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<sup>™</sup>
- 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.

File Edit Wew Configuration Setup Debug Status UNRities Help	1 DEM0_1 - ED	DEM0_1 - EDE					
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SERCOS       if_io       RUN_AUTO, _ON, ct_run         Devices       ct_end       f_decel       FEED, jAccel         Ct_end       f_decel       FEED, jAccel         Devices       if_decel       FEED, jAccel         Ct_end       f_decel       FEED, jAccel         Devices       if_device_status       FEED, jAccel         Devices       Num       VabueState         Data-Long       DefCODDI14       Detance         Data-Long       DefCODDI16       Speed         Data-Long       DefCODDI16       acde         Data-Long       DefCODDI16       acde         Data-Long       DefCODDI17       canElements         Data-Long       DefCODDI74       canElements         Data-Long       DefCODI75       canCurk         Data-Long       DefCODI76       canElements         Data-Long       DefCODI77       canElements         Data-Long       DefCODI78       canCourk         Datourdo       Def	Global	Parameters			set_ratio	FEED, rqRNum, rqRDen	
Settings       If_LO       Kon_Kolo, _os, Cc_Lui         Settings       if_decel       FEED_status         Powiekt Scamer       if_decel       FEED_BUSY, _ON, ct_wt_decel         Settings       if_decel       if_decel         Devices       if_decel       if_decel         Devices       if_decel       FEED_BUSY, _ON, ct_wt_decel         Data-Long       OxfCOD014       Detance         Data-Long       OxfCOD018       Gpeed         Data-Long       OxfCOD016       rqRNm         Data-Long       OxfCOD016       rqRNm         Data-Long       OxfCOD017       cambre         Data-Long       OxfCOD018       rqRDen         Data-Long       0xfCOD017       cambre         Data-Long       0xfCOD017       cambre         Data-Long       0xfCOD0174	E SERCOS				15.10	DUN AUTO ON at yun	
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Settings         cte_wt_decel         if device status         PEBD_BUSY, ON, cte_wt_decel           Cample Reade         WebX1         WebX1 <td< td=""><td>E P DeviceNet</td><td>t Scanner</td><td></td><td>ct_end</td><td>f_decel</td><td>FEED, jAccel</td></td<>	E P DeviceNet	t Scanner		ct_end	f_decel	FEED, jAccel	
Control         Control <t< td=""><td>Device</td><td>gs es</td><td></td><td>cte_wt_decel</td><td>if_device_status</td><td>FEED_BUSY,_ON,cte_wt_decel</td></t<>	Device	gs es		cte_wt_decel	if_device_status	FEED_BUSY,_ON,cte_wt_decel	
Complexemple         Weak1         Yeace         Address(HeVL)Objeck.         Name         Value/State           Data - Long         0.45C00014         Distance         Value/State         Value/State           Data - Long         0.45C00014         Distance         Value/State         Value/State           Data - Long         0.45C00016         Kocel         Value/State         Value/State           Data - Long         0.45C000164         right         Value/State         Value/State           Data - Long         0.45C000170         camElements         Data- Long         0.45C000170         CamElements           Data - Long         0.45C000170         camCount         Input         4         CUT_ENALE         Output         6         IDLE         Device Status         3         FEED_ENALED         Global HW PLS         1         IN_CUT_WINDOW         Value/State         INCUT_WINDOW         INSTREED         INSTREED         INSTREED         INSTREED         <			<u> </u>			<u>Ľ</u>	
Index         Long         Pades/Long         Net         Index/Long         Pades/Long           Data-Long         De5000014         Detance         Deta-Long         De5000018         Speed           Data-Long         De5000014         Decel         Deta-Long         De5000014         Deta-Long         De5000017           Data-Long         De50000104         rq8/bm         Deta-Long         De50000164         rq8/bm           Data-Long         De50000104         rq8/bm         Deta-Long         De5000017         camElements           Data-Long         De50000170         camElements         Deta-Long         De5000178         camCount           Data-Long         De50000178         camCount         Input         4         CUT_ENARE         Detwice Status         1         FEED_ENARLED         Detwice Status         3         FEED_ENARLED         Global HW PL5         1         IN_CUT_WINDOW         IN_S87, COL 12         9:43 AM         // // // // // // // // // // // // //	Compile Results Wa	anch 1   Watch 2   Watch 3   Wa	nch4   Ti	ace Results   Block Read	[ unless Prints		
Data - Long         Ox85000018         Ggeed           Data - Long         0x85000002         Decel           Data - Long         0x85000020         Decel           Data - Long         0x8500016         rqRNum           Data - Long         0x8500016         rqRNum           Data - Long         0x85000164         rqRNum           Data - Long         0x85000162         cams2mt           Data - Long         0x85000162         cams2mt           Data - Long         0x85000174         cam8tments           Data - Long         0x85000174         cam8tm           Data - Long         0x82000174         cam8tm           Data - Long         0x8200174         cam8tm           Data - Long         0x92000174         cam8tm           Data - Long	Data - Long	0xBC000014	iDista	nce	value/state		
Data - Long         DefC00001C         Mcccl           Data - Long         DefC00001C         Decel           Data - Long         DefC000104         rqRDen           Data - Long         DefC000104         angle           Data - Long         DefC000104         angle           Data - Long         DefC000107         camEtements           Data - Long         DefC000170         camEtements           Data - Long         DefC000170         camEtements           Data - Long         DefC000173         camCourt           Data - Long         DefC00173         camCourt           Data - Long         DefC00173         camCourt           Data - Long         DefC00174         camStart           Data - Long         DefC00178         camStart           Output         6         IDLE         Device Status           Device Status         1         IM	Data - Long	0×BC000018	iSpee	d			
Data - Long         0-85:000164         rcpR/bim           Data - Long         0-85:000164         rcpR           Data - Long         0-85:000164         angle           Data - Long         0-85:000164         angle           Data - Long         0-85:000164         angle           Data - Long         0-85:000170         camElements           Data - Long         0-85:000170         camElements           Data - Long         0-85:000178         camCount           Tiput         4         CUT_ENARLE           Output         6         TDLE           Device Status         3         FEED_ENARLED           Global HW PL5         1         IN_CUT_WINDOW	Data - Long	0xBC00001C	iAccel				
Data - Long         0.95000168         righDen           Data - Long         0.95000164         angle           Data - Long         0.9500016C         camStart           Data - Long         0.9500016C         camStart           Data - Long         0.95000174         camEments           Data - Long         0.95000174         camCount           Data - Long         0.9700174         camCount           Data - Long         0.9700174         camStart	Data - Long	0xBC000164	raRN	, m			
Data - Long         0x8C000104         angle           Data - Long         0x8C000107         camStart           Data - Long         0x8C000170         camStart           Data - Long         0x8C000170         camStart           Data - Long         0x8C000178         camCount           Input         4         CUT_ENARE           Output         6         IDLE           Device Status         1         FEED_DOWN           Device Status         3         FEED_ENARLED           Global HW PLS         1         IN_CUT_WINDOW	Data - Long	0xBC000168	rgRDe	en			
Data - Long         0x85C0001 AC         camBart           Data - Long         0x85C000174         camBart           Data - Long         0x85C000174         camCements           Data - Long         0x85C000174         camCount           Device 3routs         4         CDEVER           Device 3routs         1         FEED_ENABLED           Global HW PLS         1         IN_CUT_WINDOW	Data - Long	0×BC000104	angle				
Data - Long         UDE_UDD170         Camilements           Data - Long         DB2000174         Camilements           Data - Long         DB2000178         Camilements           Data - Long         DB200178         Camilements           Device Status         1         FEED_ENABLED           Global HW PLS         1         INCUT_WINDOW	Data - Long	0x8C00016C	camS	tart			
DNB - Long         0x85000178         camCount           Input         4         UT_ENABLE           Outputk         6         IDLE           Device Status         1         FEED_ENABLED           Global HW PL5         1         IN_CUT_WINDOW	Data - Long	0x8C000170	campl	ements			
Input         4         OUT_ENABLE           Output         6         IDLE           Device Status         1         FEED_DOWN           Device Status         3         FEED_ENABLED           Global HW PLS         1         IN_CUT_WINDOW	Data - Long	0x8C000178	camC	ount			
Output         6         IDLE           Device 31         FEED_DOWN           Device 33xus         3           FEED_ENABLED           Global HW PL5         1           IN_CUT_WINDOW	Input	4	CUT	ENABLE			
Device Status         1         FEED_DOWN           Device Status         3         FEED_ENARED           Global HW PLS         1         IN_CUT_WINDOW           For Help, press F1         DEMO_1.srf         CONNECTED         IN S87, COL 12         9:43 AM	Output	6	IDLE				
Ueweb starus 3 FFED_ENABLED Global HW PLS 1 IN_CUT_WINDOW For Help, press FI   DEMO_L.srf   CONNECTED     [UN 587, COL 12   9:43 AM ],	Device Status	1	FEED	_DOWN			
Stock         MI_COL_WIRKOW           For Help, press F1         DEMO_1.srf         CONNECTED         UN 587, COL 12         9:43 AM	Clobal HW PLS	3	TNL CI	_EIMADLED			
For Help, press F1 DEMO_1.srf   CONNECTED   UN 587, COL 12   9:43 AM   ,							
For Help, press F1 DEMO_1.srf CONNECTED LN 587, COL 12 9:43 AM							
	For Help, press F1					DEMO_1.srf   CONNECTED     LN 587, COL 12   9:43 AM	

#### **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<sup>™</sup>

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 I 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.
- 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	12.00 in (304.8 mm) (See Section 7 - Installation Guidelines)
Panel Depth	

#### 3.2 POWER REQUIREMENT

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

#### 3.3 SERCOS INTERFACE

Interface	SERCOS II
Option	
Interface	V01.02
Version	
Topology	Multi drop fiber optic ring
Transmissi	2, 4, 8 and 16 MB/second
on Rates	

#### 3.4 ENVIRONMENT

Storage	-10 to 70°C/14-158°F
Temperature	
Operating	0 to 50°C/32-122°F
Temperature	
Humidity	35 to 90% Relative Humidity, non-condensing
Shock and	1 G or less
Vibration	
Operating	Free of dust, liquids, metallic particles and corrosive gases.
Conditions	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 /	Classification: CAN bus	
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	Classification: SMA style - SERCOS compatible Fiber Optics	
Transmitter/	SERCOS: Data Transfer and Protocol are defined by the SERCOS	
Receiver	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.	
	OFF: $1V\pm5\%$ 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)	YELLOW
Defined by order part number	
100Mb (When 1Gb is maximum speed	GREEN
of the Emerald controller)	

(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 ¼ 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<sup>™</sup> 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

OVOTEN OTATIO	PROCENN FRROPS
PROGRAM LOADED	P+D DIVIDE BY ZERO
PROGRAM RUNNING "A" W/FLASHING DOT=	P + I ILLEGAL ARGUMENT
PROGRAM RUNNING "A" W/SOLID DOT=	P+2 sercos device wrong state
SYSTEM RESET (NO APPLICATION)	P+3 STACK OVERFLOW
LOSS OF PROGRAM/FLASH FAILURE	P+4 STACK UNDERFLOW
CLEARING FLASH	P+S dnet device wrong state
- LOW POWER	P+6 DNET QUE FULL
SYSTEM BOOTING	
NOV RAM FAILURE	
CACHE ERROR	
SYSTEM RESET (NO O.S.)	P+n application memory error
	$\mathbb{P}+\mathbb{L}$ excessive cam elements per interrupt
SYSTEM ERRORS	SERCOS ERRORS
$E + \Box$ sercos timing calc error	
E + BAD OPCODE	
E + TRIED TO LOAD PROGAM WHILE NOT RESET	COMM PORT ERRORS
E +  tried to set a read only flag	-+D PORT 1/PORT 2 PACKET TIMEOUT
E + H set dnet scanner without software	- + PORT 1 HANDSHAKE ERROR
E+ DDNET SCANNER INIT FAIL	-+2 PORT 2 HANDSHAKE ERROR
E + P dnet parameter error	
E + O OPCODE NOT COMPLETED	-+4 BAD PACKET SENT TO PORT 1
E+ config space fail	
E + E exceeded available timers	-+B PRINT Q FULL
	- + C ETHERNET PACKET ERROR
CPU EXCEPTION	ERRORS
P+D+DTLB EXCEPTION LOAD/FETCH	
P + D + T tereption store	
P + D + 4 address error exception load/fetch	P+D+GMEMORY ALIGNMENT ERROR
P + D + 5 address error exception store	□ □ □ □+□+□PROGRAMMING ERROR
P + D + B bus error exception fetch	$\mathbb{P} + \mathbb{D} + \mathbb{B}$ floating point unavailable
$P + D + \overline{D}$ bus error load or store	
	$\mathbb{P} + \mathbb{P} + \mathbb{P}$ instruction translation miss
$P + \Pi + \Pi$ break point exception	$\mathbb{P} + \mathbb{T} + \mathbb{T}$ data load translation miss
	P+T+P data store translation miss
	NOTE:
	CPU EXCEPTIONS ARE FATAL
	GALL IIS FUR ASSISTANUL.

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.
		<ul> <li>The device may not be powered, look at Module Status LED.</li> </ul>
On-line, Not Connected	Flashing Green	<ul> <li>Device is on-line but has no connections in the established state.</li> <li>The device has passed the Dup_MAC_ID test, is on-line, but has no established connections to other nodes.</li> <li>For a Group 2 Only device it means that this device is not allocated to a master.</li> <li>For a UCMM capable device it means that the device has no established connections.</li> </ul>
Link OK On-Line, Connected	Green	<ul> <li>The device is on-line and has connections in the established state.</li> <li>For a Group 2 Only device it means that the device is allocated to a Master.</li> <li>For a UCMM capable device it means that the device has one or more established connections.</li> </ul>
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 255.3 [10.05] MIN -63.5 [2.50] - 178.6 [7.03]-SEE NOTE 2 8 00 00000000 00000000 178.7 [7.03] 222.7 [8.77] 00000000 00000000 SERCOS 2 \_\_\_\_\_D&T 10-32 [M5] X3 25.4 [1.00] MIN Ŧ ∄ 0 0 207.0 [8.15] ο 25.4 [1.00] MIN -1.50 [38.1] inninkann 25.4 [1.00] MIN 25.4 [1.00] MIN RECOMMENDED INSTALLATION CLEARANCE TITLE INDUSTRIAL INDEXING SYSTEMS, Inc. CONTROLLER, EMERALD

www.iis-servo.com

X.XXX±0.01

DRAWING NUMBER

<u>∕</u> ± 0°40 REV A

EMC-2100

ECN 23-120 DATE 31MAY12 SH. 1 OF 1

DIMENSIONS ARE MM [INCHES] TOLERANCES X.XX±0.02

#### **SECTION 8 - CABLES AND ACCESSORIES**

#### DRAWING NUMBER

C-752YYY C-753YYY C-822YYY C-987YYY INT-810

#### **DESCRIPTION**

SERCOS II Fiber Optic Cable, Cabinet External SERCOS II Fiber Optic Cable, Cabinet Internal Adaptor Cable Modular Data Cable Encoder Cable Adapter

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3.) TEST USING TEST PROCEDURE TST-0061.				
4.) MINIMUMM BEND RADIUS - 1.58 (40 MM)				
LUSS INUREMENTER U.SOB				
5.) REPEATED BENDING ENDURANCE: 5000 TIMES MIN.				
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4.) MINIMUN BEND RADIUS98 LOSS INCREMENT=<0.5 dB (QUARTER BEND)	(ZS MM)							
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