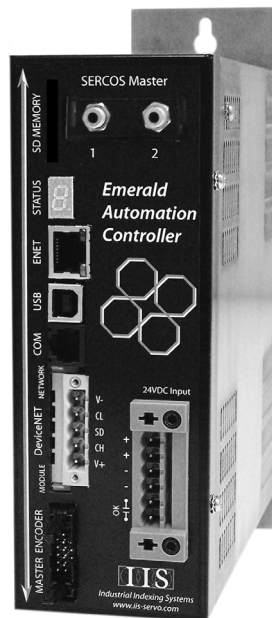


IB-20B005

EMERALD SERIES AUTOMATION CONTROLLER

OCTOBER 2023

EMERALD EMC-2100



INSTRUCTION BOOK

INDUSTRIAL INDEXING SYSTEMS, Inc.

Revision – A

Approved By: WS 10/16/23

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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.

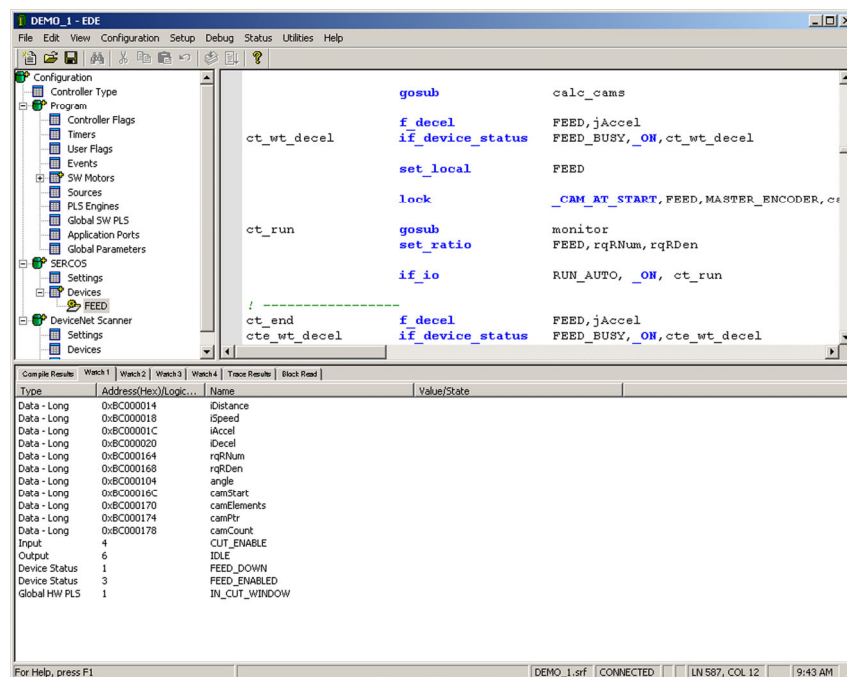
The EMC-2100 Emerald Automation Controller embodies a blend of open architecture features with a true real-time operating system designed for those demanding applications the require tight deterministic synchronization of motion, IO and auxiliary equipment. The controller supports up to 32 devices on the automation bus including Servo Motor Drives, Digital and Analog IO. The result is a state-of-the art performance and superior connectivity to other systems and network components.

The EMC-2100 has a wide array of features, including:

- a 32-bit Power PC processor
- SERCOS II Interface™
- DeviceNet/CanBus port
- One RS-232 port
- One USB 2.0 Serial Executive Port
- Encoder master follower input
- programmable limit switch (PLS) Functions with up to 8 PLS Engines sources
- 8 software simulated motors (pacers)
- failsafe watchdog timer
- high visibility status displays

The EMC-2100 is a total redesign of the very popular EMC-2005 version of the Emerald Series Motion Controller. Included standard now are the popular features Removable Memory Card Reader and Ethernet.

The controller is programmed using our comprehensive **Emerald Motion Programming Language (EML)** and powerful new **Emerald Development Environment (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-2100 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-2100 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:

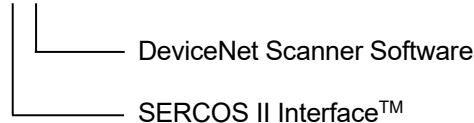
EMC-2100XXY

WHERE:

XX = Automation Bus Option (One must be selected)
S2 = SERCOS II Interface™

Y = Option List in Alphabetical Order
Blank = No Option Selected
S = DeviceNet Scanner Software

Example: EMC-2100S2S



SECTION 2 - DESCRIPTION

The Emerald EMC-2100 product is a Multi-axis, high-speed serial bus, master servo motion controller, with the ability to command up to 32 Axis of 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 USB 2.0 Serial or 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 a USB2.0 Serial Port, RS-232 port, DeviceNet/Can Bus port, 10/100 Ethernet Port, Removable Memory Card Slot, Master Encoder Input, Motion Bus Communication Ports, as well as a Hardware Watchdog and power connections.

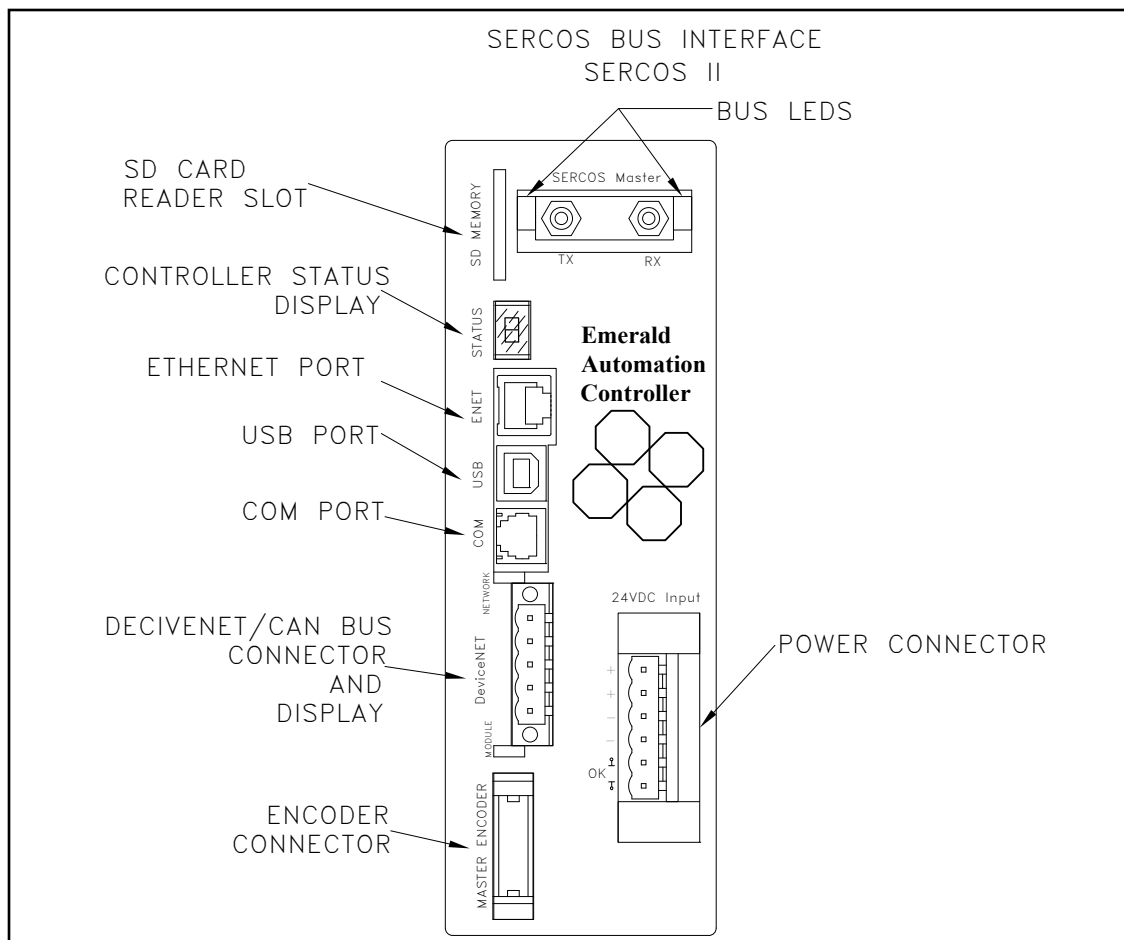


Figure 2.1 - Emerald Layout

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 LED(S) - 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. This SD CARD READER SLOT allows for quick updates of controller firmware applications.
2. ENET - This RJ-45 Ethernet Port connector supports 10/100 Fast Ethernet supporting a number of protocols to allow the EMC-2100 to be connected to plant Industrial Ethernet networks.
3. USB - This USB-2.0 Type B Port connector is a USB serial communication Executive port. It uses a custom protocol to communicate with the EDE software tools on a PC. This port also facilitates firmware download.
4. COM - This 6-pin RJ-11 connector is an RS-232 serial communication port. It can be used to communicate with the IIS OPI-7.0TFT 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.
5. DEVICE NET | CANBUS CONNECTOR AND DISPLAY - This 5-pin header is a DeviceNet/CANBus 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
6. ENCODER - This 10-pin header is a high-speed master encoder pulse input.
7. 24V DC INPUT - This power 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 (OK) output contact will be closed when the Motion Application is executing.

SECTION 3 - EMERALD SPECIFICATIONS

3.1 GENERAL

Weight	2.8 lbs / 1.3 Kgs
Dimensions	Width 2.5 in Height 8.75 in Depth 7.25 in
Recommended Panel Depth	12.00 in (304.8 mm) (See Section 7 - Installation Guidelines)

3.2 POWER REQUIREMENT

Supply Voltage	24 volts DC + 10%, Class 2 power supply
Supply Current	.75 amps max

3.3 SERCOS INTERFACE

Interface Option	SERCOS II
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/32-122°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

ENET Port	Classification: 10/100 Base T Fast Ethernet
USB Port	Classification: USB2.0 Serial Communication Port Data Transfer: EMC Packet protocol Protocol: 115200 baud, 1 stop bit, 8 data bits, No parity
COM Port	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 defined 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, 0.5 Amp Maximum

SECTION 4 - EMERALD WIRING

This section details the pinouts of the external connectors on the EMERALD controller. This port is used for executive communications between the EMC-2100 and the IIS PC software tools. Refer to **Section 8 INTERFACE CABLES** for part numbers of cables to interface to these connectors.

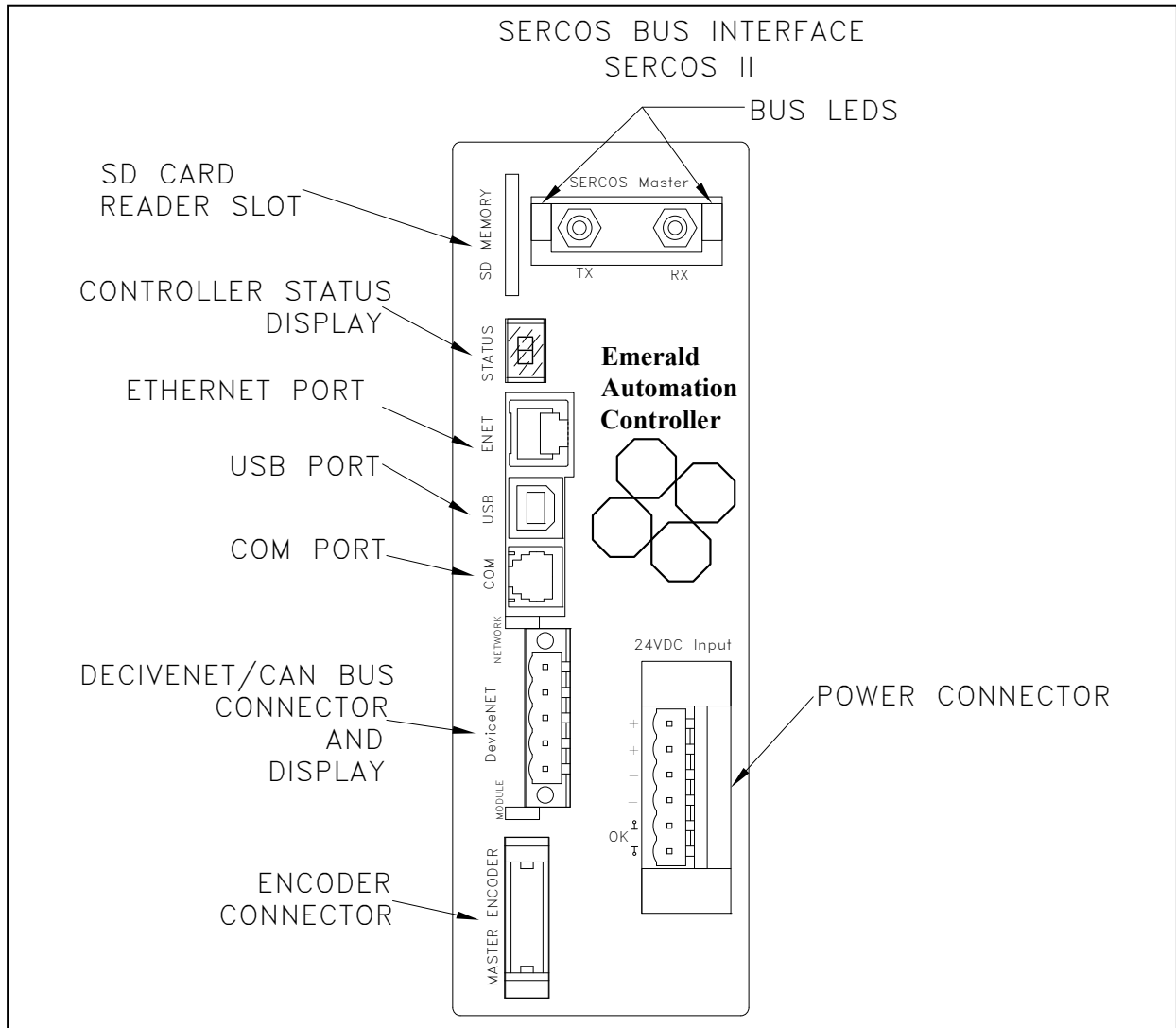


Figure 4.1 – Emerald Wiring

4.1 ENET PORT (Ethernet)

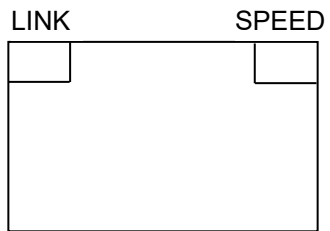


Figure 4.2 - ENET Port

PORT STATUS	LINK LED STATUS
NO CONNECTION	OFF
CONNECTED	SOLID GREEN
ACTIVITY	FLASHING GREEN

PORT STATUS	SPEED LED STATUS
OFF	10Mb
MAXIMUM SPEED (1Gb OR 100Mb) Defined by order part number	YELLOW
100Mb (When 1Gb is maximum speed of the Emerald controller)	GREEN

(Refer to C-822000)

4.2 USB PORT

This port is used for executive communications between the EMC-2100 and the IIS PC software tools. It uses a standard USB 2.0 AB cable for connection to a PC. The appropriate serial driver is installed with the Software tools. (Refer to C-822000)

4.3 COM PORT (RS-232 SERIAL)

This port is ports are used for communication and use RJ-11 connectors to interface to respective devices. The port pinout is shown in **Figure 4.3**.

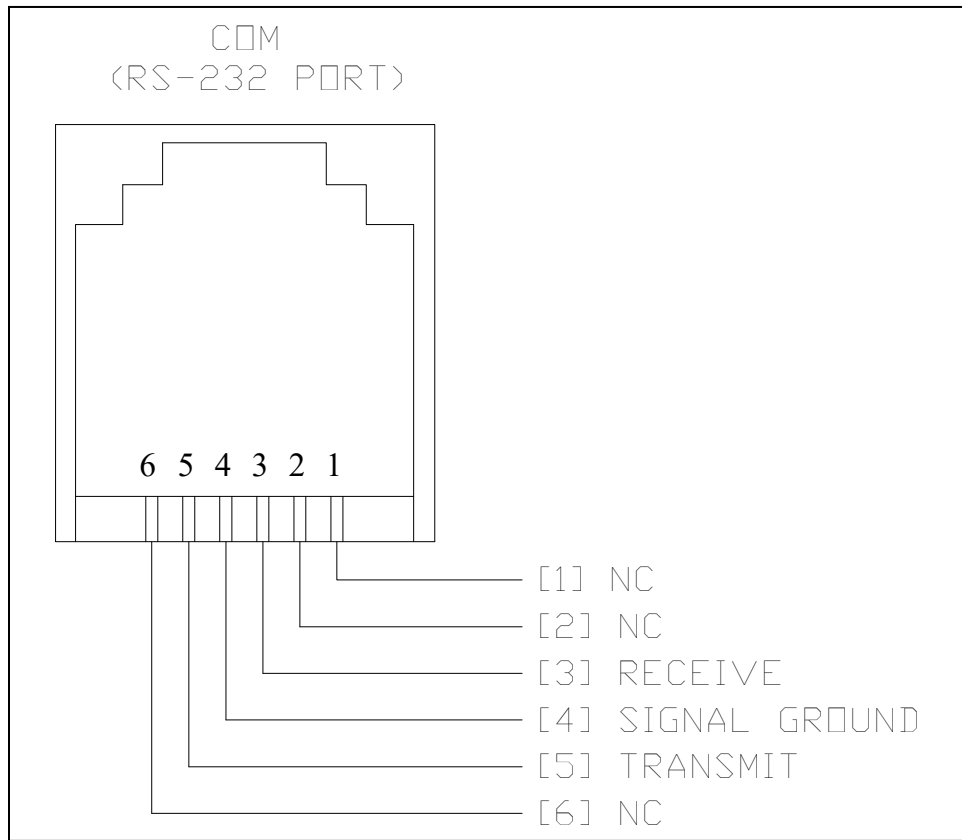


Figure 4.3 - COM Port - RS-232

REF: C-987YYY
REF: C-822000

4.4 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 4.4**.

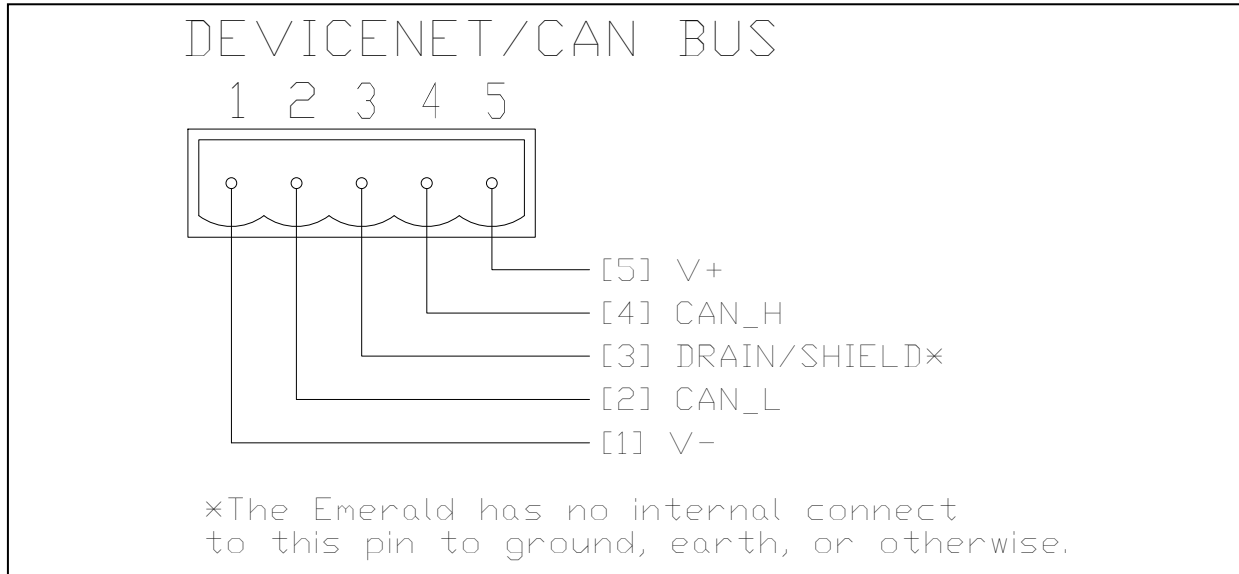


Figure 4.4 - DeviceNet/CAN Bus

4.4.1 WIRING RECOMMENDATIONS

- A. A termination resistor at either end of the Can Bus trunk.
 - Termination Resistor Specifications
 - 121 ohm
 - 1% Metal Film
 - 1/4 Watt

- B. Ideally the Drain Wire (pin-3) should be tied to the supply ground at the power supply. At that power supply the ground should be tied to earth.

- C. DeviceNet Specifications for further wiring concerns can be found with the Open DeviceNet Vendors Association (ODVA).

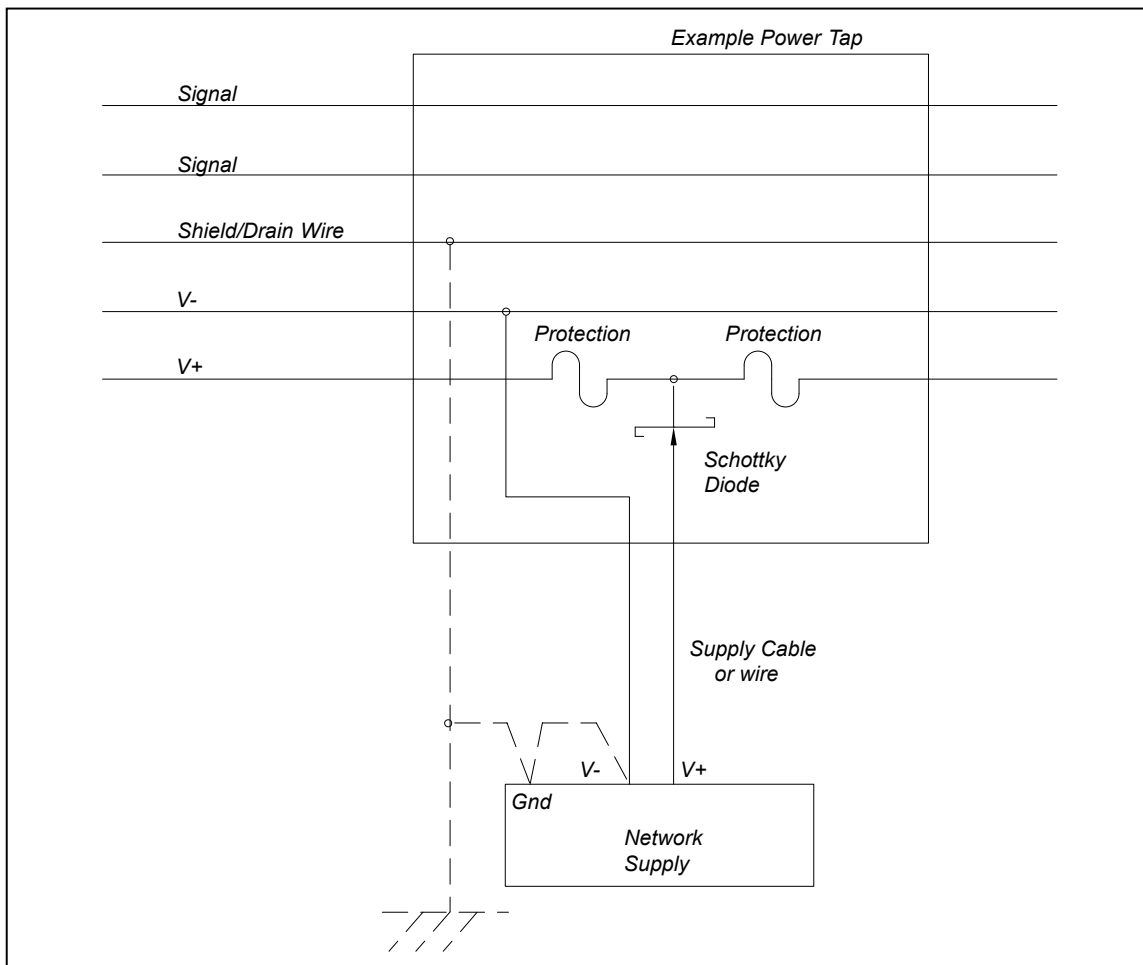


Figure 4.5 - Diagram of DeviceNet Power Tap

4.5 ENCODER INTERFACE

The Encoder interface connector pinouts are shown in **Figure 4.6**.

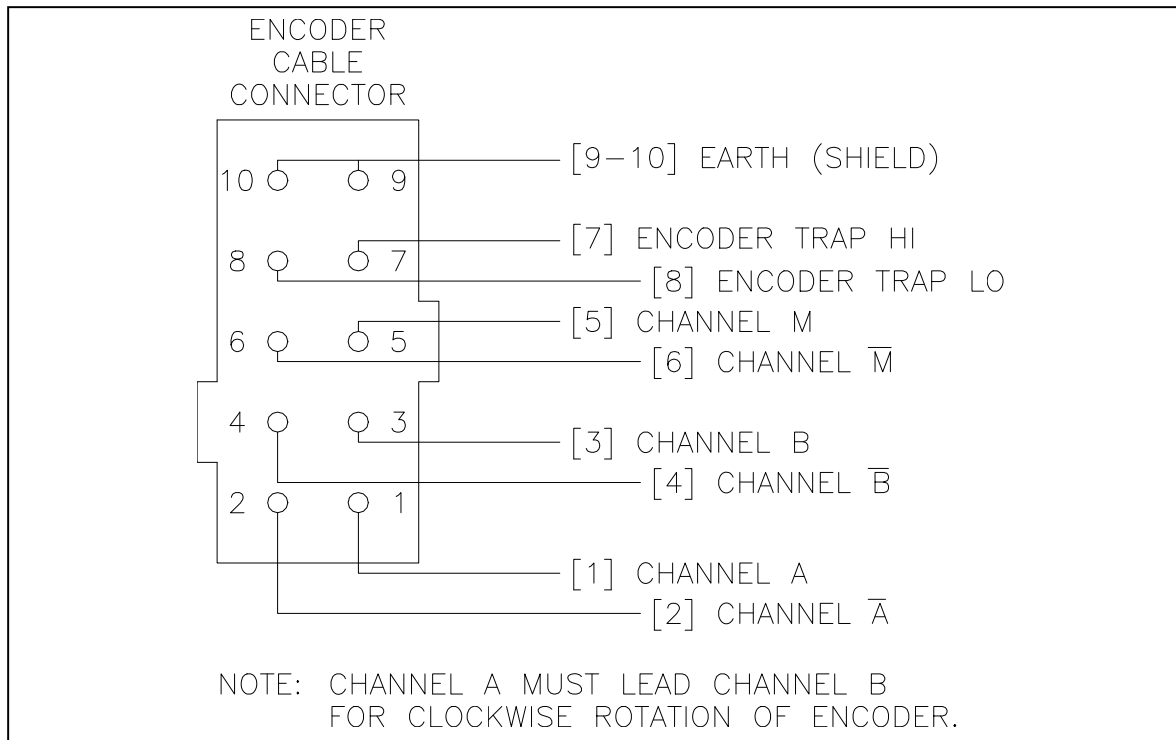


Figure 4.6 - Encoder Interface Connector Pinouts

See page 2 of INT-810 drawing.

4.6 POWER AND WATCHDOG CONNECTER

The 24-volt, Class 2 power supply is to be used to power the EMC-2100.

The pinouts of the WD/24V connector are shown in **Figure 4.7**.

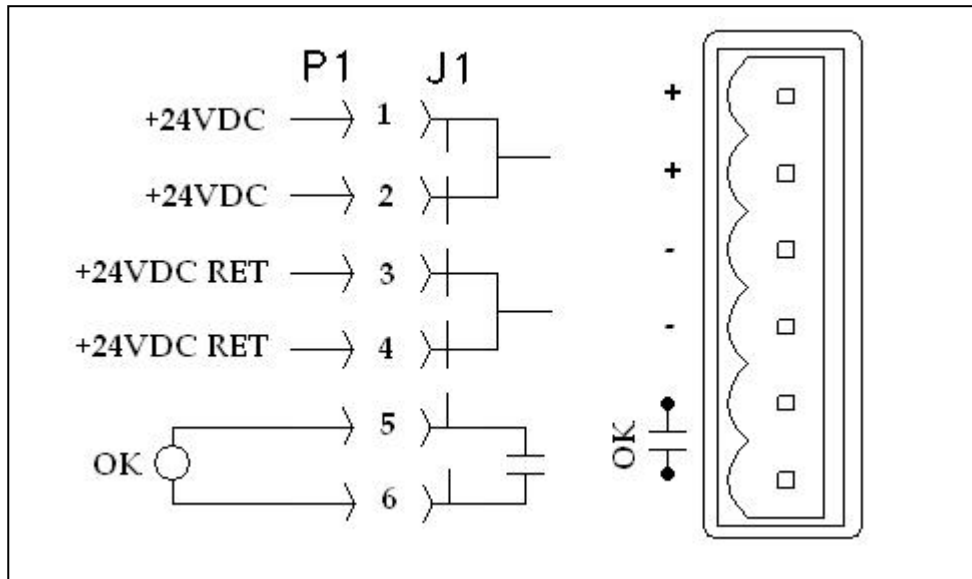


Figure 4.7 - Power and Watchdog Connection

4.7 SERCOS INTERFACES

4.7.1 SERCOS II INTERFACE TX/RX

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

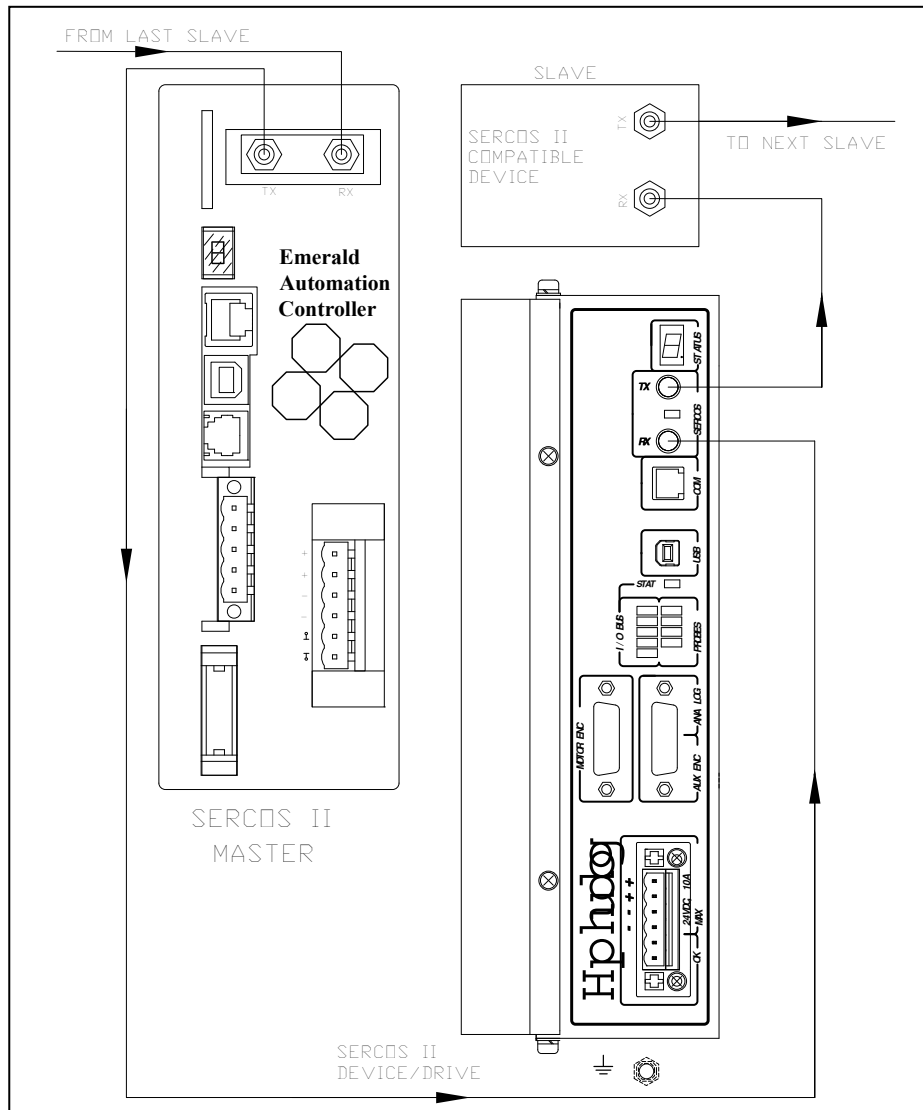


Figure 4.8 - Typical SERCOS II Fiber Optic Ring

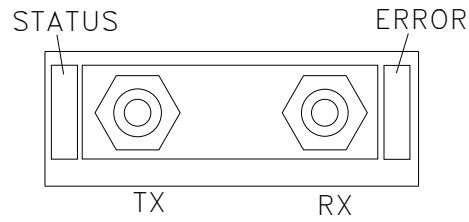
SECTION 5 - STATUS & ERROR CODES

5.1 CONTROLLER STATUS

<u>SYSTEM STATUS</u>		<u>PROGRAM ERRORS</u>	
<input type="checkbox"/> PROGRAM LOADED		<input type="checkbox"/> + <input type="checkbox"/> DIVIDE BY ZERO	
<input type="checkbox"/> PROGRAM RUNNING "A" W/FLASHING DOT= AT LEAST ONE DRIVE DISABLED		<input type="checkbox"/> + <input type="checkbox"/> ILLEGAL ARGUMENT	
<input type="checkbox"/> PROGRAM RUNNING "A" W/SOLID DOT= ALL DRIVES ENABLED		<input type="checkbox"/> + <input type="checkbox"/> SERCOS DEVICE WRONG STATE	
<input type="checkbox"/> SYSTEM RESET (NO APPLICATION)		<input type="checkbox"/> + <input type="checkbox"/> STACK OVERFLOW	
<input type="checkbox"/> LOSS OF PROGRAM/FLASH FAILURE		<input type="checkbox"/> + <input type="checkbox"/> STACK UNDERFLOW	
<input type="checkbox"/> CLEARING FLASH		<input type="checkbox"/> + <input type="checkbox"/> DNET DEVICE WRONG STATE	
<input type="checkbox"/> LOW POWER		<input type="checkbox"/> + <input type="checkbox"/> DNET QUE FULL	
<input type="checkbox"/> SYSTEM BOOTING		<input type="checkbox"/> + <input type="checkbox"/> RESERVED	
<input type="checkbox"/> NOV RAM FAILURE		<input type="checkbox"/> + <input type="checkbox"/> RESERVED	
<input type="checkbox"/> CACHE ERROR		<input type="checkbox"/> + <input type="checkbox"/> ENCOUNTERED AN END_PROGRAM STATEMENT	
<input type="checkbox"/> SYSTEM RESET (NO O.S.)		<input type="checkbox"/> + <input type="checkbox"/> APPLICATION MEMORY ERROR	
		<input type="checkbox"/> + <input type="checkbox"/> EXCESSIVE CAM ELEMENTS PER INTERRUPT	
<u>SYSTEM ERRORS</u>		<u>SERCOS ERRORS</u>	
<input type="checkbox"/> + <input type="checkbox"/> SERCOS TIMING CALC ERROR		<input type="checkbox"/> + <input type="checkbox"/> RING FAULT	
<input type="checkbox"/> + <input type="checkbox"/> BAD OPCODE		<input type="checkbox"/> + <input type="checkbox"/> SERVICE CHANNEL FAULT	
<input type="checkbox"/> + <input type="checkbox"/> TRIED TO LOAD PROGRAM WHILE NOT RESET		<u>COMM PORT ERRORS</u>	
<input type="checkbox"/> + <input type="checkbox"/> TRIED TO SET A READ ONLY FLAG		<input type="checkbox"/> + <input type="checkbox"/> PORT 1/PORT 2 PACKET TIMEOUT	
<input type="checkbox"/> + <input type="checkbox"/> SET DNET SCANNER WITHOUT SOFTWARE		<input type="checkbox"/> + <input type="checkbox"/> PORT 1 HANDSHAKE ERROR	
<input type="checkbox"/> + <input type="checkbox"/> DNET SCANNER INIT FAIL		<input type="checkbox"/> + <input type="checkbox"/> PORT 2 HANDSHAKE ERROR	
<input type="checkbox"/> + <input type="checkbox"/> DNET PARAMETER ERROR		<input type="checkbox"/> + <input type="checkbox"/> RESERVED	
<input type="checkbox"/> + <input type="checkbox"/> OPCODE NOT COMPLETED		<input type="checkbox"/> + <input type="checkbox"/> BAD PACKET SENT TO PORT 1	
<input type="checkbox"/> + <input type="checkbox"/> CONFIG SPACE FAIL		<input type="checkbox"/> + <input type="checkbox"/> BAD PACKET SENT TO PORT 2	
<input type="checkbox"/> + <input type="checkbox"/> EXCEEDED AVAILABLE TIMERS		<input type="checkbox"/> + <input type="checkbox"/> PRINT Q FULL	
		<input type="checkbox"/> + <input type="checkbox"/> ETHERNET PACKET ERROR	
<u>CPU EXCEPTION ERRORS</u>			
<input type="checkbox"/> + <input type="checkbox"/> + <input type="checkbox"/> TLB MODIFICATIONS		<input type="checkbox"/> + <input type="checkbox"/> + <input type="checkbox"/> RESERVED	
<input type="checkbox"/> + <input type="checkbox"/> + <input type="checkbox"/> TLB EXCEPTION LOAD/FETCH		<input type="checkbox"/> + <input type="checkbox"/> + <input type="checkbox"/> MACHINE CHECK EXCEPTION	
<input type="checkbox"/> + <input type="checkbox"/> + <input type="checkbox"/> TLB EXCEPTION STORE		<input type="checkbox"/> + <input type="checkbox"/> + <input type="checkbox"/> + <input type="checkbox"/> + <input type="checkbox"/> RESERVED	
<input type="checkbox"/> + <input type="checkbox"/> + <input type="checkbox"/> ADDRESS ERROR EXCEPTION LOAD/FETCH		<input type="checkbox"/> + <input type="checkbox"/> + <input type="checkbox"/> MEMORY ALIGNMENT ERROR	
<input type="checkbox"/> + <input type="checkbox"/> + <input type="checkbox"/> ADDRESS ERROR EXCEPTION STORE		<input type="checkbox"/> + <input type="checkbox"/> + <input type="checkbox"/> PROGRAMMING ERROR	
<input type="checkbox"/> + <input type="checkbox"/> + <input type="checkbox"/> BUS ERROR EXCEPTION FETCH		<input type="checkbox"/> + <input type="checkbox"/> + <input type="checkbox"/> FLOATING POINT UNAVAILABLE	
<input type="checkbox"/> + <input type="checkbox"/> + <input type="checkbox"/> BUS ERROR LOAD OR STORE		<input type="checkbox"/> + <input type="checkbox"/> + <input type="checkbox"/> RESERVED	
<input type="checkbox"/> + <input type="checkbox"/> + <input type="checkbox"/> SYSCALL		<input type="checkbox"/> + <input type="checkbox"/> + <input type="checkbox"/> INSTRUCTION TRANSLATION MISS	
<input type="checkbox"/> + <input type="checkbox"/> + <input type="checkbox"/> BREAK POINT EXCEPTION		<input type="checkbox"/> + <input type="checkbox"/> + <input type="checkbox"/> DATA LOAD TRANSLATION MISS	
		<input type="checkbox"/> + <input type="checkbox"/> + <input type="checkbox"/> DATA STORE TRANSLATION MISS	
		<input type="checkbox"/> + <input type="checkbox"/> + <input type="checkbox"/> RESERVED	
		<input type="checkbox"/> + <input type="checkbox"/> + <input type="checkbox"/> RESERVED	
		<input type="checkbox"/> + <input type="checkbox"/> + <input type="checkbox"/> UNKNOWN EXCEPTION	
		NOTE: CPU EXCEPTIONS ARE FATAL CALL IIS FOR ASSISTANCE.	

Figure 5.1 - Controller Status

5.2 SERCOS STATUS DISPLAYS



NETWORK STATE	LED STATUS
PHASE 0	OFF
PHASE 1	FLASHING YELLOW
PHASE 2	SOLID YELLOW
PHASE 3	FLASHING GREEN
PHASE 4	SOLID GREEN

NETWORK STATE	ERROR LED
NO ERROR	OFF
ERRORS	RED DIMLY LIT
NO CONNECTION	RED

Figure 5.2 - SERCOS II Status Display

5.3 DEVICENET STATUS DISPLAYS

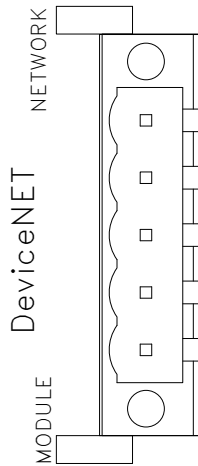


Figure 5.3 - DeviceNet

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** defines the Module Status LED states.

MODULE STATE	LED STATE	INDICATES
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 standby 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.

NETWORK STATE	LED STATE	INDICATES
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 - SD CARD READER

6.1 SECURE DIGITAL (SD) MEMORY CARD READER OVERVIEW

The SD Card Reader facilitates EMC-2100 Application Program and Operating System Firmware uploads from power-up, using readily available "SD and SDHC" Standard Memory Cards" (herein referred to as just SD). SD can be obtained from local retailers in the business of supplying consumer electronic and computer equipment.

6.2 USING THE SD CARD READER

The SD Card Reader Supports any memory size SD or SDHC from any manufacturer that is formatted with a fat16 file system. Most SD cards can be purchased preformatted.

The SD Card can be used to upload a new version of the Controller firmware or application file to the Emerald Controller. These files must be located in the root directory of the SD Flash card. A personal computer with a SD Card Read should be used to load files onto card.

6.3 PROCEDURE TO UPDATE FIRMWARE USING THE READER

- 1) Turn power off to the controller.
- 2) Put an SD CARD with a valid version of the EMC-2100 firmware in its root directory in the card reader slot. This firmware can be obtained from contacting technical support at Industrial Indexing Systems. Only one version of the firmware should be on the card. If more than one version is found, the controller will use the first one it comes across.
- 3) Power on the controller, after the initial boot sequence the controller will detect the SD Card, query it for a valid firmware extension (*.abs) and start clearing the current firmware from flash.
- 4) Once the firmware is cleared the new firmware is loaded. The display will rotate the outer segments of the Status Display in a clockwise rotation while the firmware is being loaded.
- 5) Once the download is complete, the flash is now updated with the new contents. While this is occurring, the display will alternate between a "c" and a backwards "c".
- 6) The process is complete once the display flashes the current rev of the firmware loaded in the unit.

6.4 PROCEDURE TO UPDATE APPLICATION USING THE READER

- 1) Turn power off to the controller.
- 2) Put an SD CARD with a valid version of the EMC-2100 application program into the card reader slot. Only one version of the application should be on the card. If more than one version is found, the controller will use the first one it comes across.
- 3) Power on the controller. The controller will boot normally up to the point of starting the application programming. If the controller detects the SD Card, it will query it for a valid application program extension (*.exf) and start clearing the current application from flash. The display will momentarily stop while this is occurring.
- 4) Once the application is cleared the new application is loaded. The display will now show an "A".

SECTION 7 - INSTALLATION GUIDELINES

7.1 GENERAL

This section contains the specific information needed to properly install the Emerald EMC-2100 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.

7.2 ENCLOSURE CABINET REQUIREMENTS

Ideally, the EMC-2100 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.

7.3 MOUNTING THE SYSTEM UNIT

The EMC-2100 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-2100 in **Section 7.7 - Installation Drawings** for mounting dimensions.

7.4 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 ensure 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.

7.5 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-2100 earth ground must be connected to this ground bus.

7.6 POWER ISOLATION

Although the unit is equipped with a fuse and transient voltage protection, it is recommended that the EMC-2100 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.

7.7 INSTALLATION DRAWINGS

DRAWING NUMBER

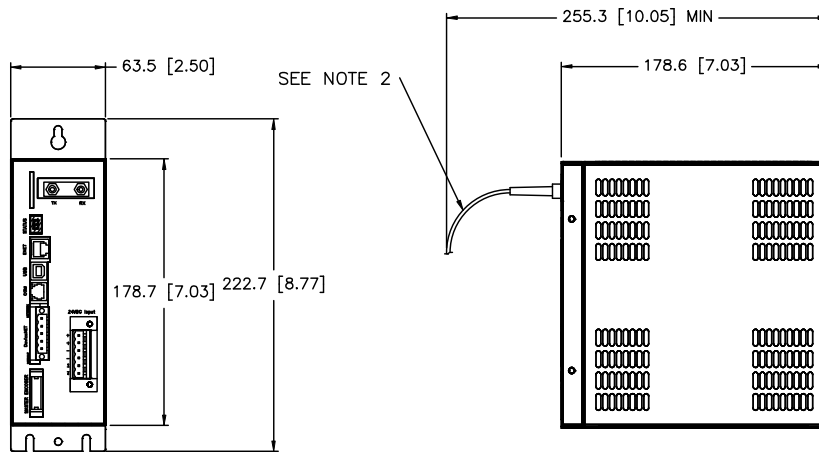
DESCRIPTION

EMC-2100

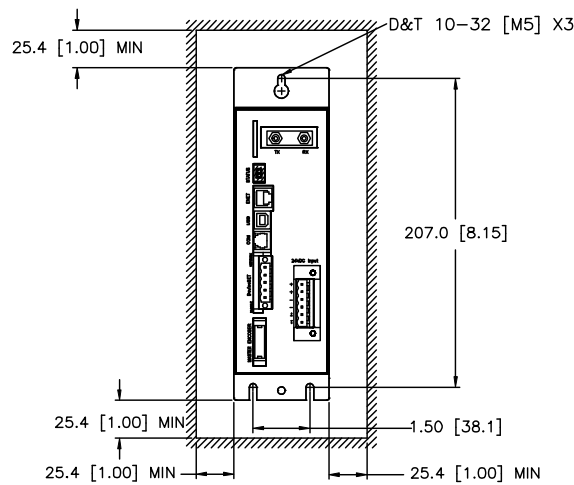
Emerald Automation Controller

NOTES:

1. RECOMMENDED CABINET DEPTH TO BE 304.8 [12.00]
2. OPTIC CABLE BEND RADIUS 40.1 [1.58] MIN



SERCOS 2



RECOMMENDED INSTALLATION CLEARANCE



INDUSTRIAL INDEXING SYSTEMS, Inc.

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TITLE
 CONTROLLER, EMERALD

DRAWING NUMBER
 EMC-2100

DIMENSIONS ARE MM [INCHES]	TOLERANCES X.XX±0.02	X.XXX±0.01	± 0°40'	REV A	ECN 23-120	DATE 31MAY12	SH. 1 OF 1
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SECTION 8 - CABLES AND ACCESSORIES

DRAWING NUMBER

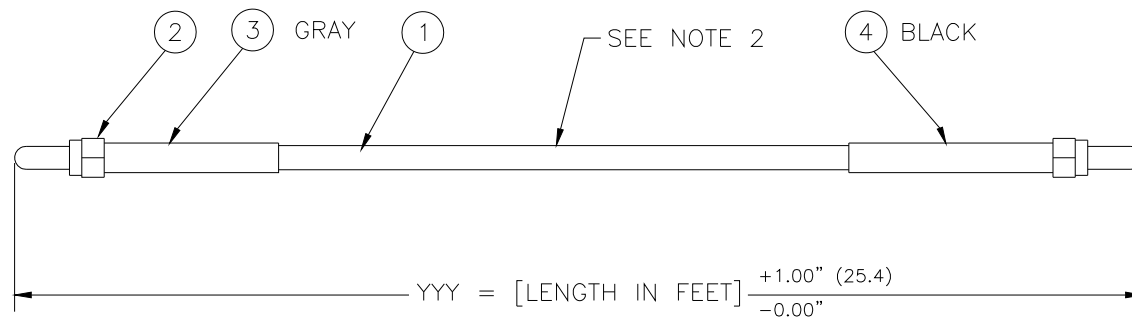
DESCRIPTION

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

DATE	SYM	REVISION RECORD	DR	CK	CK
07JAN05	B	PER ECN 04-441	EB		

NOTES:

- 1.) ASSEMBLE PER QP-08-0006.
- 2.) MARK PER QP-08-0001.
- 3.) TEST USING TEST PROCEDURE TST-0061.
- 4.) MINIMUM BEND RADIUS - 1.58 (40 MM)
LOSS INCREMENT=< 0.5dB
(QUARTER BEND)
- 5.) REPEATED BENDING ENDURANCE: 5000 TIMES MIN.
LOSS INCREMENT=< 1dB
(IN CONFORMITY TO JIS C 6861)

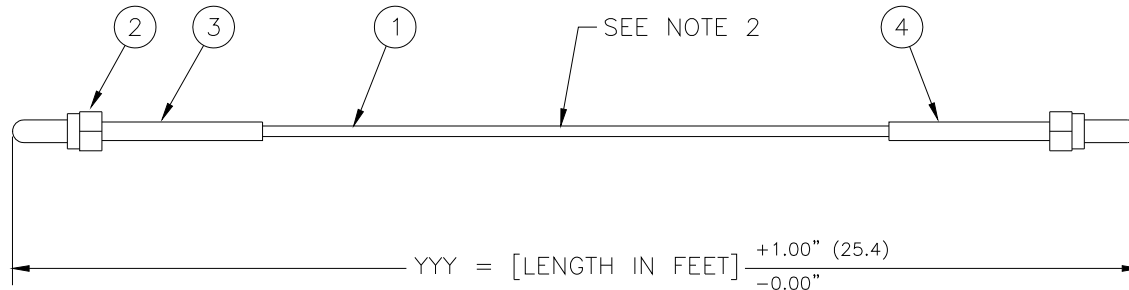


CHECKED BY CD	DATE 3/7/01	THIS DRAWING, AND THE DATA CONTAINED THEREIN, ARE PROPRIETARY INFORMATION OF: INDUSTRIAL INDEXING SYSTEMS, Inc. AND IS ISSUED IN STRICT CONFIDENCE. AND IT SHALL NOT BE REPRODUCED, COPIED, OR USED FOR ANY PURPOSE WHATSOEVER, WITHOUT THE PRIOR WRITTEN PERMISSION OF: INDUSTRIAL INDEXING SYSTEMS, Inc.			
APPROVED BY J.CARTER	DATE 3/7/01	TITLE CABLE, SERCOS FIBER OPTIC, EXTERNAL			
MATERIAL -----	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)	DRAWN BY BOWMAN	DRAWING NUMBER C-752YYY		
FINISH -----	TOLERANCES X.X± --- X.XX± --- X.XXX± ---	ANGULAR ± ---	AutoCAD FILE LOCATION Q:\DFTG\CABLES\C-7XX	SCALE ---	SHEET NO. 1 OF 1
		DATE 10MAY00	REVISION B		

DATE	SYM	REVISION RECORD	DR	CK	CK
07JAN05	C	PER ECN 04-441	EB		

NOTES:

- 1.) ASSEMBLE PER QP-08-0006.
- 2.) MARK PER QP-08-0001.
- 3.) TEST USING TEST PROCEDURE TST-0061.
- 4.) MINIMUM BEND RADIUS - .98 (25 MM)
LOSS INCREMENT=<0.5 dB
(QUARTER BEND)
- 5.) REPEATED BENDING ENDURANCE: 5000 TIMES MIN.
LOSS INCREMENT=< 1dB
(IN CONFORMITY TO JIS C 6861)



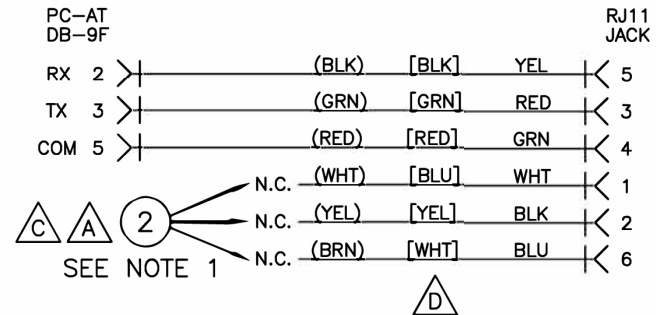
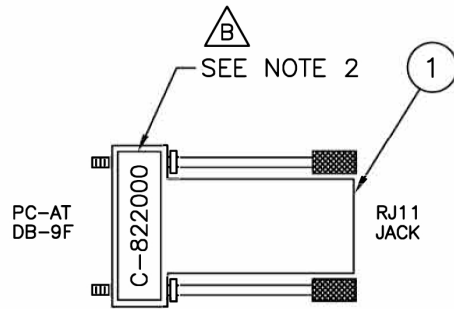
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APPROVED BY	DATE				
APPROVED BY J.CARTER	DATE 3/7/01	TITLE CABLE, SERCOS FIBER OPTIC, INTERNAL			
MATERIAL	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)	DRAWN BY BOWMAN	DRAWING NUMBER		
SPEC SHT: GHCP 4001	TOLERANCES	AutoCAD FILE LOCATION Q:\DFTG\CABLES\C-7XX	C-753YYY		
FINISH	X.X± --- X.XX± --- X.XXX± ---	ANGULAR ± ---	DATE 10MAY00	SCALE ---	SHEET NO. 1 OF 1
					REVISION C

NOTES:

- 1.) INSULATE UNUSED WIRES.
- 2.) MARK PER QP-08-0001.
- D 3.) COLORS IN (*) OR [*] ARE ALTERNATE COLORS.

DATE	SYM	REVISION RECORD	DR	CK	CK
13MAR01	C	PER ECN 01-070	EB	EB	CDR
03FEB16	D	PER ECN 16-022	JC		

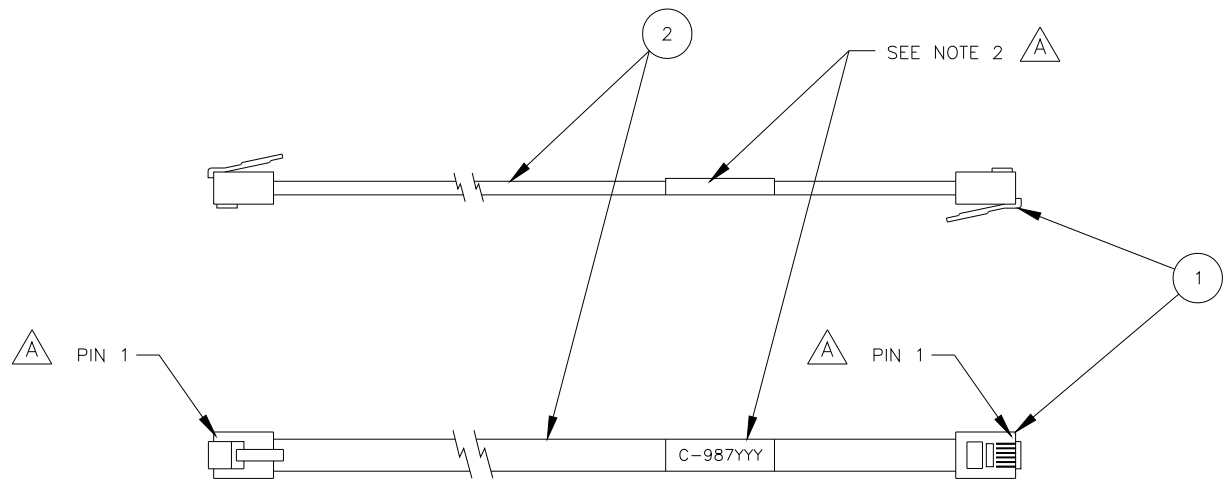


CHECKED BY	DATE	THIS DRAWING, AND THE DATA CONTAINED THEREIN, ARE PROPRIETARY INFORMATION OF: INDUSTRIAL INDEXING SYSTEMS, Inc. AND IS ISSUED IN STRICT CONFIDENCE, AND IT SHALL NOT BE REPRODUCED, COPIED, OR USED FOR ANY PURPOSE WHATSOEVER, WITHOUT THE PRIOR WRITTEN PERMISSION OF: INDUSTRIAL INDEXING SYSTEMS, Inc.			
APPROVED BY	DATE				
APPROVED BY	DATE				
TITLE		CABLE ADAPTOR, 9P, FE, STANDARD			
MATERIAL		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)	DRAWN BY	DRAWING NUMBER	
		TOLERANCES	AutoCAD FILE LOCATION	C-822000	
FINISH		X.X± --	ANGULAR	Q:\DFTG\CABLES\C-8XX	
		X.XX± --	± --	DATE	SCALE
		X.XXX± --		B 09MAY96	NTS
				SHEET NO.	REVISION
				1 OF 1	D

DATE	SYM	REVISION RECORD	DR	CK	CK
29JAN99	A	PER ECN 98-270/99-027	CWB	EB	CDR

NOTES:

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

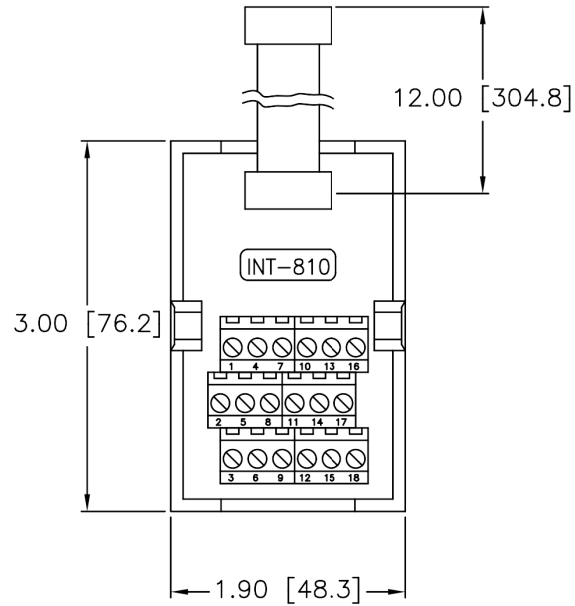
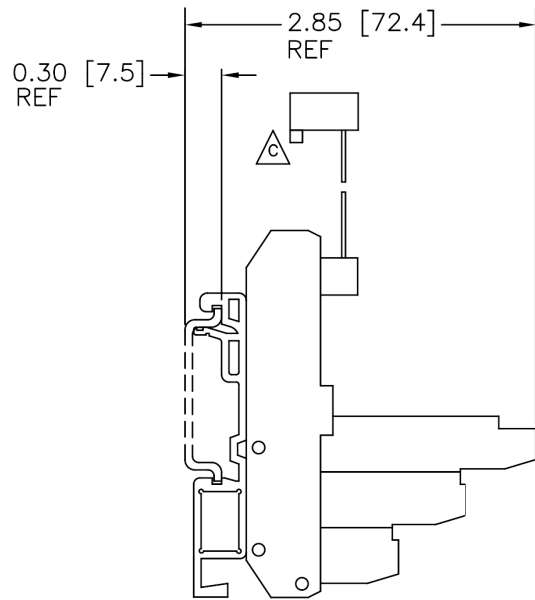


	△	
1	← WHT →	1
2	← BLK →	2
3	← RED →	3
4	← GRN →	4
5	← YEL →	5
6	← BLU →	6

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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	DRAWING NUMBER C-987YYY	
FINISH -----		TOLERANCES X.X± --- X.XX± --- X.XXX± ---	ANGULAR ± ---	AutoCAD FILE LOCATION Q:\DFTG\CABLES\C-9XX	SHEET NO. 1 OF 1
		B	DATE 13AUG92	SCALE ---	REVISION A

DATE	SYM	REVISION RECORD	DR	CK	CK
14MAR01	B	PER ECN 01-099	EB		CDR
02JUL14	C	PER ECN 14-087	CD		



- 1 > (1) CH1 > CHANNEL 1
- 2 > (2) CH1 > CHANNEL 1
- 3 > (4) CH2 > CHANNEL 2
- 4 > (5) CH2 > CHANNEL 2
- 5 > (7) CH3 > CHANNEL 3
- 6 > (8) CH3 > CHANNEL 3
- 7 > (16) ROHI
- 8 > (17) ROLO
- 9 > NC
- 10 > NC
- (10) +5V OUT
- (13) +5V IN
- (11) COM OUT
- (14) COM IN
- (3) SHIELD
- (6) SHIELD
- (9) SHIELD
- (12) SHIELD
- (15) SHIELD
- (18) MACHINE GROUND

ENCODER TO MSC



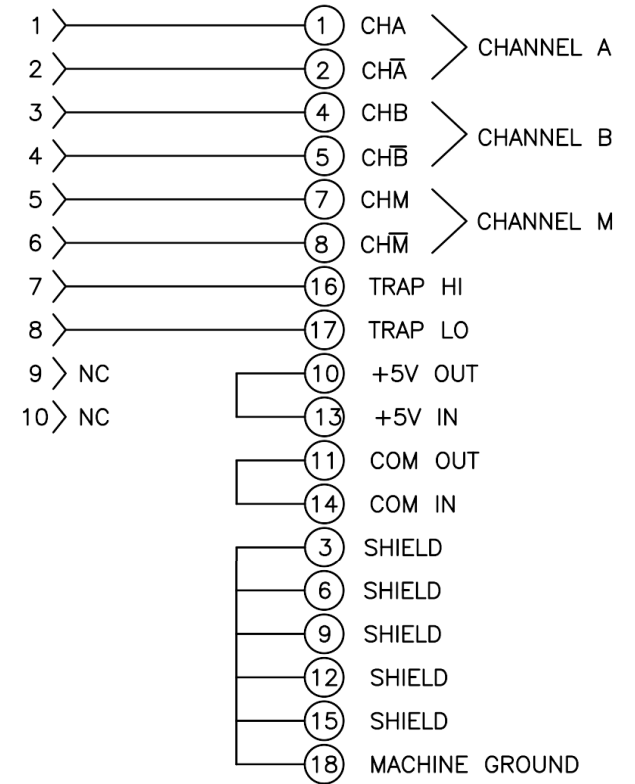
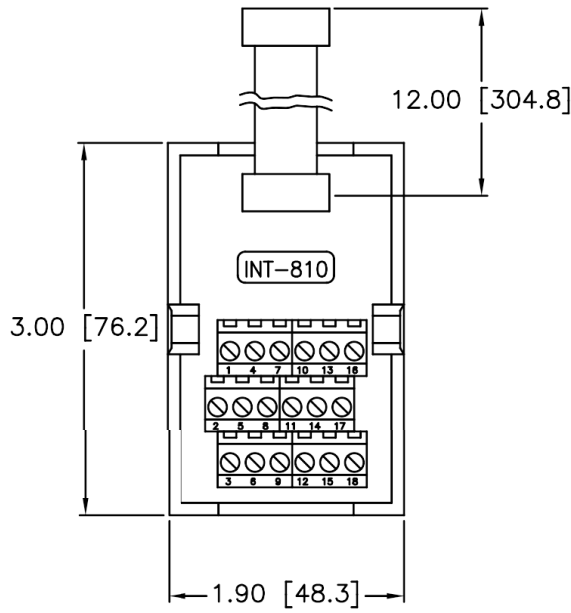
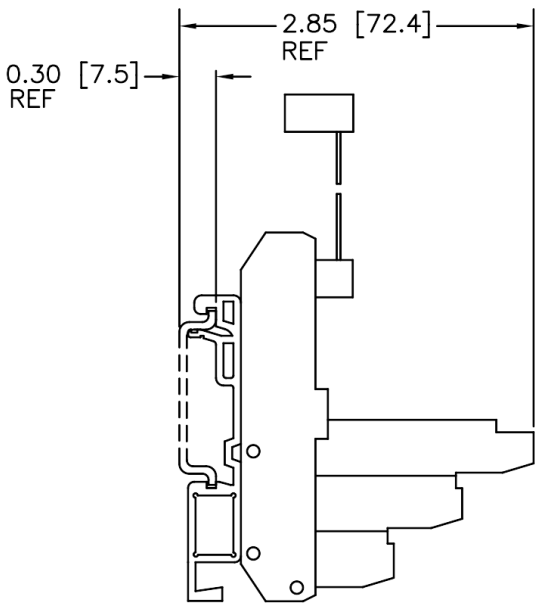
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TITLE					
ADAPTOR, ENCODER CABLE					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)		DRAWN BY DAUNCE		DRAWING NUMBER	
TOLERANCES		AutoCAD FILE LOCATION		INT-810	
X.XX ± 0.01	ANGULAR ± 0°30'	Q:\DFTG\PWB\INT-BXX\INT-810		SHEET NO.	REVISION
X.XXX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

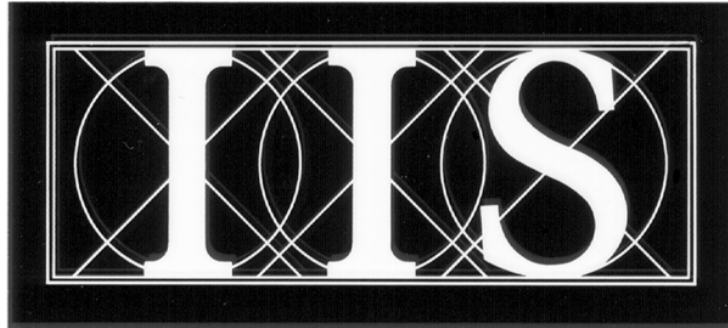
DATE	SYM	REVISION RECORD	DR	CK	CK
14MAR01	B	PER ECN 01-099	EB		CDR
02JUL14	C	PER ECN 14-087	CD		



ENCODER TO EMERALD

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

	IB-20B005	
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