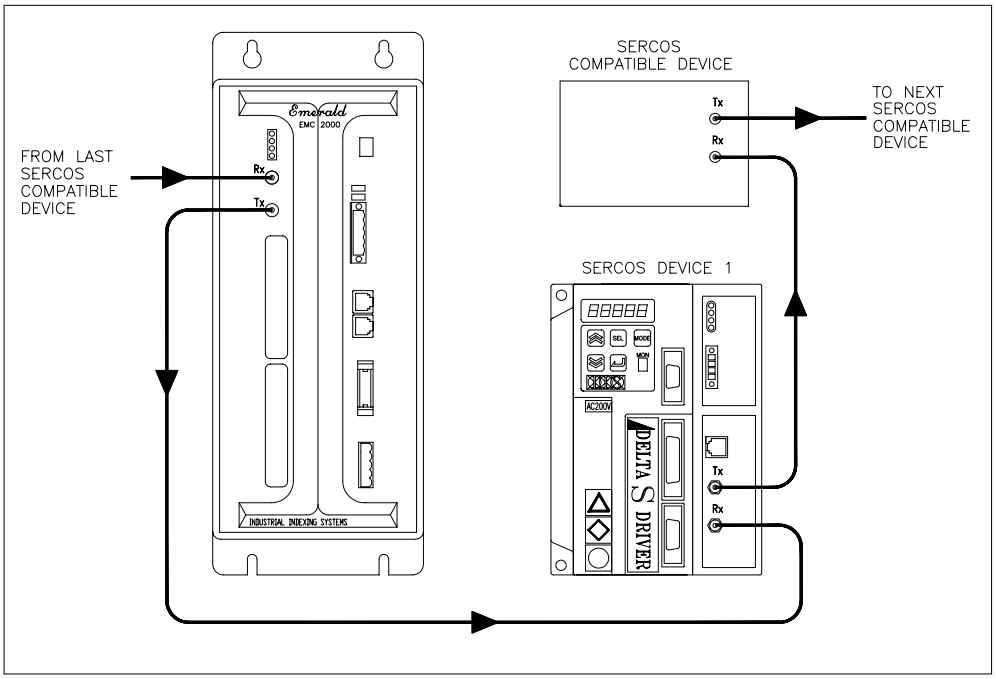


Figure 4.5 - Typical SERCOS Ring

SECTION 5 - STATUS & ERROR CODES

5.1 CONTROLLER STATUS

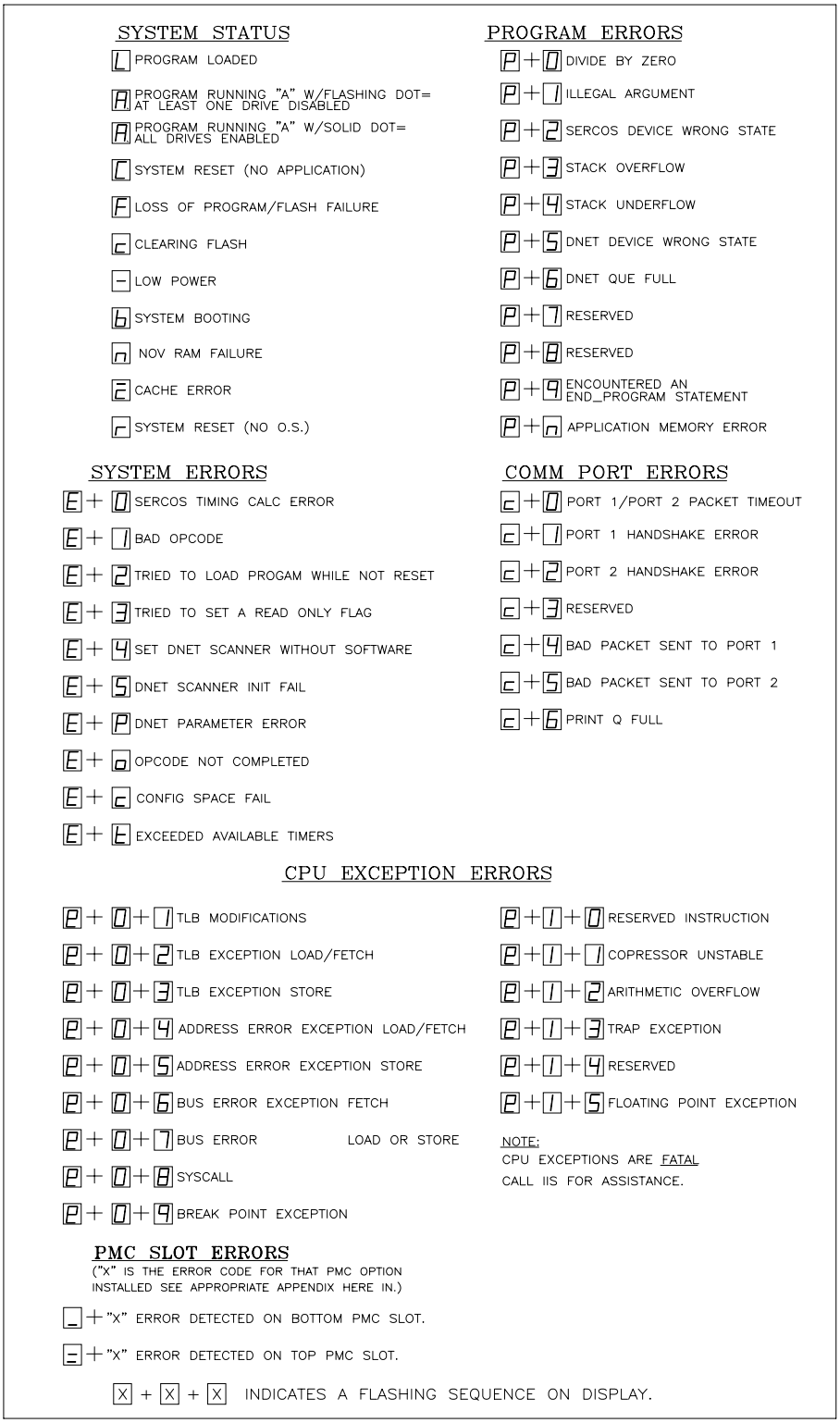


Figure 5.1 - Controller Status

5.2 SERCOS STATUS DISPLAYS

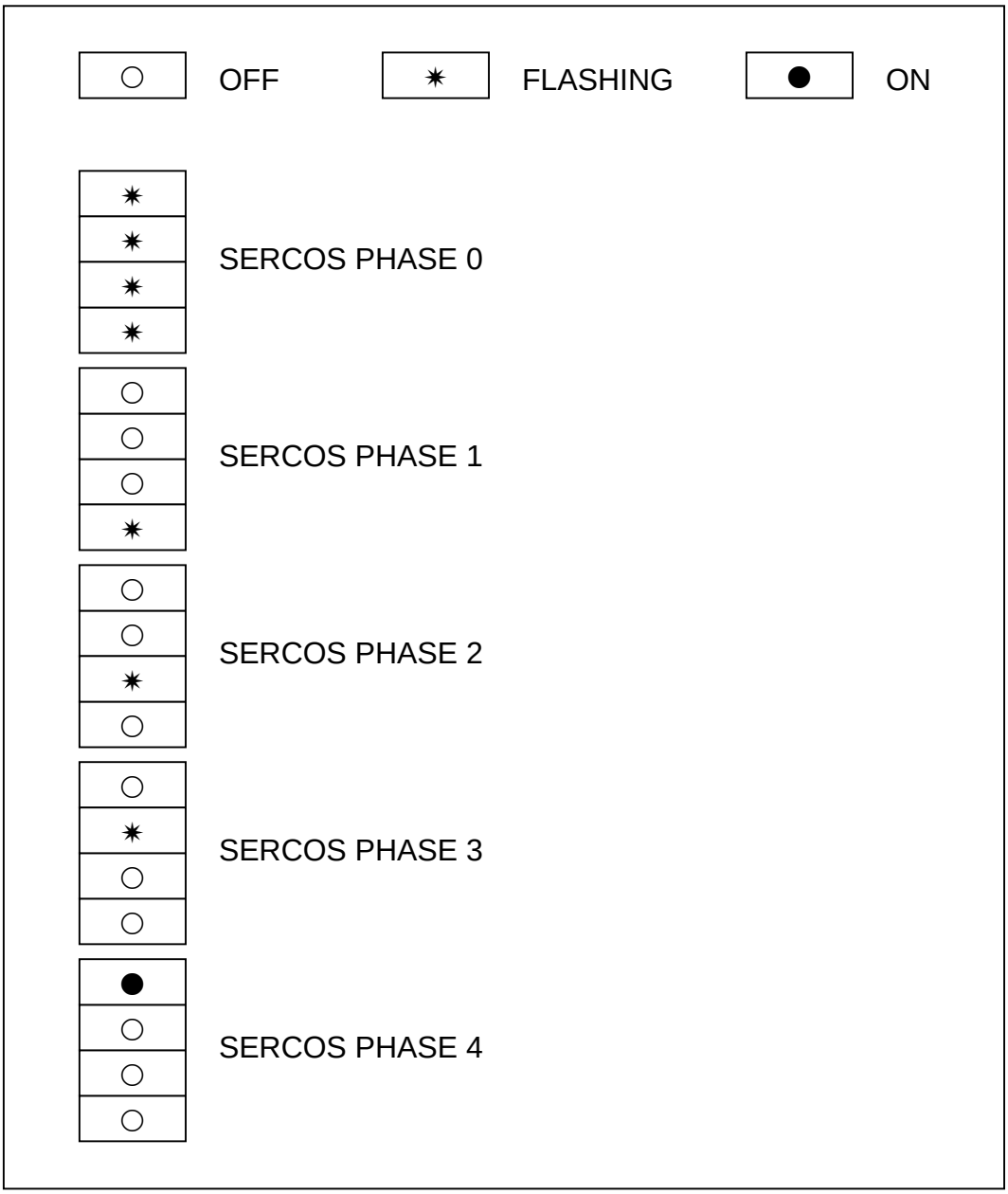


Figure 5.2 - SERCOS Status Displays

5.3 DEVICENET STATUS DISPLAYS FOR PORT 3

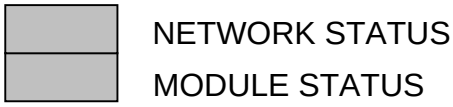


Figure 5.3 - DeviceNet

5.3.1 MODULE STATUS LED

The lower bi-color (green/red) LED provides DeviceNet device status. It indicates whether or not the device has power and is operating properly. **Table 5.1** and **Figure 5.3** define the Module Status LED states.

STATE	LED IS	TO INDICATE
No Power	Off	There is no power applied to the device.
Device Operational	Green	The device is operating in a normal condition.
Device in Standby (The Device Needs Commissioning)	Flashing Green	The device needs commissioning due to configuration missing, incomplete or incorrect. The device may be in the standy state.
Minor Fault	Flashing Red	Recoverable fault.
Unrecoverable Fault	Red	The device has an unrecoverable fault; may need replacing.
Device Self Testing	Flashing Red & Green	The device in self-test.

Table 5.1 - Module Status LED

5.3.2 NETWORK STATUS LED

The upper bi-color (green/red) LED indicates the status of the communication link.

Table 5.2 defines the Network Status LED states.

STATE	LED IS	TO INDICATE
Not Powered/Not On-line	Off	Device is not on-line. - The device has not completed the Dup_MAC_ID test yet. - The device may not be powered, look at Module Status LED.
On-line, Not Connected	Flashing Green	Device is on-line but has no connections in the established state. - The device has passed the Dup_MAC_ID test, is on-line, but has no established connections to other nodes. - For a Group 2 Only device it means that this device is not allocated to a master. - For a UCMM capable device it means that the device has no established connections.
Link OK On-Line, Connected	Green	The device is on-line and has connections in the established state. - For a Group 2 Only device it means that the device is allocated to a Master. - For a UCMM capable device it means that the device has one or more established connections.
Connection Time-Out	Flashing Red	One or more I/O Connections are in the Timed-Out state.
Critical Link Failure	Red	Failed communications device. The device detected an error that has rendered it incapable of communicating on the network (Duplicate MAC ID or Bus-off).
Communication Faulted and Received an Identify Comm Fault Request - Long Protocol	Flashing Red & Green	A specific Communication Faulted device. The device has detected a Network Access error and is in the Communication Faulted state. The device has subsequently received and accepted an Identify Communication Faulted Request - Long Protocol message.

Table 5.2 - Network Status LED

SECTION 6 - INSTALLATION GUIDELINES

6.1 GENERAL

This section contains the specific information needed to properly install the Emerald EMC-2000 controller unit. For maximum performance it is recommended that the controller unit be installed in a NEMA 12 type enclosure and certain other criteria be met.

6.2 ENCLOSURE CABINET REQUIREMENTS

Ideally, the EMC-2000 controller unit, along with other related electronic components, should be mounted on a panel housed in a NEMA 12 enclosure. It is recommended that the cabinet have a depth of 12.00 inches (304.8 mm) to accommodate the bend radius of the SERCOS fiber optic cables. The enclosure should be mounted as far away as practical from noise generating devices, such as SCR equipment.

6.3 MOUNTING THE SYSTEM UNIT

The EMC-2000 controller unit is designed for mounting on a grounded panel, and is secured to the panel with four #10 screws. Be sure to provide adequate spacing around the controller unit for ease of maintenance and proper ventilation. Typically wire ways can be located up to 3 inches (76 mm) from the edge of the controller unit back plate. Refer to drawing number EMC-2000 in **Section 6.7 - Installation Drawings** for mounting dimensions.

6.4 CABLE ISOLATION REQUIREMENTS

It is imperative that any low-voltage signal conductors, such as resolvers, encoders or communications, (24V or less) be routed in conduits or wire ways separate from high-voltage, such as motor cables, and transformer lines (100V or more). This will insure that electromagnetic fields produced by high power transmission do not corrupt the low level signals. All cabling shields must be connected according to manufacturer specifications.

6.5 GROUNDING REQUIREMENTS

The site must have a suitable earth ground rod and ground bus installed. The NEMA 12 enclosure, wire ways, conduits, and machine frame must be connected to this ground bus. The EMC-2000 earth ground must be connect to this ground bus.

6.6 POWER ISOLATION

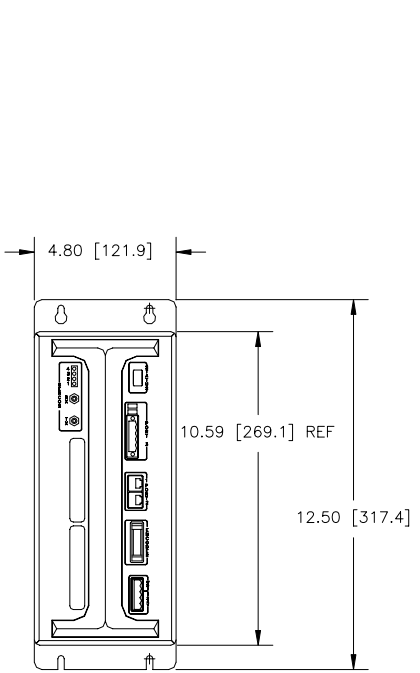
Although the unit is equipped with a fuse and transient voltage protection, it is recommended that the EMC-2000 unit be connected to a separate 24 VDC power supply than the supply used for system I/O. This will isolate noisy I/O contacts from the controller power.

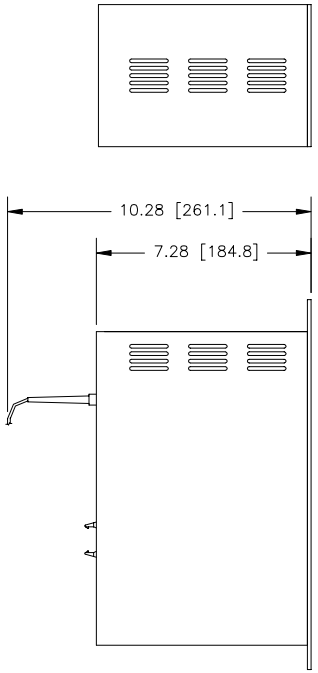
6.7 INSTALLATION DRAWINGS

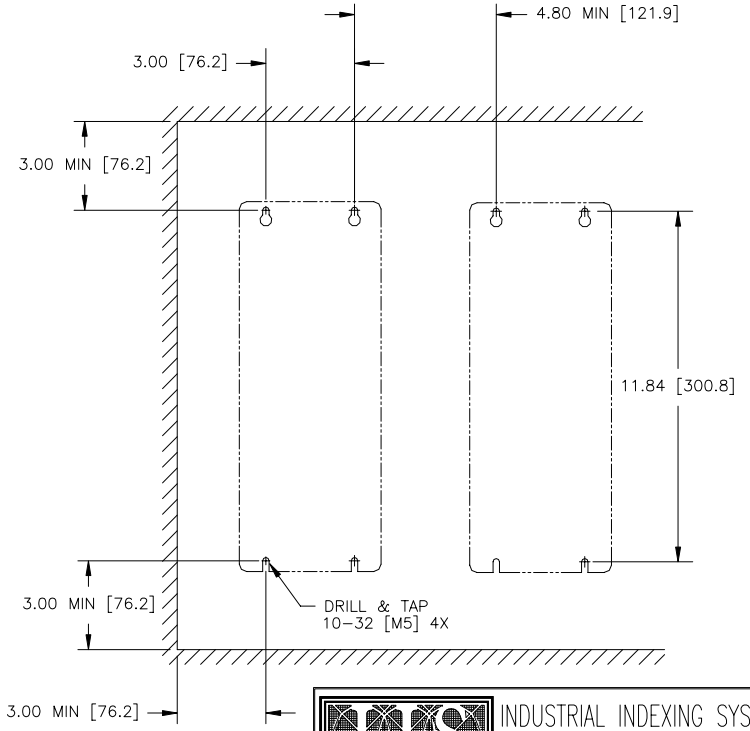
DRAWING NUMBER	DESCRIPTION
EMC-2000	Emerald Controller

NOTES:
1.) RECOMMENDED CABINET DEPTH TO BE 12.00 [304.8].

DATE	SYM	REVISION RECORD	DR	CK	CK
22JUN00	0	PER ECN 00-033	EB	EB	CDR







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TITLE: CONTROLLER, EMERALD

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X.XX± 0.01					
X.XXX± 0.005					

SECTION 7 - CABLES AND ACCESSORIES

DRAWING NUMBER	DESCRIPTION
C-752YYY	SERCOS Fiber Optic Cable, External
C-753YYY	SERCOS Fiber Optic Cable, Internal
C-822YYY	Adaptor Cable
C-987YYY	Modular Data Cable
INT-810	Encoder Cable Adapter

DATE	SYM	REVISION RECORD	DR	CK	CK
21AUG02	A	PER ECN 02-242	CWB		

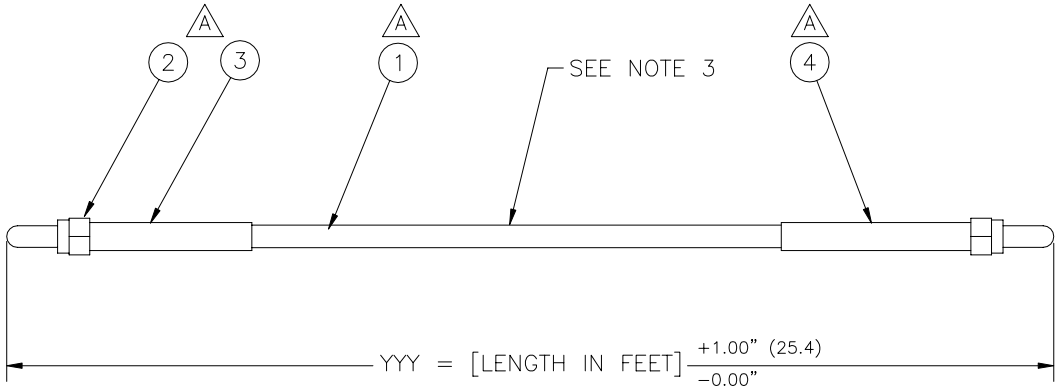
NOTES: (A)

1.) SHORT TERM BEND RADIUS – .98 (25 MM)
LESS THAN 1 HOUR, NON-OPERATIONAL.

2.) LONG TERM BEND RADIUS – 1.58 (40 MM)

3.) MARK PER QP-08-0001.

4.) TEST USING TEST PROCEDURE TST-0061.



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APPROVED BY: J.CARTER	DATE: 3/7/01				
APPROVED BY:	DATE:	TITLE: CABLE, SERCOS FIBER OPTIC, EXTERNAL			
MATERIAL: ----------		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)	DRAWN BY: BOWMAN		DRAWING NUMBER: C-752YYY
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DATE	SYM	REVISION RECORD	DR	CK	CK
21AUG02	A	PER ECN 02-242	CWB		

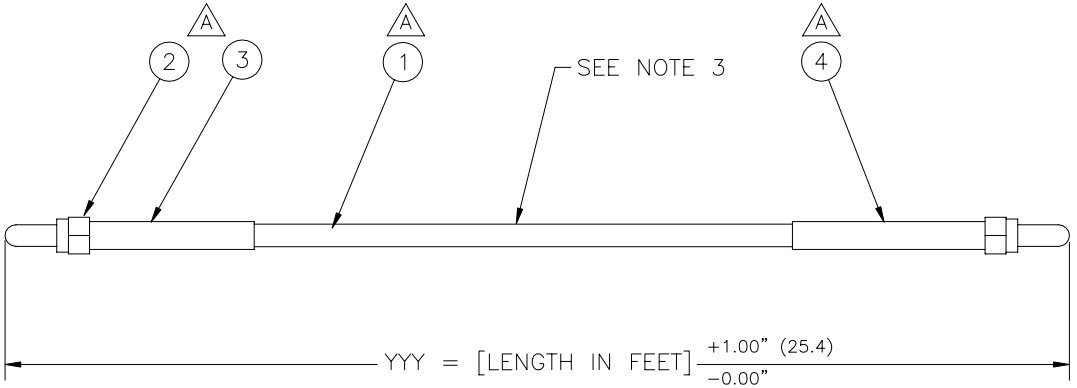
NOTES: (A)

1.) SHORT TERM BEND RADIUS – .98 (25 MM)
LESS THAN 1 HOUR, NON-OPERATIONAL.

2.) LONG TERM BEND RADIUS – 1.58 (40 MM)

3.) MARK PER QP-08-0001.

4.) TEST USING TEST PROCEDURE TST-0061.



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APPROVED BY: J.CARTER	DATE: 3/7/01	
APPROVED BY:	DATE:	
MATERIAL: ----------		
FINISH: ----------		

TITLE: CABLE, SERCOS FIBER OPTIC, EXTERNAL

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± ---
X.XXX± ---
ANGULAR ± ---

DRAWN BY: BOWMAN
AutoCAD FILE LOCATION: Q:\DFTG\CABLES\C-7XX

DRAWING NUMBER: C-752YYY

B | DATE: 10MAY00 | SCALE: --- | SHEET NO.: 1 OF 1 | REVISION: A

DATE	SYM	REVISION RECORD	DR	CK	CK
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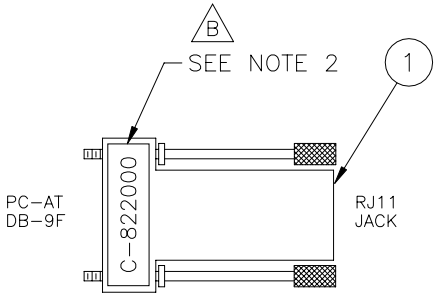
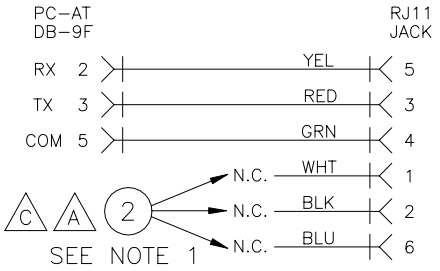
NOTES:

1.) INSULATE UNUSED WIRES.

2.) MARK PER QP-08-0001.





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CHECKED BY	DATE	
APPROVED BY ELS	DATE 15AUG96	
APPROVED BY ELS	DATE 10MAY96	
MATERIAL ---------		
FINISH ---------		

TITLE: CABLE ADAPTOR, 9P, FE, STANDARD

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)

TOLERANCES: X.X± -- ; X.XX± -- ; X.XXX± -- ; ANGULAR ± --

DRAWN BY: BOWMAN

AutoCAD FILE LOCATION: Q:\DFTG\CABLES\C-8XX

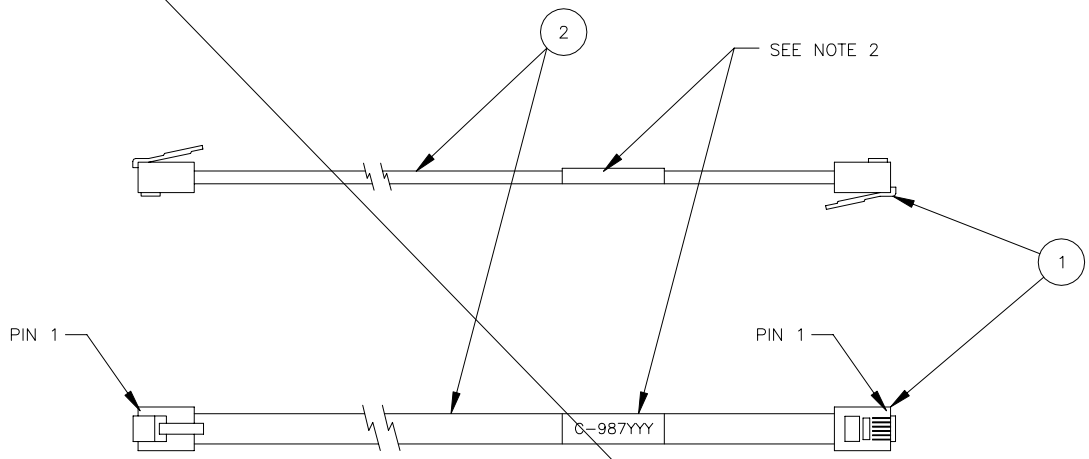
DRAWING NUMBER: C-822000

SIZE	DATE	SCALE	SHEET NO.	REVISION
B	09MAY96	NTS	1 OF 1	C

DATE	SYM	REVISION RECORD	DR	CK	CK
		PER ECN		EB	

NOTES:

1) CRIMP CABLE (ITEM 2) TO ENDS (ITEM 1) WITH MODULAR CRIMP TOOL, PART No. 1005-6P6C.
2) MARK PER OP-08-0001.



1	WHT	1
2	BLK	2
3	RED	3
4	GRN	4
5	YEL	5
6	BLU	6

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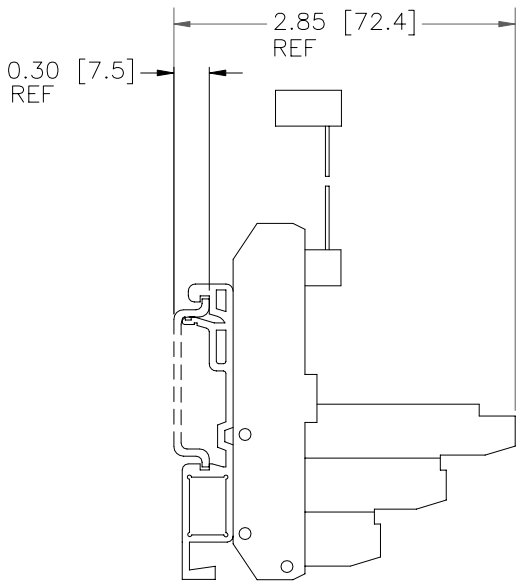
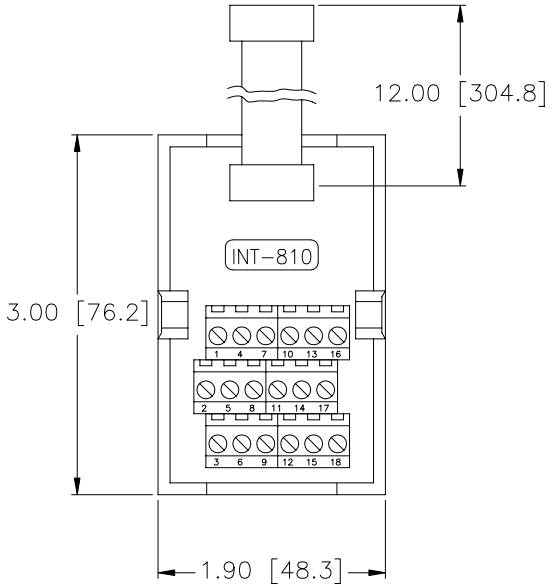
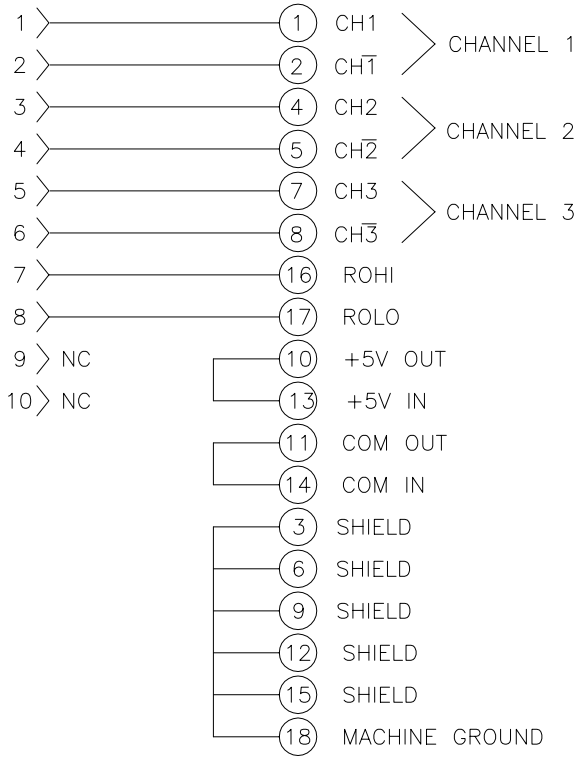
CHECKED BY: E. BAIER	DATE: 8/31/92	THIS DRAWING, AND THE DATA CONTAINED THEREIN, ARE PROPRIETARY INFORMATION OF; INDUSTRIAL INDEXING SYSTEMS, Inc. AND IS ISSUED IN STRICT CONFIDENCE, AND IT SHALL NOT BE REPRODUCED, COPIED, OR USED FOR ANY PURPOSE WHATSOEVER, WITHOUT THE PRIOR WRITTEN PERMISSION OF; INDUSTRIAL INDEXING SYSTEMS, Inc.
APPROVED BY: J.C.	DATE: 8/31/92	
APPROVED BY	DATE	TITLE: CABLE, DATA, MODULAR
MATERIAL	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)	DRAWN BY: ERTURK
	TOLERANCES	AutoCAD FILE LOCATION: Q:\DFTG\CABLE
FINISH	X.X± / X.XX± / X.XXX±	ANGULAR ±
	B	DATE: 13AUG92
		SCALE: ---
		DRAWING NUMBER: C-987YYY
		SHEET NO.: 1 OF 1
		REVISION: A

DATE	SYM	REVISION RECORD	DR	CK	CK
14MAR01	B	PER ECN 01-099	EB		CDR







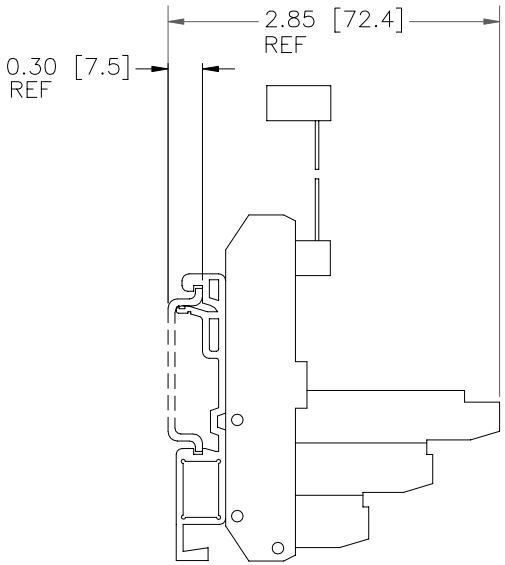
ENCODER TO MSC

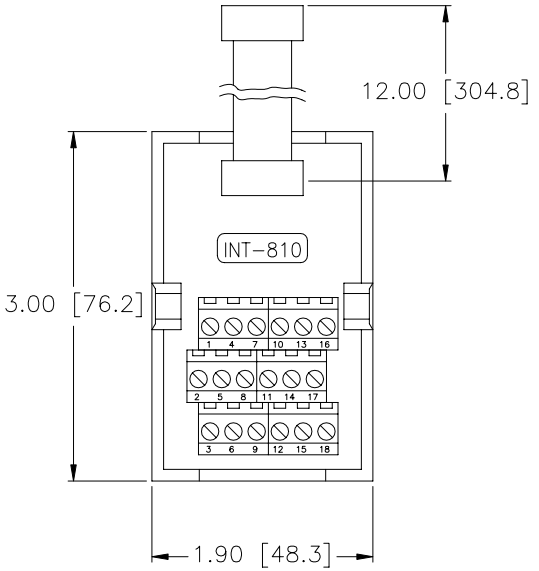
INDUSTRIAL INDEXING SYSTEMS, Inc.
www.iis-servo.com

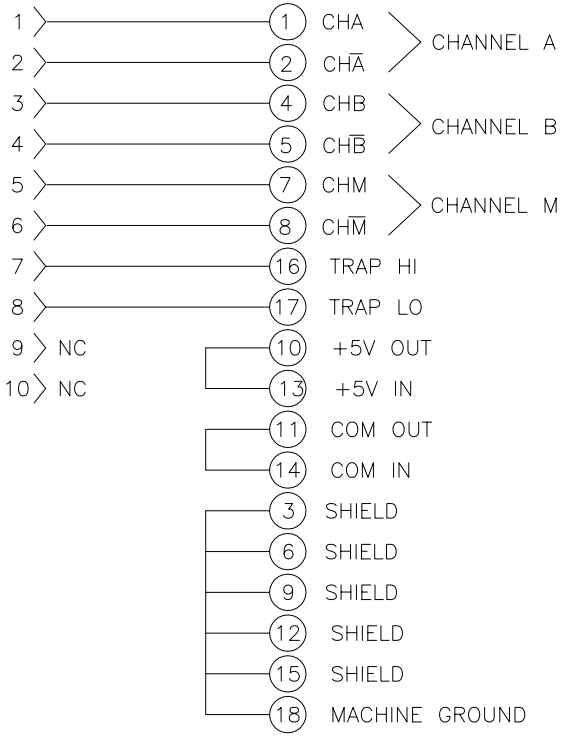
TITLE: ADAPTOR, ENCODER CABLE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)	DRAWN BY	DRAWING NUMBER
TOLERANCES	DAUNCE	INT-810
X.X± --	AutoCAD FILE LOCATION	
X.XX± 0.01	Q\DFTG\PWB\INT-8XX\INT-810	
X.XXX± 0.005 ANGULAR ± 0°30'	B DATE 06APR91 SCALE NTS	SHEET NO. 1 OF 2 REVISION B

DATE	SYM	REVISION RECORD	DR	CK	CK
14MAR01	B	PER ECN 01-099	EB		CDR







ENCODER TO EMERALD

INDUSTRIAL INDEXING SYSTEMS, Inc.
www.iis-servo.com

TITLE: ADAPTOR, ENCODER CABLE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)	DRAWN BY: DAUNCE	DRAWING NUMBER: INT-810
TOLERANCES: X.X± -- / X.XX± 0.01 / X.XXX± 0.005; ANGULAR ± 0°30'	AutoCAD FILE LOCATION: Q\DFTG\PWB\INT-8XX\INT-810	
	B / DATE: 06APR91 / SCALE: NTS	SHEET NO.: 2 OF 2 / REVISION: B

APPENDIX A - MODEM PMC OPTION BOARD

A.1 MODEM OVERVIEW

The PMC-Modem option board for the Emerald Motion Controller (EMC-2000) has been developed around the Conexant Smart Socket Modem; refer to "www.conexant.com".

The PMC-Modem is a 33.6KBaud modem.

The Emerald Development Environment (EDE) fully supports connection remotely over the phone lines to the EMC-2000 with a PMC-Modem installed.

The PMC-Modem once installed into the EMC-2000 from the factory is configured to Auto-Answer a phone line connection. It will also auto-negotiate the carrier and data baud rates of the United States by just connecting to a direct phone line.

Operation of the PMC-Modem outside the United States can be achieved with minor setup changes to the modem.

A.2 POWER REQUIREMENT

The PMC-Modem option board requires an addition 2.5 watts maximum from the EMC power supply, therefore when sizing the 24VDC power supply for the EMC-2000 be a little generous and add about .5 Amps of current for each Modem installed.

A.3 WIRING

The PMC-Modem accepts a standard phone RJ11 connector, therefore RING is on PIN-3 and TIP is on PIN-4.

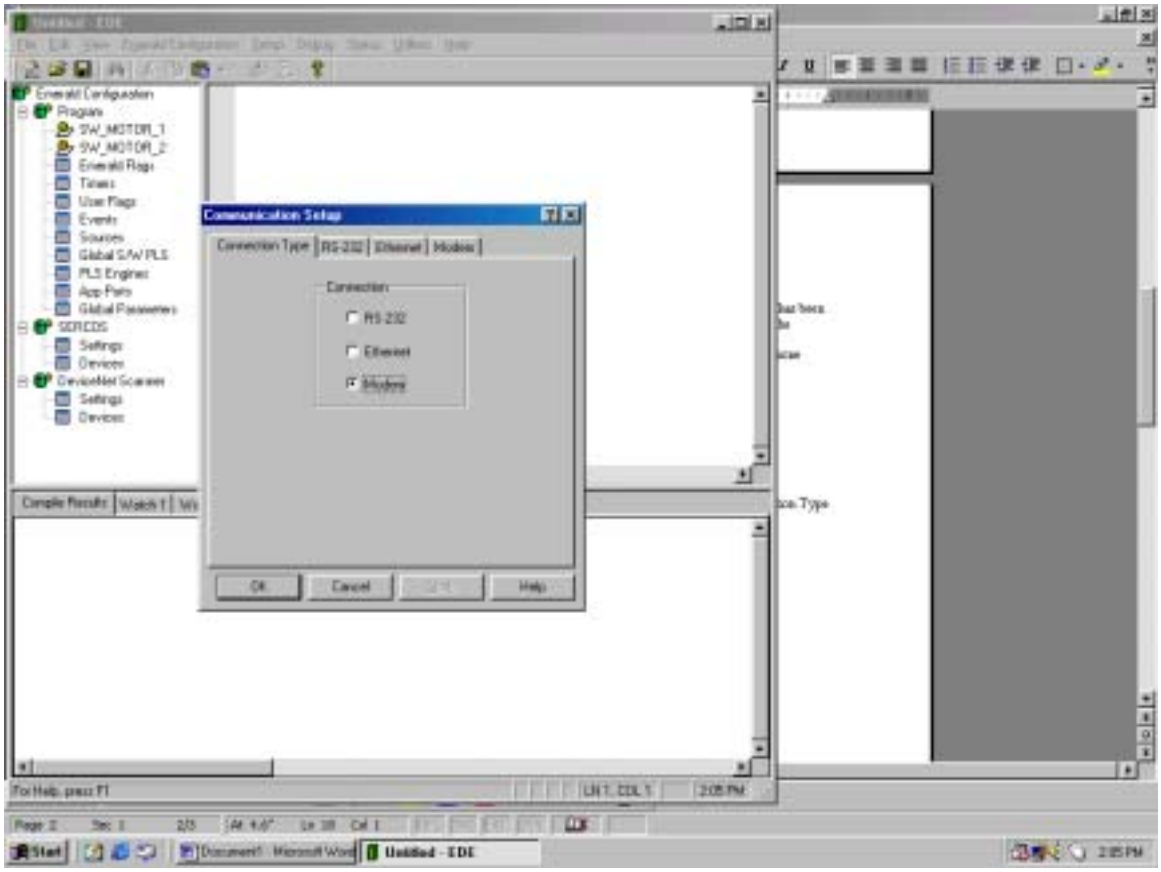
A.4 EDE SETUP FOR MODEM COMMUNICATION

The EDE is a PC Windows application developed by Industrial Indexing Systems to program the Emerald Motion Controller. The EDE can be configured to communicate remotely with the EMC via RS232, ETHERNET, or MODEM.

For remote access to the EMC-2000 with a PMC-Modem it is necessary to configure the EDE for communication via modem. It is required that the PC running the EDE has an installed modem.

A.4.1 SELECT MODEM FOR CONNECTION

From EDE tool bar go to **Setup** then select **Communication**, once the screen for connection Type appears select **Modem** as shown below.



A.4.2 MODEM EDE CONFIGURATION SCREEN

When the EDE is not connected to a controller the modem settings for the PC in which the EDE is running from can be change from the Modem Communication Setup Screen as seen below.

Port: Allows selection of the COM port in which the modem resides on the development platform (PC). The COM port for the modem in any PC running Windows 98 and higher may be gotten from the System display in the Control Panel.

1. Double Click on My Computer from the Windows Desk Top.
2. Double Click on Control Panel.
3. Double Click on Modem.
4. Select Desired Modem from Pull down then click on properties.

Baud Rate: Allows user selection for desired bit rate. The PMC-Modem will operate up to a Baud Rate of 28800, however depending on phone line integrity slower rates may have to be used for error free operation. It's possible to select the highest rate available and let the modems auto-negotiate to the best rate under current line conditions.

A.4.3 CONNECTION PROPERTIES

Connect String: Allows user selection of the string to originate a call via the modem. Most modems will work with a setting of ATD; this is an ASCII Terminal Command to the modem.

Dialed Number: Allows user to select the phone number to connect to the EMC-2000. For the EDE to connect to an EMC-2000 with a Modem, the EMC-2000 needs to be plugged into a phone line, this phone line must have a number to be entered here.

NOTE

The EMC-2000 modem should be plugged into a direct phone line and not one in which the line goes thru an operator or switchboard.

Connection Timeout: Allows the user select the amount of time to wait for the connection to the EMC-2000 to take place.

A.4.4 DISCONNECT PROPERTIES

Escape String: Allows user selection of string to tell the modem to drop from data mode and accept ASCII Terminal Commands.

Disconnect String: Allows user selection to tell the modem to Hang-Up. Most modems will work with a setting of ATH0; this is an ASCII Terminal Command.

Disconnect Delay: Allows the user to select the time in which the EDE should wait for the modem to disconnect.

A.5 EMC ASCII TERMINAL MODE

ASCII Terminal mode is a typical means of communicating with any modem directly no matter what the platform it resides. ASCII Terminal communication is accomplished over Port 1 of the EMC-2000 to the modem plugged into one of the EMC's PMC Option Slots. To communicate to the PMC-Modem in this manner it is necessary to use a terminal emulator such as HyperTerminal. HyperTerminal is shipped with most Microsoft Windows Products, it can be found in the Accessories/Communications folder.

HyperTerminal Setup/Properties:

1. Connect using: Direct to COMx
2. Configure
    a. Bits per second: 38400
    b. Data bits: 8
    c. Parity: None
    d. Stop bits: 1
    e. Flow Control: None
3. ASCII setup:
    a. Enable typed characters locally.

In step 1 above, replace COMx with the COM port of the PC in which the modem resides. For instance, if the modem in the PC was configured on the fourth COM Port use COM4.

Once ASCII Terminal Emulator is setup type in "AT?<cr>" for the EMC's ASCII Terminal help screen to be displayed.

If characters are not displayed in the ASCII Terminal window as they are typed in, the user may ask the EMC-2000 to echo them by typing in "AT;E1<cr>".

NOTE: <cr> is the Enter key on the PC keyboard.

A.6 PMC-MODEM LEDS

The PMC-Modem has four status LEDs; see description below:

Tx: A green LED that turns on when ever the PMC-Modem is transmitting data out the phone line.

Rx: A yellow LED that turns on when ever the PMC-Modem is receiving data from the phone line.

On: A green LED with three statuses:

- FLASHING - When the Modem phone line is ringing for the EMC Modem to pick up.
- SOLID ON - Modem normal indication, indication that self-tests passed and successful initialization, modem is ready to Auto-Answer. The On LED should stay LIT after answering and during a connection.
- SOLID OFF - Modem initialization failed, modem not operational, contact factory.

Ct: A red LED with two statuses:

- SOLID OFF - No carrier detected, modem is waiting for a connection.
- SOLID ON - Carrier has been detected; modem has a connection and is awaiting data. Data is present when Rx and Tx LEDs are FLASHING.

All LEDs are on during initial power-up, booting, of the EMC when the EMC's Status Display is a "**b**", but then should transition to just the **On** LED turned ON once the boot cycle is complete. If during power-up the Modem should fail any of the initialization all its LEDs are turned OFF, this is an indication that the modem is not operational.

A.7 EMC STATUS DISPLAYS FOR PMC-MODEM

The EMC will monitor the PMC-Modem operation and display any errors it detects as follows:

Flashing "**=**" then "**0**": Top PMC slot modem receiver over run error.
Flashing "**=**" then "**1**": Top PMC slot modem framing error.
Flashing "**=**" then "**2**": Top PMC slot modem parity error.
Flashing "**=**" then "**3**": Top PMC slot modem break mode error.
Flashing "**=**" then "**4**": Top PMC slot modem reserved.
Flashing "**=**" then "**5**": Top PMC slot modem inter-character timeout.

For a modem in the Bottom PMC slot replace the "**=**" character with the "**-**" character.

A.8 OPERATION OUTSIDE OF UNITED STATES

The PMC-Modem can be setup to operate outside of the United States by setting one of its available country codes.

It is important to verify which modem card is installed prior to setting the country code. The user will need to type the following AT command into the ASCII Terminal Emulator "ATI3" the data returned is the DSP that is used in the modem simply match it up to one of the charts below for the proper country codes. It is also possible to get the list of country codes that are in the modem by typing the AT command "AT+GCI=?". This only returns the codes not the countries that they belong to.

ATI3=P2109-v34

COUNTRY	CODE	COUNTRY	CODE	COUNTRY	CODE
Australia	09	Hong Kong	50	Norway	82
Austria	0A	Hungry	51	Philippines	89
Belgium	0F	India	53	Poland	8A
Brazil	16	Ireland	57	Portugal	8B
Bulgaria	1B	Israel	58	Russia	B8
Canada	20	Italy	59	Singapore	9C
China	26	Japan	00	South Africa	9F
Czech and Slovak Rep.	2E	Korea	61	Spain	A0
Denmark	31	Luxemburg	69	Sweden	A5
Finland	3C	Malaysia	6C	Switzerland	A6
France	3D	Mexico	73	Taiwan	FE
Germany	42	Netherlands	7B	United Kingdom	B4
Greece	46	New Zealand	7E	United States	B5

ATI3=CX81802-v34

COUNTRY	CODE	COUNTRY	CODE	COUNTRY	CODE
Argentina	07	Greece	FD	Netherlands	FD
Australia	09	ICELAND	FD	New Zealand	7E
Austria	FD	Ireland	FD	Norway	FD
Belgium	FD	Indonesia	99	Philippines	B5
Brazil	16	Israel	B5	Poland	99
Canada	B5	Italy	FD	Portugal	FD
Chile	99	Japan	00	Spain	FD
Cyprus	FD	Korea	B5	Sweden	FD
China	B5	Liechtenstein	FD	Switzerland	FD
Denmark	FD	Luxembourg	FD	Taiwan	FE
Estonia	FD	Malaysia	6C	Turkey	FD
France	FD	Mexico	B5	United Kingdom	FD
Germany	FD			United States	B5

If the desired country for installation doesn't appear in the table, it is recommended that the operator try a country within the same region. For example, if it is desired to install an EMC-2000 with a modem in South America, it's suggested to use Brazil's country code.

The country code may be set using the ASCII Terminal Mode (see Section A.5) over Port 1 (RS232) of the controller. The AT command when setting the country code, as seen from help screen (AT?), is AT+GCI=00 for Japan.

A.9 EMC MODEM PROGRAMMING INSTRUCTIONS

Using the EMC-2000's programming language it is possible to configure a PMC-Modem to operate as needed per an application.

It is intended that an application program could achieve the following:

- Set the modems country of installation setting.
- Retrieve the modems country of installation setting.

To avoid confusion the list of instructions and an explanation of there usage is maintain in the EDE, please refer to the EDE help for further information when programming the PMC-Modem.

APPENDIX B - ETHERNET PMC ETHERNET BOARD

B.1 ETHERNET OVERVIEW

The PMC-Ethernet card enables the application programmer to run the EDE software tools via Ethernet.

The PMC-Ethernet card creates an embedded XML document, which allows data to be transferred between a web application and the Emerald Motion Controller (EMC-2000). The application programmer can specify the exact nature of the resources available to the XML.

B.2 POWER REQUIREMENT

The PMC-Ethernet card requires an addition 4.8 watts maximum from the EMC power supply, therefore when sizing the 24VDC power supply for the EMC-2000 add .5 Amps of current for each Ethernet card installed.

B.3 WIRING

The PMC-Ethernet accepts a standard RJ-45 plug, therefore PIN-1 is Input Receive Data +, PIN-2 is Input Receive Data -, PIN-3 Output Transmit Data +, PIN-6 Output Transmit Data –, and pins 4,5,7, and 8 are not used.

B.4 PMC-ETHERNET LEDS

The PMC-Ethernet has four status LEDs; see description below:

Rx: A green LED that turns on when ever the PMC-Ethernet card is receiving data.

Tx: A yellow LED that turns on when ever the PMC-Ethernet card is transmitting data.

L: A green LED that turns on when there is a valid link exists.

100: A yellow LED that is on when the unit is set in 100 Mbits/s mode.

B.5 EDE SETUP FOR ETHERNET COMMUNICATION

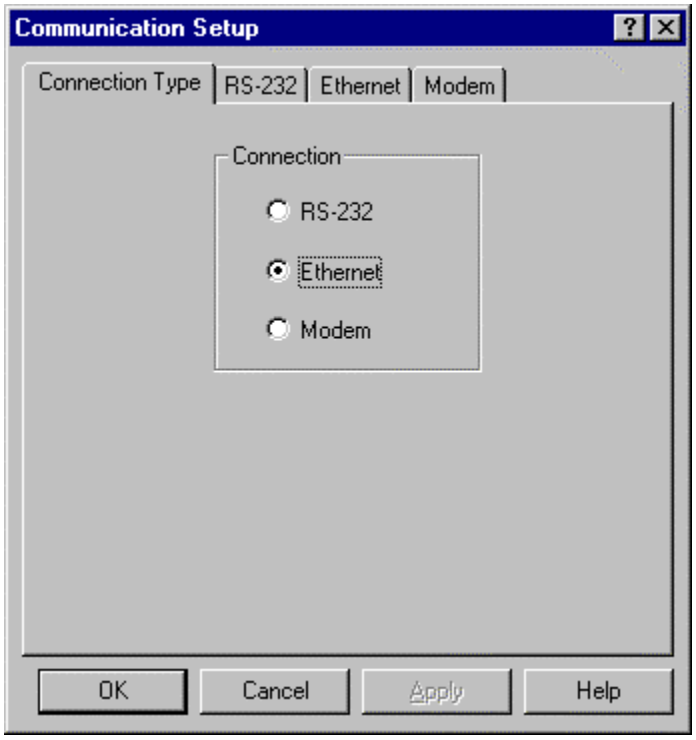
The EDE is a PC Windows application developed by Industrial Indexing Systems to program the Emerald Motion Controller. The EDE can be configured to communicate remotely with the EMC via RS232, ETHERNET, or MODEM.

For remote access to the EMC-2000 with a PMC-Ethernet card, it is necessary to configure the EDE for communication via Ethernet. It is required that the PC running the EDE has an Ethernet connection.

B.5.1 SELECT ETHERNET FOR CONNECTION TYPE

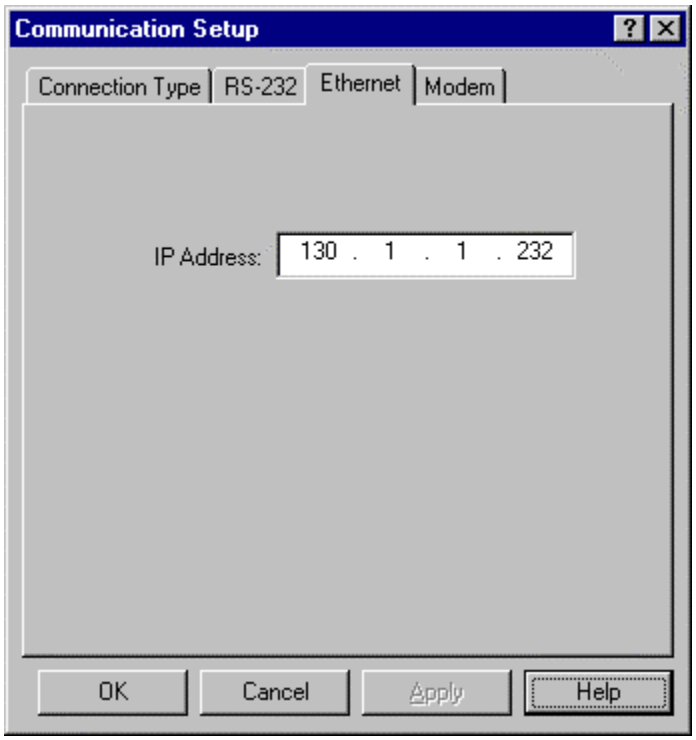
From the EDE toolbar go to **Setup** then select **Communication**, once the screen for Connection Type appears select **Ethernet** as shown below.

NOTE
To be able to select communication, the EDE must not be currently connected.



B.5.2 ETHERNET EDE CONFIGURATION SCREEN

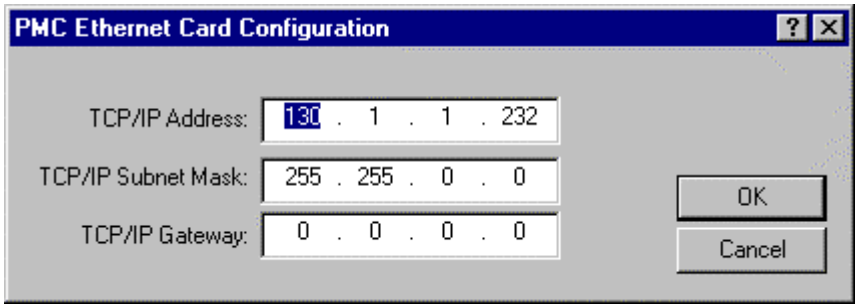
After the Connection Type is set to Ethernet, select the Ethernet tab and the screen below will be displayed.



IP Address: This needs to be set to the IP Address of the Emerald controller that you desire to communicate to. After this value is entered, the EDE should be able to communicate over the Ethernet to the desired controller by selecting debug then connect from the EDE toolbar.

B.6 ETHERNET CARD SETUP

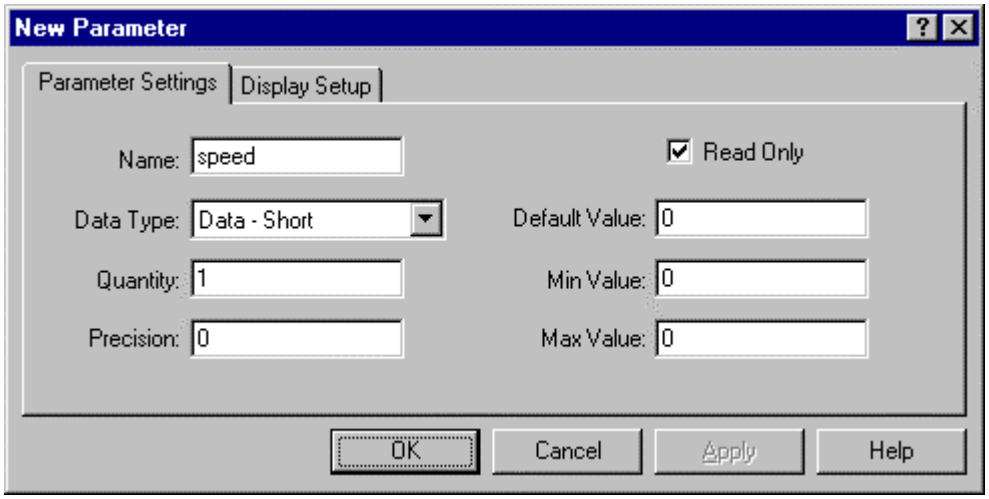
While you are connected using either RS-232 or Modem, from the EDE toolbar go to **Emerald Configuration** then select **PMC Cards** and then the Ethernet card from the desired slot. If Ethernet card is not displayed in the list, then the Emerald controller is not recognizing that the card is installed. After selected the desired Ethernet card the following window will be displayed:



These settings can be modified to the desired settings while connected.

B.7 GLOBAL PARAMETERS

Using the EMC-2000's programming language it is possible to configure 128 Global parameters. These parameters are accessible through XML and controlled through the global parameter configuration.



Name: The name field must match a name used in the configuration section or program area of the selected data type.

Data Type: The type of data that is specified in the name field.

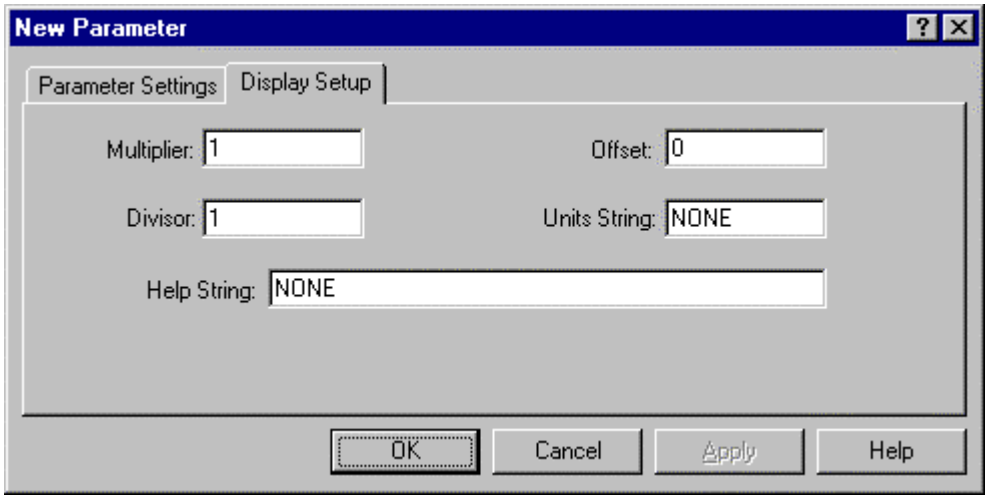
Quantity: This field is only used for data types that can be arrays. The number entered should be the same size or less then the size of the array.

Default Value: This value is currently not being used.

Read Only: If this box is checked the user cannot write any information to this parameter over a network connection.

Min Value: This value will limit the value written to this parameter.

Max Value: This value will limit the value written to this parameter.



B.7 GLOBAL PARAMETERS (cont'd)

The values on this tab of the global parameters can be used to modify the actual value for display purposes.

The following formulas should be used for data types short, long, text, short ext memory, and long ext memory by the web page developer to input a value to the controller and to display a value returned from the controller:

$$\text{Displayed Value} = \frac{(\text{Emerald value} + \text{offset}) * \text{multiplier}}{\text{divisor} * (10 \wedge \text{precision})}$$

NOTE: The value displayed should contain the number of decimal places of the entered precision.

$$\text{Value written to Emerald} = \frac{\text{value entered} * \text{divisor} * (10 \wedge \text{precision})}{\text{multiplier}} - \text{offset}$$

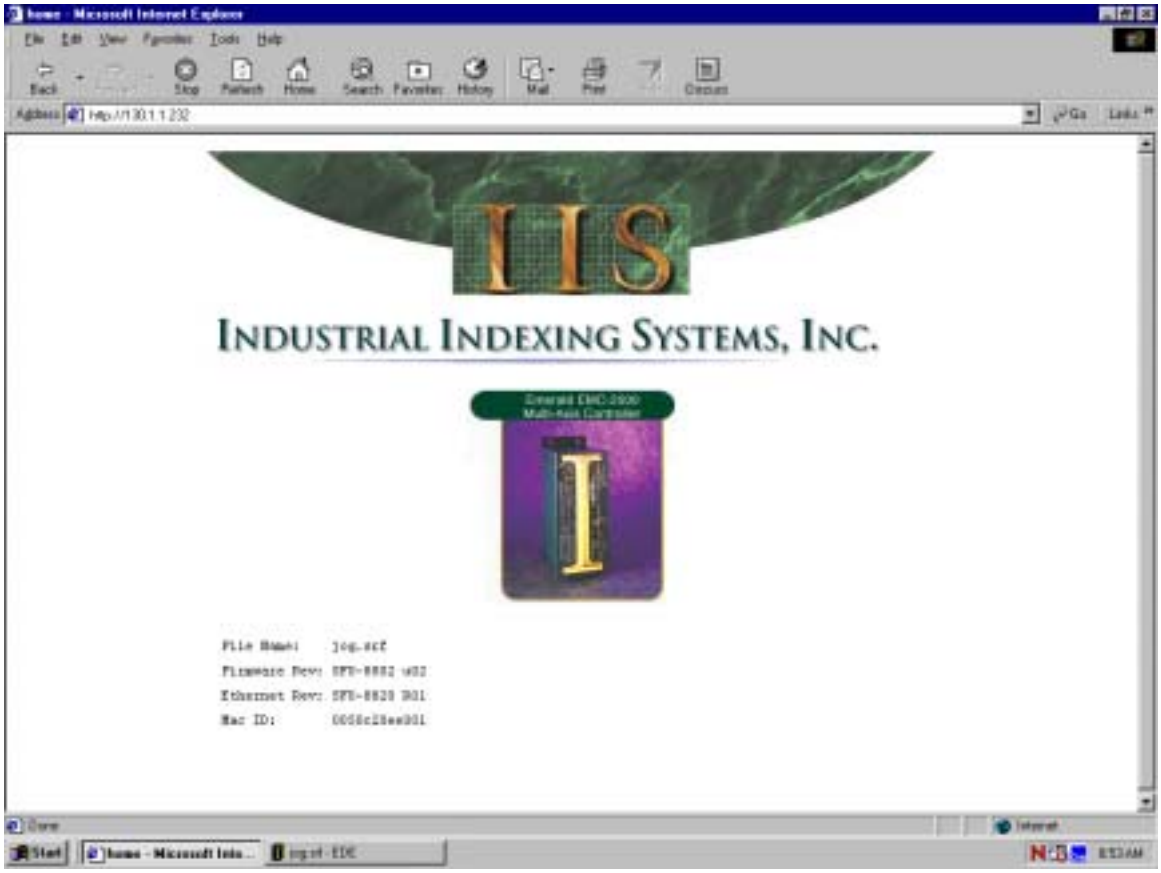
NOTE: When the Emerald receives the value it is compared against the min and max limits. If a value is greater then the max limit the number is set equal to the max limit before it is written to the emerald memory. If a value is less then the min limit it is set equal to the min limit value before it is written to the emerald memory.

The unit's string is served up as part of the XML document.

The help string is not currently used.

B.8 DEFAULT WEB PAGE

The PMC-Ethernet card will serve up a home page as shown below:



File Name: Program Currently loaded in the Emerald Controller.

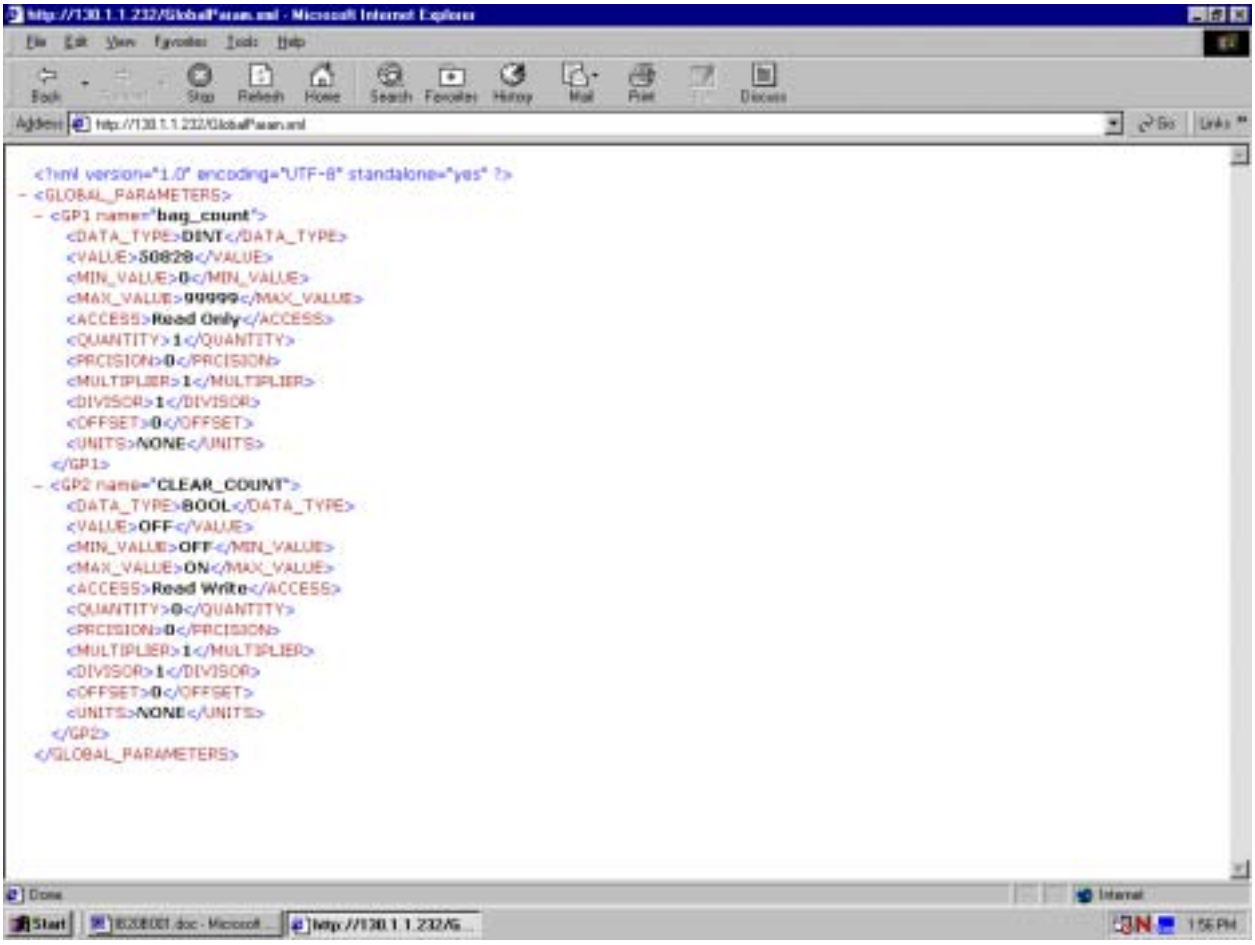
Firmware Rev: Revision of firmware currently in the Emerald Controller.

Ethernet Rev: Revision of firmware in the Ethernet card.

Mac ID: Ethernet Mac ID.

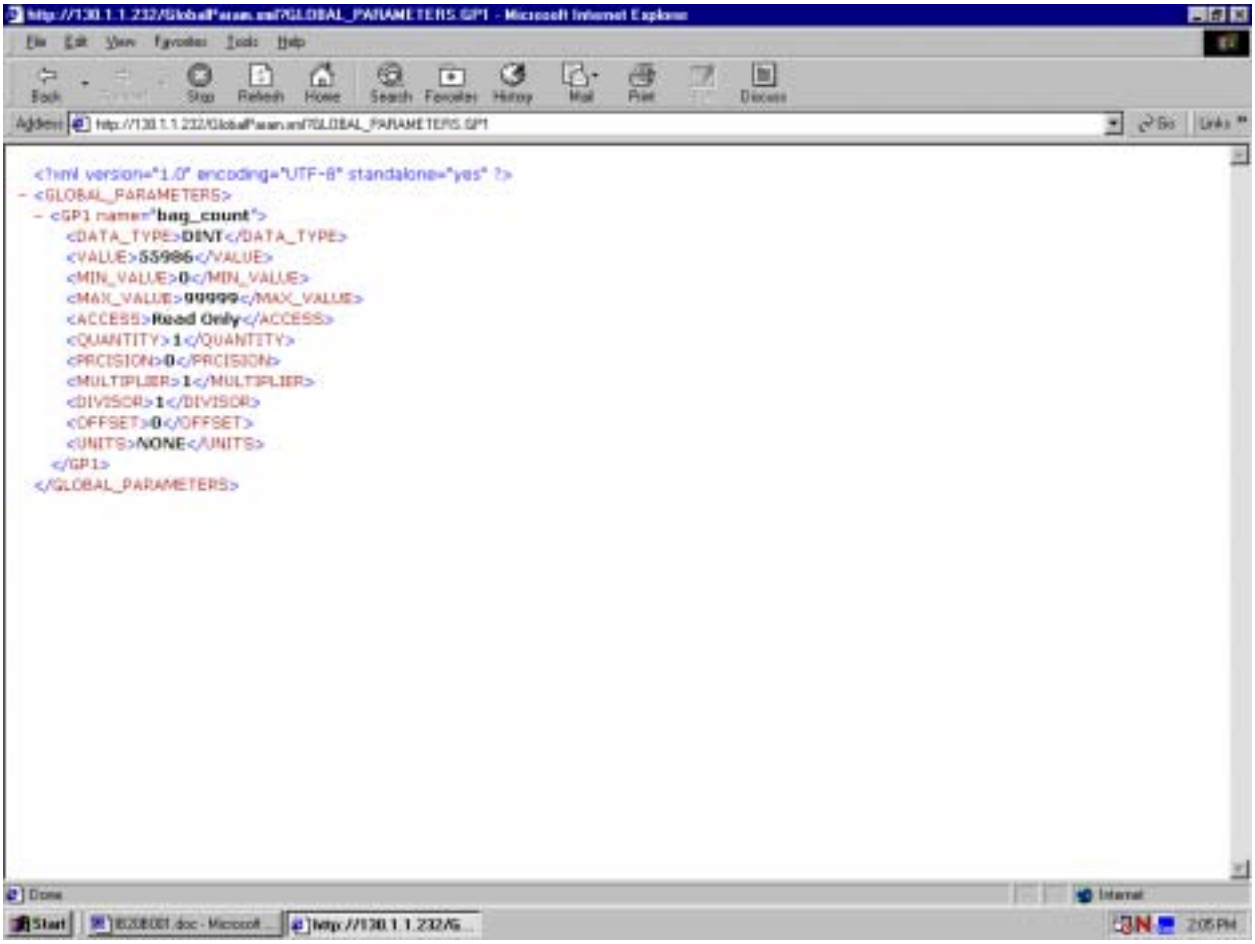
B.9 SAMPLE XML DOCUMENT

For web page developers the PMC-Ethernet card will serve up an embedded XML document. The document contains application specific data defined during application development using Global Parameter configuration. This document is available through the home page address/GlobalParam.xml. If a value has a quantity greater then 1, then a comma will separate the values returned. If a value is displayed as <VALUE>123,34,12</VALUE> the quantity would be 3. Floating point numbers will be returned in an exponential format with 10 decimal places.



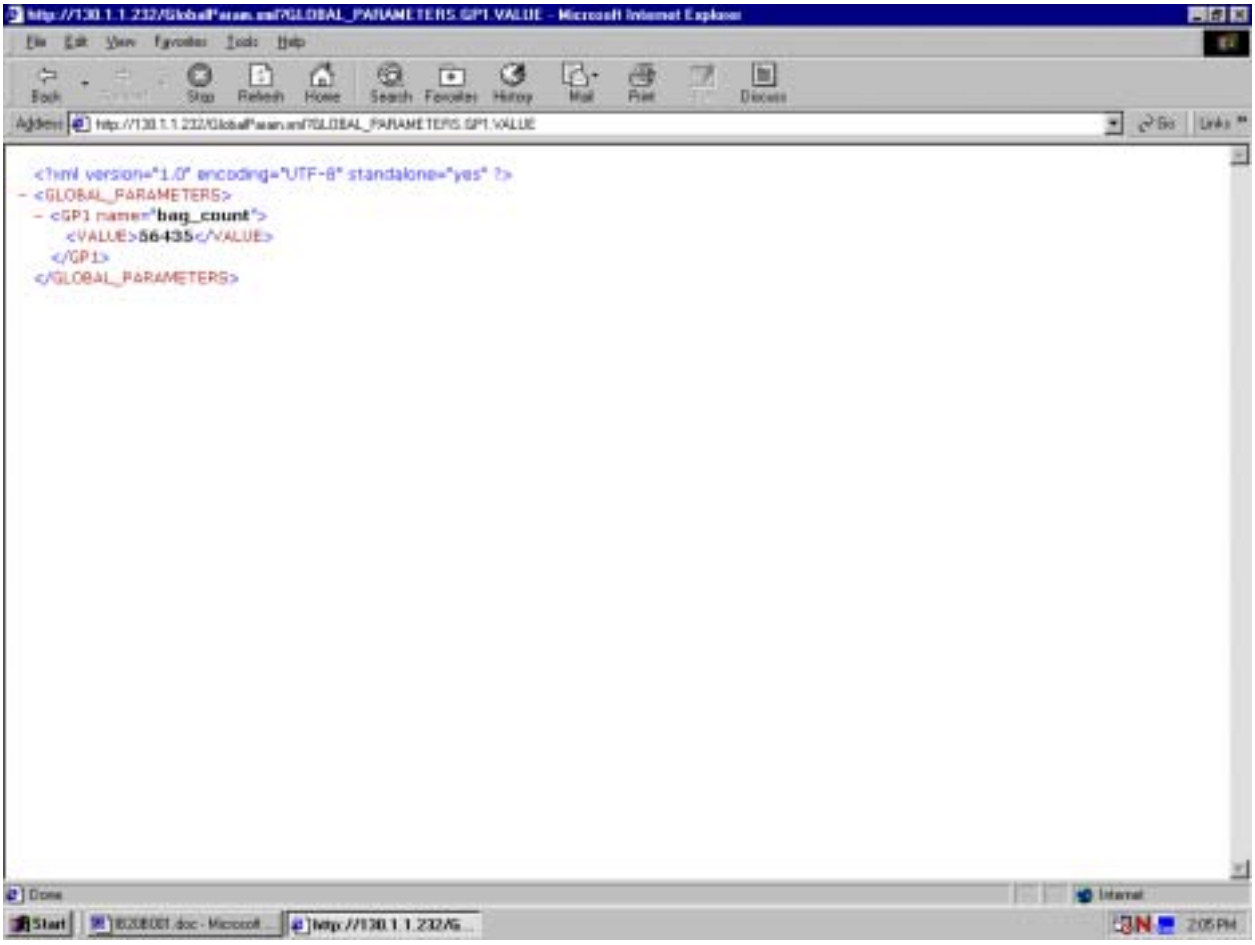
B.10 SAMPLE GLOBAL PARAMETER

To obtain an individual Global Parameter enter the home page address/GlobalParam.xml?GLOBAL_PARAMETER.GPXX where XX is the desired parameter number. If a value has a quantity greater then 1, then a comma will separate the values returned. If a value is displayed as <VALUE>123,34,12</VALUE> the quantity would be 3. Floating point numbers will be returned in an exponential format with 10 decimal places.



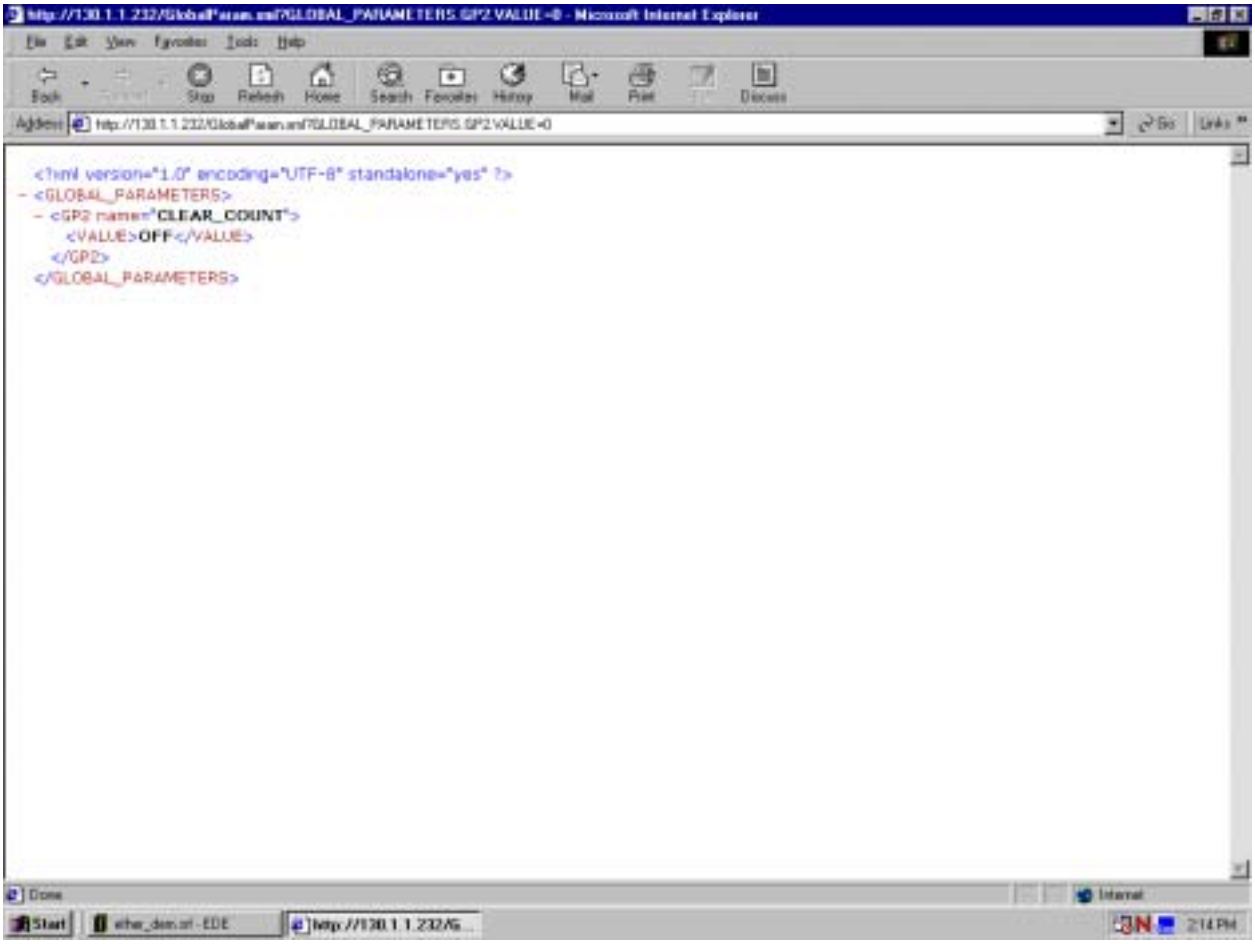
B.11 SAMPLE GLOBAL PARAMETER VALUE

To obtain an individual Global Parameter value enter the home page address/GlobalParam.xml?GLOBAL_PARAMETER.GPXX.VALUE where XX is the desired parameter number. If a value has a quantity greater then 1, then a comma will separate the values returned. If a value is displayed as <VALUE>123,34,12</VALUE> the quantity would be 3. Floating point numbers will be returned in an exponential format with 10 decimal places.



B.12 SAMPLE SETTING A GLOBAL PARAMETER VALUE

To set an individual Global Parameter value enter the home page address/GlobalParam.xml?GLOBAL_PARAMETER.GPXX.VALUE=YYY where XX is the desired parameter number and YYY is the desired input value. The page that will be displayed in the browser is the get a parameter value page. To enter several values to a Global Parameter with a quantity greater then 1, enter the home page address/GlobalParam.xml?GLOBAL_PARAMETER.GPXX.VALUE=YYY,ZZZ where XX is the desired parameter with a quantity greater then 1, YYY is the first value, and ZZZ is the second value. If the Global Parameter is a flag setting the value to 0 will turn it off while setting it to one will turn on the flag. In order to write a value to the controller memory, the Global Parameter must not be read only. Before a value is written, it is compared against the min and max parameter values. If the value is greater then the max value, then the max value will be written. If the value is less then the min value, then the min value will be written to memory.



APPENDIX C - MASTER RESOLVER PMC OPTION BOARD

C.1 MASTER RESOLVER OVERVIEW

The PMC-Resolver card enables the application programmer to connect a resolver to the Emerald Controller. The attached resolver can then be configured as a Master Source in the application via the EDE software tools.

C.2 POWER REQUIREMENT

The PMC-Resolver card requires an additional 2.5 watts maximum from the EMC power supply, therefore when sizing the 24VDC power supply for the EMC-2000 add .5 Amps of current for each PMC-Resolver Card installed.

C.3 WIRING

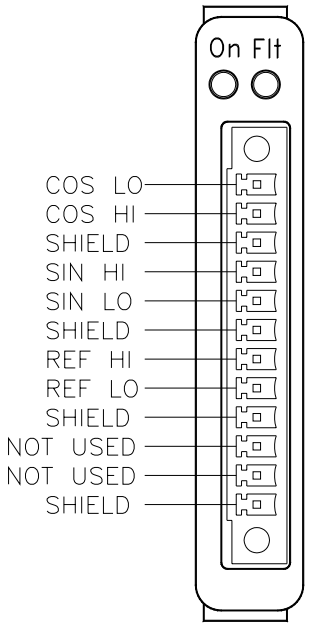


Figure C.1 - PMC-Resolver Card Wiring

C.4 PMC-RESOLVER LEDS

The PMC-Resolver card has two status LEDs:

On: A green LED that turns on at power up and remains on if the PMC-Resolver card is initialized correctly by the EMC-2000.

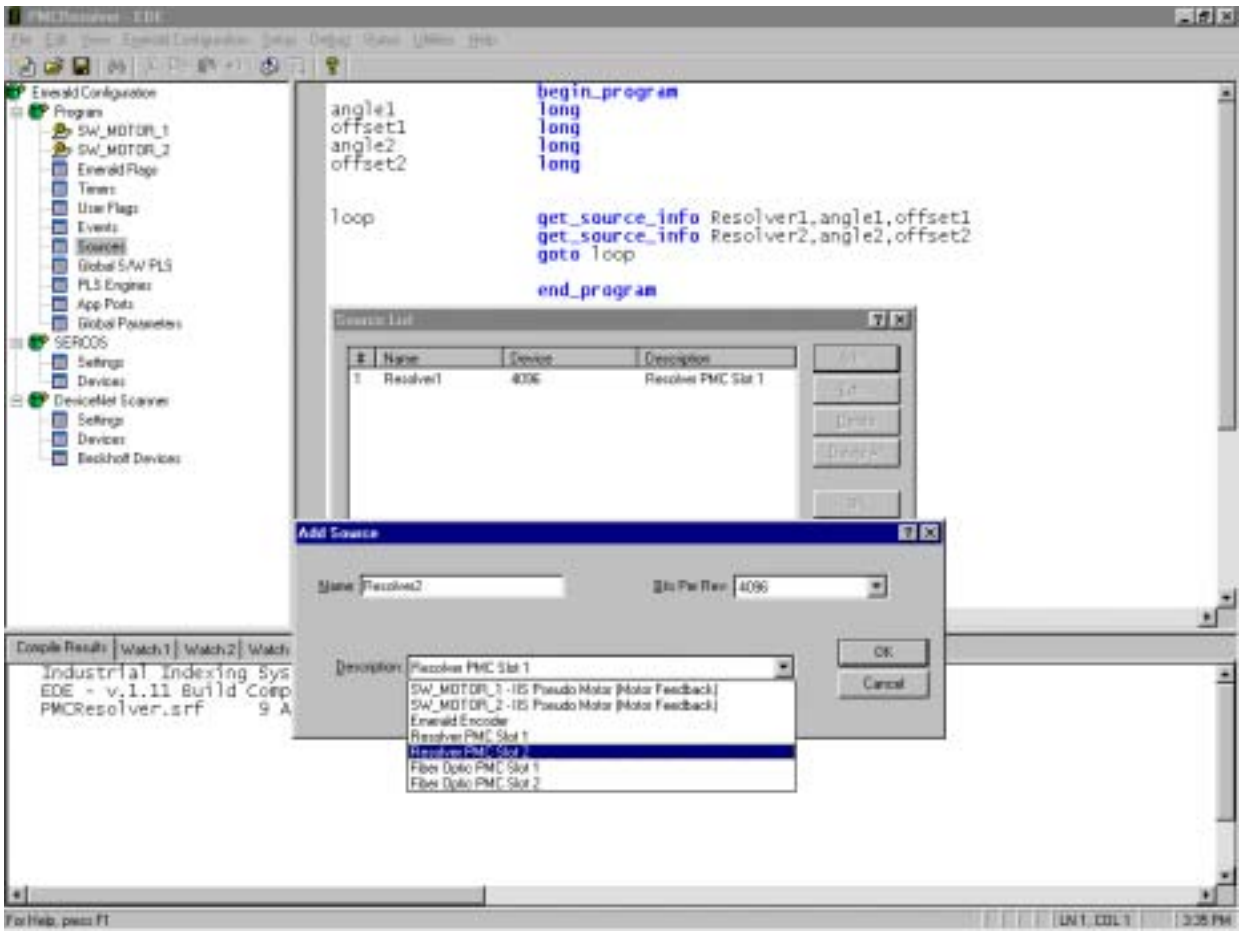
Flt: A red LED that turns on at power up. This LED will go out after the EMC-2000 initializes the PMC-Resolver card and no fault exists on the card. If the red LED is still on then check if resolver is connected correctly and the bit resolution is configured appropriately for the application.

C.5 PMC-RESOLVER CARD SETUP

To utilize the resolver position feedback from a PMC-Resolver card in an application, the card must be configured as a Master Position Source in the application.

C.5.1 CONFIGURING A RESOLVER AS A MASTER POSITION SOURCE

To configure the PMC-Resolver card as a source first determine which PMC option slot location the card is installed (See **Section 2, Figure 2.1**). From the Emerald Configuration tree select "SOURCES". A Source List dialog box will appear. From the Source list dialog box select "Add" button to add a source. The Add Source Dialog box will appear. In the Add Source dialog box name your source and select "Resolver PMC Slot 1" or "Resolver PMC Slot 2" as the description.



You will then need to set the bit resolution of the position feedback in bits per rev. The table below defines the maximum shaft speed the resolver for a given bit resolution. A shaft speed above the Maximum for a given resolution will cause a fault on the card and may return errors in the resolver position.

Resolution (Bit)	Bits Per Revolution	Max Resolver Shaft Speed	Description
10	1024	14400	10 Bit Mode
12	4096	3600	12 Bit Mode
14	16384	900	14 Bit Mode
16	65536	225	16 Bit Mode

APPENDIX D - FIBER OPTIC MASTER PMC OPTION BOARD

D.1 FIBER OPTIC MASTER OVERVIEW

The PMC-FIBER OPTIC MASTER (PMC-FOM herein) card enables the application programmer to connect an Industrial Indexing Systems Fiber Optic Master Signal to the Emerald Controller. The Fiber Optic Master can then be configured as a Master Source in the application via the EDE software tools.

More than one Emerald can easily receive the same master signal from an encoder or resolver using the PMC-FOM option boards. The PMC-FOM(s) allow a fiber-optic chain to be utilized, accomplished by connecting one Emerald's PMC-FOM Transmitter to the next Emerald's PMC-FOM Receiver with fiber-optic cables.

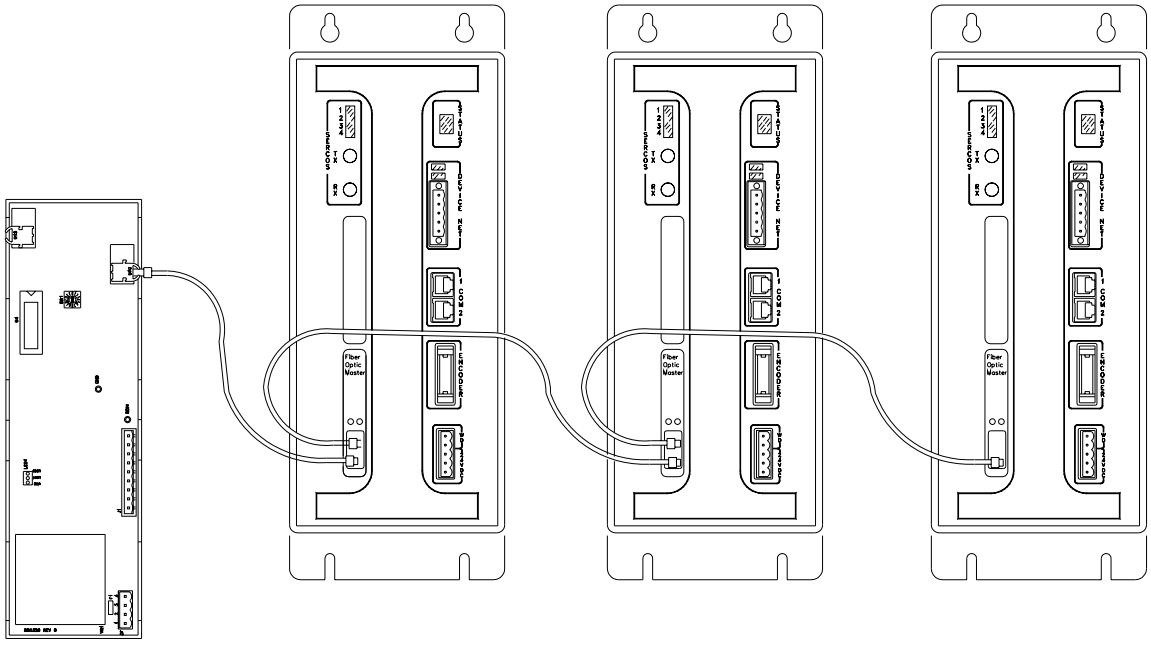


Figure D.1 - Fiber Optic Master Overview

D.2 SPECIFICATIONS

D.2.1 POWER REQUIREMENTS

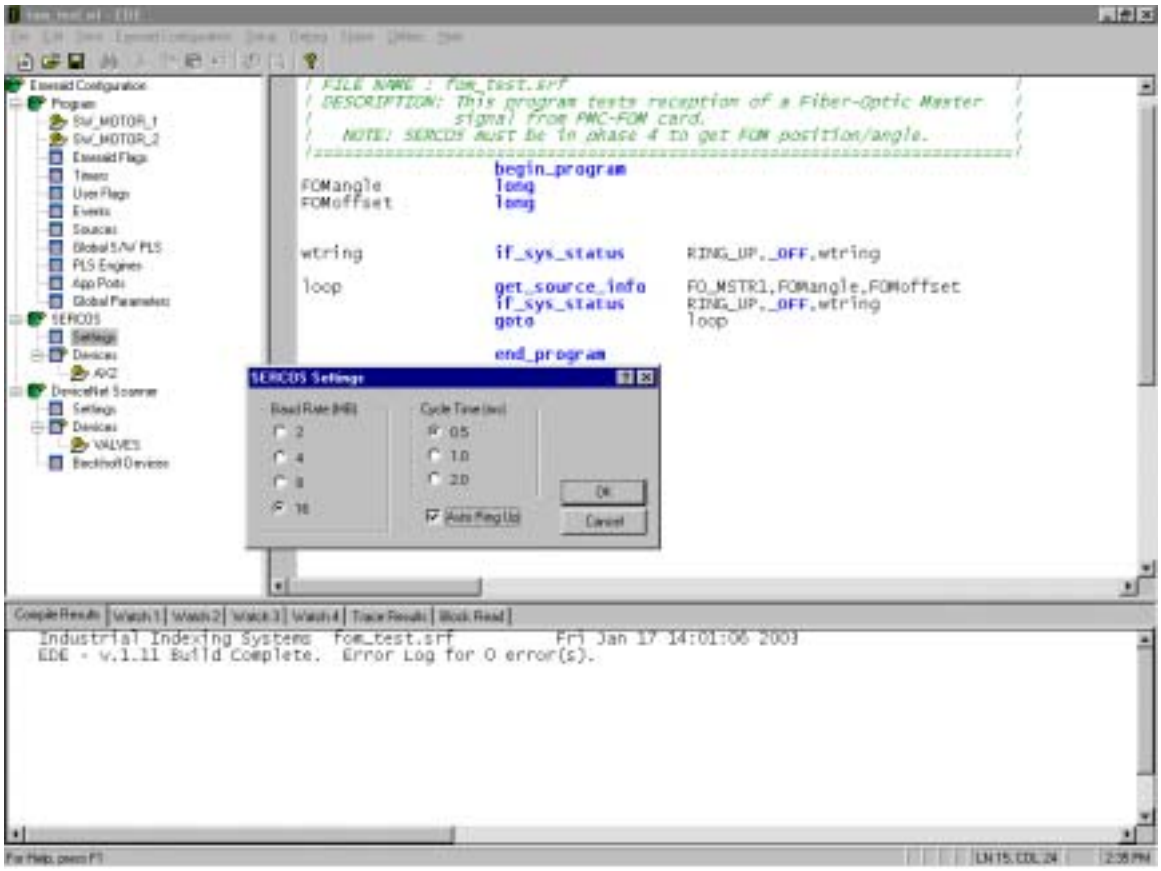
The PMC-FOM card requires an additional 2.5 watts maximum from the EMC power supply, therefore when sizing the 24VDC power supply for the EMC-2000 add .5 Amps of current for each PMC-FOM Card installed.

D.2.2 OPTICAL MASTER PROPOGATION

Master Signal Reception to Master Signal Transmission to be within 200 nanoseconds.

D.2.3 MASTER POSITION UPDATE

Fiber Optic Master Signal is conditioned internally by the EMC-2000 at the SERCOS cycle time. The SERCOS cycle time is setup within the SERCOS settings as shown below:



D.3 DESCRIPTION

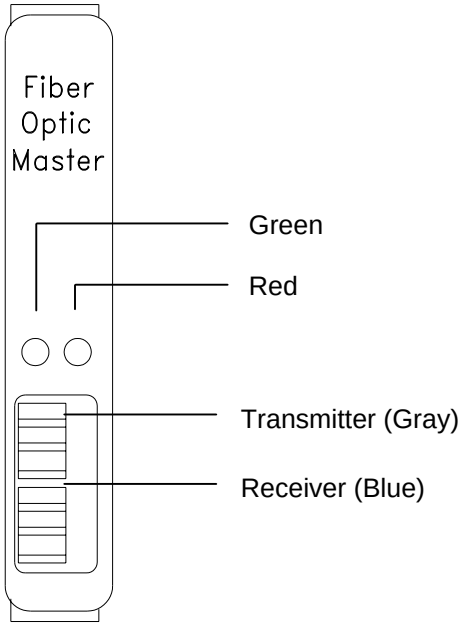


Figure D.2 - Fiber Optic Master Description

D.4 PMC-FOM LEDS

The PMC-FOM card has two status LEDs:

A green LED that turns on at power up and remains on if the PMC-FOM card is initialized correctly by the EMC-2000. Once the EMC-2000 controller has successfully brought up its SERCOS control ring and the Fiber-optic signal from the PMC-FOM has no signal the ON green LED will flash.

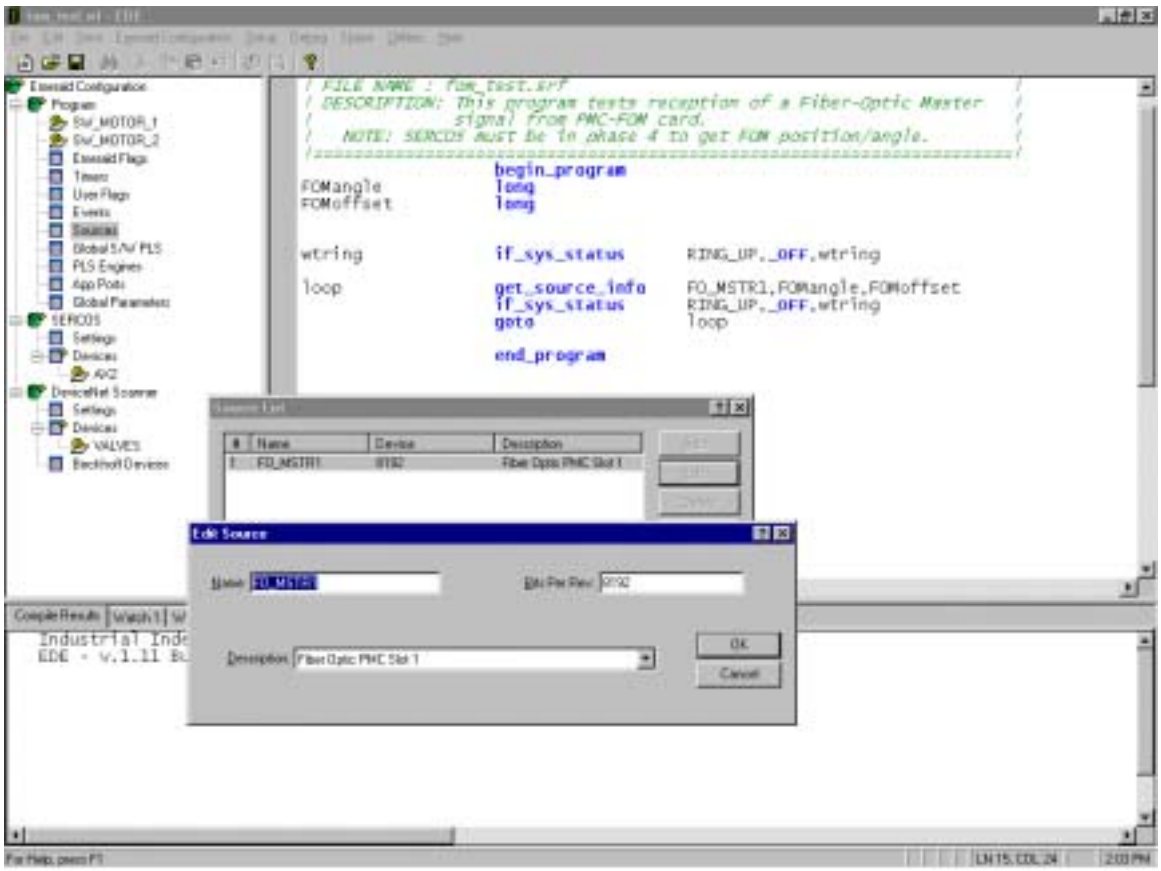
A red LED that turns on at power up and goes out after the EMC-2000 initializes the PMC-FOM card and no fault exists on the card. If the red LED is on with no Fiber-optic cable connected to the receiver the EMC-2000 was not able to initialize the card. If the red LED is on only when receiving a fiber-optic signal, then check for incorrect transmission rate settings at the Fiber-Optic Master source.

D.5 PMC-FOM CARD SETUP

To utilize the Fiber-Optic position feedback from a PMC-FOM card in an application, the card must be configured as a Master Position Source in the application.

D.5.1 CONFIGURING A PMC-FOM AS A MASTER POSITION SOURCE

To configure the PMC-FOM card as a source first determine which PMC option slot location the card is installed (See **Section 2, Figure 2.1**). From the Emerald Configuration tree select "SOURCES". A Source List dialog box will appear. From the Source list dialog box select "Add" button to add a source. The Add Source Dialog box will appear. In the Add Source dialog box name your source and select "Fiber Optic PMC Slot 1" or "Fiber Optic PMC Slot 2" as the description.



You will then need to set the bit resolution of the position feedback in bits per rev expected from master source transducer and IIS Fiber-Optic converter, typically an EFC or RFC connected to a encoder or resolver respectively.

APPENDIX E - SMARTMEDIA MEMORY PMC OPTION BOARD

E.1 SMARTMEDIA MEMORY OVERVIEW

The optional PMC-SmartMedia board facilitates EMC-2000 Application Program and Operating System Firmware uploads from power-up, using readily available "SmartMedia Memory Cards" (herein referred to as just SmartMedia). SmartMedia can be obtained from local retailers in the business of supplying consumer electronic and computer equipment.

E.2 SPECIFICATIONS

E.2.1 POWER REQUIREMENTS

The optional PMC-SmartMedia board requires an additional 2.5 watts maximum from the EMC power supply, therefore when sizing the 24VDC power supply for the EMC-2000 add .5 Amps of current.

E.2.2 SMARTMEDIA SUPPORT

All of the following sizes are supported from any manufacture:

1MegaByte	16MegaByte
2MegaByte	32MegaByte
4Megabyte	64MegaByte
8MegaByte	128MegaByte

E.3 PMC-SMARTMEDIA DESCRIPTION

When the PMC-SmartMedia board is installed in an Emerald Controller the SmartMedia insertion slot and two LEDS are visible. The LEDs help to determine functional status of the SmartMedia option board and memory. The SmartMedia are to be inserted into the socket until only about 1/8" of the card is showing outside the socket.

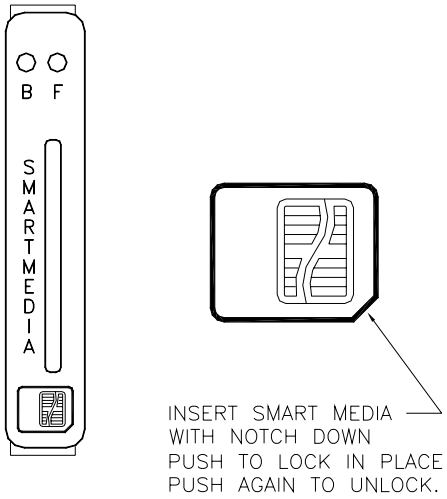


Figure E.1 - PMC-SmartMedia Description

E.4 PMC-SMARTMEDIA LEDS

The PMC-SmartMedia option board has two status LEDs marked with **B** and **F** meaning busy and fault respectively. Upon power-up of the EMC-2000 both LEDS will be ON until the PMC-SmartMedia board is properly initialized, then both the **B** and **F** led should go out. If the PMC-SmartMedia board has malfunctioned during this process the red **F**ault LED will stay ON.

NOTE: In The Event Of A Power-Up Fault The Green Busy Led May Also Stay On With The Red Fault Led.

The following constitutes the remaining statuses from the LEDs:

B (Busy green LED):

ON - Indicates that the SmartMedia socket is active, **don't** disturb the memory card.
OFF - Indicates socket is idle and SmartMedia may be removed or inserted.

F (Fault red LED):

ON - SmartMedia is possibly damaged or of incorrect format. Remove the memory and cycle power to the EMC-2000 to see if the power-up initialization is successful.
OFF - No faults.

E.5 PMC-SMARTMEDIA OPERATION

The SmartMedia may be inserted or removed with or without the Emerald controller having power applied.

IMPORTANT

Avoid removing SmartMedia memory cards when the Busy LED is on, in that this could damage the SmartMedia memory card.

The PMC-SmartMedia board will search the root directory of an inserted SmartMedia to find an application program and or EMC-2000 Operating System Firmware to upload the controller with, files of the extensions *.exf and *.abs respectively. If only the Application Program is desired to be uploaded than the *.abs file should not be in the root directory of the SmartMedia only the *.exf file. Likewise if its desired that only the Operating System Firmware be uploaded then the *.exf file should not reside in the root directory of the SmartMedia only the *.abs file. Its important to note that only one *.exf and one *.abs file may reside in the root directory of the SmartMedia for proper operation. It is okay for a directory tree and other files of differing extensions, other than *.exf or *.abs, too reside in the root directory without effecting PMC-SmartMedia board operation.

Files are to be copied to the SmartMedia using a PC with SmartMedia read/write support.

APPENDIX F - EMBEDDED PC PMC OPTION BOARD

F.1 EMBEDDED PC OVERVIEW

The Embedded PC option board for the Emerald Motion Controller (EMC-2000) has been developed around the Geode SC2200 integrated processor.

General Features

- 32-bit x86 processor with MMX instruction set support running at 300 MHz
- 256 Mbyte SDRAM
- 1 VGA Port
- 3 USB ports, OHCI version 1.0 compliant
- 1 10/100 Mbit Ethernet port
- 1 Isolated 3-wire serial port
- 20 Gbyte Hard Drive

The Embedded PC interfaces to the EMC-2000 over the PCI bus. Windows drivers are available to interface a Visual Basic application to the EMC-2000. See IIS Document IB-20B003 for details on the Windows driver.

F.2 POWER REQUIREMENT

The Embedded PC option board requires an additional 12 watts maximum from the EMC power supply, therefore when sizing the 24VDC power supply for the EMC-2000 be a little generous and add about .5 Amps of current.

F.3 WIRING

Most of the connections to the Embedded PC use standard PC connectors.

F.3.1 ETHERNET

The Ethernet Port on the Embedded PC accepts a standard RJ-45 plug.

F.3.2 USB

The three USB ports on the Embedded PC are standard USB Type-A sockets.

F.3.3 SERIAL PORT

The serial port on the Embedded PC accepts a standard RJ-11 phone plug. The table below lists the pin out for the connector.

RJ-11 Plug (On the cable)	Function
1	NC
2	NC
3	Tx
4	Ground
5	Rx
6	NC

F.3.4 VGA

To connect a VGA monitor to the Embedded PC IIS adapter cable C-763000.5 is needed.

F.4 LEDS

There are four LEDs on the Embedded PC to indicate Ethernet and Hard Drive status.

100 - Green LED indicating a 100Mbit Ethernet Link
10 - Green LED indicating a 10Mbit Ethernet Link
ACT - Amber LED indicating Ethernet Activity
HDD - Red LED indicating Hard Drive Activity

F.5 USB PORTS

As mentioned above there are three USB ports on the Embedded PC. Any USB device that is supported by the operating system can be connected to any of the three ports. Each port is capable of supplying 500mA to its connected devices.

The BIOS for the Embedded PC has two USB features that aid in loading an operating system and performing non-Windows functions. First, legacy USB keyboard and mouse support is provided, allowing a USB keyboard and mouse to function just like a standard keyboard or mouse. Secondly, the BIOS allow booting from a USB Mass Storage Device for operating system installation.

IB-20B001

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PRINTED IN USA