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Red Lion® Series
E3 I/O™ Modules

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Preface

Disclaimer

Portions of this document are intended solely as an outline of methodologies to be followed during the maintenance and operation of the E3 I/O™ Module equipment. It is not intended as a step-by-step guide or a complete set of all procedures necessary and sufficient to complete all operations.

While every effort has been made to ensure that this document is complete and accurate at the time of release, the information that it contains is subject to change. Red Lion Controls is not responsible for any additions to or alterations of the original document. Industrial networks vary widely in their configurations, topologies, and traffic conditions. This document is intended as a general guide only. It has not been tested for all possible applications, and it may not be complete or accurate for some situations.

Users of this document are urged to heed warnings and cautions summarized at the front of the document, such as electrical hazard warnings.

Compliance Information

It is recommended that the owner of this equipment determine and ensure conformance with any specific and applicable local regulations.

WEEE and ROHS

These devices comply with the WEEE directive. Do not throw away these devices in the standard trash.   Contact Red Lion regarding proper disposal.

These devices comply with the RoHS directive and are considered lead and other hazardous substance free.

Part 15 of the Federal Communications Commission (FCC) - A Rules: Interference

Every effort has been made to ensure that this equipment is designed to comply with the limits for a Class A digital device, as described in the FCC Rules.

This product complies with Part 15 of the FCC-A Rules.

Operation is subject to the following conditions:

1. This device may not cause harmful Interference
2. This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

Operation of this device in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

Information to the user: If this equipment causes interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: In order to meet FCC emissions limits, this equipment must be used only with cables that comply with IEEE 802.3. If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful: "How to Identify and Resolve Radio-TV Interference Problems". This booklet is available from: U.S. Government Printing Office, Washington, DC 20402, Stock No. 004-000-00345-4

Industry Canada

This Class A digital apparatus meets all requirements of the Canadian Interference Causing Equipment Regulations. Operation is subject to the following two conditions; (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Cet appareillage numérique de la classe A répond à toutes les exigences de l'interférence canadienne causant des règlements d'équipement. L'opération est sujette aux deux conditions suivantes: (1) ce dispositif ne peut pas causer l'interférence nocive, et (2) ce dispositif doit accepter n'importe quelle interférence reçiue, y compris l'interférence qui peut causer l'opération peu désirée.

Environmental Impact Statement

Red Lion equipment contains no hazardous materials as defined by the United States Environmental Protection Agency (USEPA). Red Lion recommends that all failed product be returned to Red Lion for failure analysis and proper disposal.

The equipment shall only be used in an area of not more than pollution degree 2, as defined in IEC 60664-1.

Toxic Emissions

Red Lion equipment releases no toxic emissions.

Trademark Acknowledgments

Ethernet is a registered trademark of Xerox Corporation.

EtherNet/IP™ and CIP™ are registered trademarks of ODVA.

KepServer® and KepServerEX® are registered trademarks of Kepware® Technologies.

All other company and product names are trademarks of their respective owners.

Release Notes and Document Updates

The hard copy and electronic media versions of this document are revised only at major releases and therefore, may not always contain the latest product information. As needed, Documentation Notes and/or Product Bulletins will be provided between major releases to describe any new information or document changes.

The latest online version of this document and all product updates can be accessed through the Red Lion web site at www.redlion.net/documentation.

Publication History

The following information lists the release history of this document.

ISSUE/REVISION	RELEASE DATE	CONTENT DESCRIPTION
2016-02-02	February 2016	First Release
2016-06-01	June 2016	USB Driver Selection/ E3-32AI10V update

Related Documents

Visit the Technical Resources page on the Red Lion website at the following link to view available documents related to this product.

http://www.redlion.net/documentation/red-lion-documentation

Document Comments

Red Lion appreciates all comments that will help us improve our documentation quality. The user can submit comments through the Red Lion Customer Service. Simply email us at customer.service@redlion.net.

Additional Product Information

Additional product information can be obtained by contacting the local sales representative or Red Lion through the contact numbers and/or e-mail addresses listed on the inside of the front cover.

Warnings and Cautions

Warnings apply to situations where personal injury or death may result.

Cautions apply to where reduced function or damage to equipment may result.

General Safety Cautions and Warnings

These products should not be used to replace proper safety interlocking. No software-based device (or any other solid-state device) should ever be designed to be responsible for the maintenance of consequential equipment or personnel safety. In particular, Red Lion Controls disclaims any responsibility for damages, either direct or consequential, that result from the use of this equipment in any application.

All power, input and output (I/O) wiring must be in accordance with Class I, Division 2 wiring methods and in accordance with the authority having jurisdiction.

Ces produits ne doivent pas être utilisés pour remplacer le verrouillage de sécurité approprié. Aucun dispositif basé sur un logiciel (ou tout autre dispositif à l'état solide) devraient jamais être conçus pour être responsable de l'entretien de l'équipement consécutifs ou la sécurité du personnel. En particulier, Red Lion décline toute responsabilité pour les dommages, directs ou indirects, résultant de l'utilisation de cet équipement dans n'importe quelle application.

Tout courant, câblage entrée et sortie (I / O) doit être conforme aux méthodes de câblage à la Classe I, Division 2 et conformément à l'autorité compétente.

CAUTION: If the equipment is used in the manner not specified by Red Lion, the protection provided by the equipment may be impaired.

ATTENTION: Si l'équipement est utilisé d'une manière non spécifiée par Red Lion, la protection fournie par l'équipement peut être compromise.

CAUTION: Do not perform any services on the unit unless qualified to do so. Do not substitute unauthorized parts or make unauthorized modifications to the unit.

ATTENTION: Ne pas effectuer de services sur l'appareil s'il n'est pas qualifié pour le faire. Ne pas substituer pièces non autorisées ou de modifications non autorisées de l'appareil.

CAUTION: Do not operate the equipment in a manner not specified by this manual.

ATTENTION: Ne pas faire fonctionner l'équipement d'une manière non spécifiée par ce manuel.

WARNING: Install only in accordance with Local and National Codes of authorities having jurisdiction.

ALERTE: Installer uniquement, conformément aux codes locaux et nationaux des autorités ayant compétence.
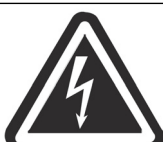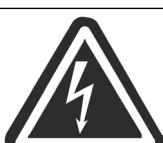
Electrical Safety Warnings

WARNING: Do not work on equipment or cables during periods of lightning activity.

ALERTE: Ne pas travailler sur le matériel ou les câbles pendant les périodes d'activité de la foudre.

WARNING: Properly ground the unit before connecting anything else to the unit. Units not properly grounded may result in a safety risk and could be hazardous and may void the warranty. See the grounding technique of this Hardware Guide for proper ways to ground the unit.

ALERTE: L'unité doit être correctement mise à la terre avant tout raccordement à l'unité. Unités pas correctement mise à la terre peut entraîner un risque de sécurité et pourraient être dangereux et peut annuler la garantie. Voir la technique de mise à la terre de ce mode d'emploi des moyens appropriés à la masse de l'appareil.

WARNING: It is recommended that this equipment be used with a Listed UL Class 2 Power Supply.

ALERTE: Il est recommendé que cet équipement soit utilisé avec une alimentation UL Listé Classe 2.

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	WARNING: A Recognized or Listed fuse, rated maximum 3A, minimum 30VDC, must be installed on the line side of the device.
	ALERTE: Un fusible reconnu ou classé, classé 3A maximale, 30VDC minimum, doit être installé sur le côté de la ligne de l'appareil.

	WARNING: Do not operate the unit with the front cover or configuration door removed, as this could create a shock or fire hazard.
	ALERTE: Ne pas faire fonctionner l'unité avec le capot avant ou la configuration porte deposee, car cela pourrait créer une décharge électrique ou un incendie.

	WARNING: Over-voltage category: II (Per IEC 61010-1)
	ALERTE : Catégorie survoltage: II (Selon IEC 61010-1)

	CAUTION: Observe proper DC Voltage polarity when installing power input cables. Reversing voltage polarity can cause permanent damage to the unit and voids the warranty.
	ATTENTION: Respecter la polarité correcte de tension DC lors de l'installation des câbles d'alimentation d'entrée. Inversion de polarité de tension peut causer des dommages permanents à l'appareil et annule la garantie.

	CAUTION: Altitude up to 2000 meters (Per IEC 61010-1)
	ATTENTION: Altitude jusqu'à 2000 mètres (Selon IEC 61010-1)

Environmental Safety / Hazardous Location Cautions and Warnings

	WARNING: Use 110&C or higher rated copper wire, (0.22Nm) 2 lb/in tightening torque for field installed conductors.
	ALERTE: Utilisez 110&C ou nominale supérieure fil de cuivre, (0,22 Nm) 2 lb/pouce couple de serrage pour le champ installé conducteurs.

	CAUTION: This equipment is suitable for use in Class I, Division 2, Groups A, B, C, and D or non-hazardous locations only.
	ATTENTION: Cet équipement est adapté pour une utilisation dans la classe I, Division 2, Groupes A, B, C et D ou non dangereux endroits seulement.

	WARNING: Explosion Hazard – Substitution of components may impair suitability for Class I, Division 2.
	ALERTE - Risque d'explosion - Remplacement d'un composant peut empêcher la conformité de Classe I, Division 2.

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⚠	**WARNING:** Explosion Hazard - When in hazardous locations, disconnect power before replacing or wiring modules. **ALERTE:** Risque d'explosion - Lorsque dans des endroits dangereux, débranchez le cordon d'alimentation avant de remplacer ou de brancher les modules.
⚠	**WARNING –** Explosion Hazard – Do not connect or disconnect equipment unless power has been switched off or the area is known to be non-hazardous. **ALERTE -** Risque d'explosion - Ne pas brancher ou débrancher les connexions lorsque le circuit est sous tension sauf si la zone est connue pour être non dangereuse.
⚠	**WARNING:** Disconnect the power and allow to cool 5 minutes before touching. **ALERTE:** Déconnectez le câble d'alimentation et laisser refroidir 5 minutes avant de la toucher.
⚠	**WARNING:** These products are to be used within control panels in hazardous locations. The enclosure shall be suitable for this location. Hot-swapping is not for use in hazardous locations. **ALERTE:** Lorsque dans des endroits dangereux, ces produits doivent être utilisés dans des panneaux de contrôle. Pas de remplacement à chaud des modules dans les zones dangereuses.
⚠	**WARNING:** A minimum IP54 rated enclosure is needed for ATEX unless an equivalent degree of protection is supplied by the location. **ALERTE:** Un boîtier IP54 minimum est nécessaire pour ATEX à moins qu'un degré équivalent de protection est fourni par l'emplacement.

Cleaning

Clean only with a damp cloth. Excess moisture or harsh chemicals can cause damage to the unit.

Regulatory Information

Product Safety
Electrical Safety: UL 508, CSA C22.2/142, IEC61010-1, CE

Emissions
EMI Emissions FCC part 15, ICES-003, Class A; EN-55022; EN6100-6-4; CE

Immunity
EMC Immunity IEC61000-6-2; (EN61000-4-2,3,4,5,6,8); CE

Vibration
IEC60068-2-27

Shock

IEC60068-2-6

Hazardous Locations

ATEX/ IECEx Zone 2 (except E3-16DIAC-1 and E3-16DORLY-1)

ATEX Directive 2014/34/EU

ANSI/ISA 12.12.01-2013 Edition (Class I, Div. 2, Groups A, B, C, and D)

CSA C22.2/213

EN 60079-0:2012+A11:2013

EN 60079-15:2010

IEC 60079-0 Ed. 6

IEC 60079-15 Ed. 4

Construction

Aluminum base and steel cover with zinc coating. Dimensions: 5.6" (144mm) x 5.3" (135mm) x 2.9" (74mm)

Marine/Offshore

Tested and/or verified to meet standards such as ABS, DNV 2.4 and Lloyds

Conditions of Safe Use

The equipment shall only be used in an area of not more than pollution degree 2, as defined in EN/IEC 60664-1.

The equipment shall be installed in an enclosure that provides a degree of protection not less than IP 54 in accordance with IEC 60079-15.

Provision shall be made to prevent the rated voltage being exceeded by the transient disturbances of more than 140% of the peak rated voltage.

Certificate number: DEMKO 15 ATEX 1526X

Protection method and marking string: ⟨Ex⟩ II 3 G Ex nA IIC T4 Gc

IECEx Certificate number: IECEX UL 15.0079X

IECEx Protection Method and marking string: Ex nA IIC T4 Gc

Statement of Limited Warranty

(a) Red Lion Controls Inc., Sixnet Inc., N-Tron Corporation, or Blue Tree Wireless Data, Inc. (the "Company") warrants that all Products shall be free from defects in material and workmanship under normal use for the period of time provided in "Statement of Warranty Periods" (available at www.redlion.net) current at the time of shipment of the Products (the "Warranty Period"). **EXCEPT FOR THE ABOVE-STATED WARRANTY, COMPANY MAKES NO WARRANTY WHATSOEVER WITH RESPECT TO THE PRODUCTS, INCLUDING ANY (A) WARRANTY OF MERCHANTABILITY; (B) WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE; OR (C) WARRANTY AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS OF A THIRD PARTY; WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE.** Customer shall be responsible for determining that a Product is suitable for Customer's use and that such use complies with any applicable local, state or federal law.

(b) The Company shall not be liable for a breach of the warranty set forth in paragraph (a) if (i) the defect is a result of Customer's failure to store, install, commission or maintain the Product according to specifications; (ii) Customer alters or repairs such Product without the prior written consent of Company.

(c) Subject to paragraph (b), with respect to any such Product during the Warranty Period, Company shall, in its sole discretion, either (i) repair or replace the Product; or (ii) credit or refund the price of Product provided that, if Company so requests, Customer shall, at Company's expense, return such Product to Company.

(d) **THE REMEDIES SET FORTH IN PARAGRAPH (c) SHALL BE THE CUSTOMER'S SOLE AND EXCLUSIVE REMEDY AND COMPANY'S ENTIRE LIABILITY FOR ANY BREACH OF THE LIMITED WARRANTY SET FORTH IN PARAGRAPH (a)**.

Chapter 1   Product Overview

This manual will help you install and maintain the Red Lion Controls Dual Ethernet I/O modules.

These modules provide simple and secure remote monitoring for sites located in harsh environments. Offering the low cost per I/O point and rugged environmental ratings, they are ideal for both control rooms and extreme locations across industries that include oil & gas, power & energy, transportation, mining, maritime and water/wastewater.

These compact DIN-Rail mountable I/O modules support open-standard protocols to provide flexible communication options for existing or newly installed Ethernet™ networks. By seamlessly replacing external devices such as switches, data concentrators and protocol converters, these I/O modules transcend simple I/O capabilities to cost-effectively streamline systems and improve reliability.

I/O Module Product Highlights

- Flexible mix of I/O channels support all instrumentation needs
- Real-Time Ring for fast redundancy
- Dual independent Ethernet ports enable flexible networking
- Built-in security pro-actively blocks unwanted access
- Extensive health diagnostics and reporting reduce downtime
- Standard Modbus protocols provide universal compatibility
- Rugged design supports extreme temperatures and hazardous locations.

Specifications

Please note that specifications are subject to change.

The latest specifications are typically found on the Red Lion website: www.redlion.net.

General Specifications

These general specifications apply to all Red Lion Dual Ethernet I/O modules.

Power	
Power supply voltage	12-24 VDC (10-30 VDC absolute min./max)
Input current requirement	150-355 mA @ 24 VDC typical w/no loads

I/O Registers and Addressing	
I/O registers available for additional expansion I/O	512 discrete inputs and outputs; 256 analog inputs and outputs
Unique station addresses	16,000+ via Sixnet® UDR (Universal Driver) protocol; 247 via Modbus protocol

Ethernet	
Ethernet Ports	10/100BaseTX (auto-detecting)
Connection	RJ45 (auto-crossover)
Isolation	1500 Volts RMS 1 minute (60 Hz)
Message Response Time	Less than 1 ms per message
Diagnostic LED per Port	Solid indicates link but no activity; Blinking indicates link and activity
Protocols Supported	TCP/IP, ARP, UDP, ICMP, DHCP, HTTP, Modbus UDP/TCP Slave mode, Modbus UDP Master mode, Sixnet UDR UDP/TCP Slave mode, and Sixnet UDR UDP Master mode.
Ethernet Modes	Real-Time Ring is rated at 30ms plus 5 ms per hop; Dual network, each with unique MAC and IP address; Pass-through for daisy-chaining the modules

RS485 Serial Port	
Type	2-wire half-duplex
Screw Terminals	485+, 485-, GND, TRM (Termination)
Isolation (E3-10RTD-1 & E3-MIX20884-1 only)	150V
Maximum Number of Stations	Up to 32 (full-load)
Maximum Network Distance	Up to 0.5 miles (baud rate dependent)
Protocols	Master and slave; Sixnet UDR and Modbus RTU / ASCII
Diagnostic LEDs	Transmit (TD) and Receive (RD)

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Web Interface	
Secure Web Access	With password protection for multiple users
Users	1 simultaneous
Memory for user pages	750K

Environmental	
Operating Temperature	-40 to +75°C (+60°C continuous and +75°C short term)
Storage Temperature	-40 to +85°C
Mounting	DIN rail (EN50022) or direct to panel
Humidity	5 to 95% RH (non-condensing) (optional conformal coating)
Flammability	UL 94V-0 materials
Electrical Safety	UL 508, CSA C22.2/142; IEC61010-1; CE
EMC Emissions	FCC part 15, ICES-003, Class A; EN55022; EN61000-6-4; CE
EMC Immunity	EN61000-6-2 (EN61000-4-2,3,4,5,6,8); CE
Vibration	IEC60068-2-6
Shock	IEC60068-2-27 (31 G)
Hazardous Locations	Class 1, Div 2, Groups A, B, C, D; CSA C22.2/213; ANSI/ISA12.12.01; ATEX/IECEx Zone 2 (except E3-16DIAC-1 and E3-16DORLY-1)
Marine and Offshore	Tested and/or verified to meet various marine and maritime standards such as ABS, DNV No. 2.4 and Lloyds.
Construction	Aluminum base and steel cover with zinc coating
Dimensions	5.6" x 5.3" x 2.9" (144mm x 135mm x 74mm)

E3-MIX24880-1 and E3-MIX24882-1 I/O Specifications

Discrete Input Channels	
Voltage Range	10-30 VDC
Input Polarity	Sourcing (apply power to active) or sinking (ground closure) on 8 inputs
Guaranteed ON Voltage	9 VDC
Guaranteed OFF Voltage	5.0 VDC
Guaranteed OFF Current	2 mA DC
Input Resistance	10K ohms
Input Current	3 mA @ 24 VDC
Input Protection	High Impedance with overvoltage protection
Filtered ON/OFF Delay	25 ms (20 Hz. max. counting rate)
Fastest Response	1 ms (400 Hz. max. counting rate)
Special Fast Counting Rate	Up to 50 KHz on channels 1 and 2 (Channel 1 is isolated to 150V on E3-MIX24880-1 only)
Pulse Counting Options	Count up, pulse timing and pulse rate (16 or 32 bit reporting)
Scan Rate (all channels)	1 ms

Discrete Output Channels	
Output Voltage Range	10-30 VDC
Maximum Output Power at Ambient	0.6A per channel, 4.8A per module
Maximum output power up to 60°C	0.4A per channel, 3.2A per module
Maximum output power from 60°C to 75°C	0.2A per channel, 1.6A per module
Maximum off state leakage	0.01 mA (less than 10 uA)
Short circuit protection	Self-resetting fuses
Minimum load	1 mA
Inrush current	5 Amps (100 ms surge)
Typical on resistance	0.3 Ohms (drop 0.3 VDC @1 Amp)
Scan rate (all channels)	1 ms

Analog Input Channels	
Analog input range	4-20 mA
A/D resolution	16 bits (0.003%) or 10 bits (0.1%) when using Fast Analog option
Full scale accuracy	± 0.02% (at 20°C, 16 bit mode)
Temperature coefficient	±- 50 ppm per °C (span and offset)
Input impedance (resistance)	100 ohms
Short circuit protection	Self-resetting fuses
DMRR (differential mode)	66 dB at 50/60 Hz
Fastest update time [# of chan.]	880 ms [all] at 16-bit; 145 ms [all] at 14-bit; 1 ms [2] at 10-bit

Analog Output Channels (applies only to E3-MIX24882-1)	
Analog output range	0-20 mA; 4-20 mA
D/A resolution	16 bits (less than 1 uA)
Full scale accuracy	+/- 0.02% (at 20°C)
Temperature coefficient	+/- 50 ppm per °C (span and offset)
Maximum output settling time	5 ms (to .05%)
Load resistance (@ 24 V)	0 - 750 Ohms
Load resistance (@ 10 V)	300 Ohms
Short circuit protection	Current limiting

E3-MIX20884-1 I/O Specifications

Isolated Discrete Input Channels	
Channels	1 - 4
Voltage range	5 - 30 VDC
Guaranteed ON voltage	3.0 VDC
Guaranteed OFF voltage	1.5 V
Guaranteed OFF current	1 mA DC
Input resistance (@ 24 VDC)	2.5K ohms
Input current (@ 24 VDC)	9.6 mA
Common mode and channel-to-channel isolation	150 VDC
Filtered ON/OFF delay	25 ms (20 Hz. max. counting rate)
Fastest response	1 ms (400 Hz. max. counting rate)
Special fast counting rate	Up to 50 KHz
Pulse counting options	Count up, pulse timing and pulse rate (16 or 32 bit reporting)

Non-Isolated Discrete Input Channels	
Channels	5 - 12
Voltage range	10 - 30 VDC
Guaranteed ON voltage	9.0 VDC
Guaranteed OFF voltage	5.0 VDC
Guaranteed OFF current	2 mA DC
Input resistance	10K Ohms
Input current (@24 VDC)	3 mA
Input polarity	Sourcing (apply power to active) or sinking (ground closure) on 8 inputs
Input protection	High impedance with overvoltage protection
Filtered ON/OFF delay	25 ms (20 Hz. max. counting rate)
Fastest response	1 ms (400 Hz. max. counting rate)
Pulse counting options	Count up, pulse timing and pulse rate (16 or 32 bit reporting)

Non-Isolated Combination Discrete Input Channels	
Channels	13 -20
Channel type (software selectable)	Discrete input and discrete output combination channel
Voltage range	10 - 30 VDC
Guaranteed ON voltage	9.0 VDC
Guaranteed OFF voltage	5.0 VDC
Guaranteed OFF current	2 mA DC
Input resistance	10K Ohms
Input current (@ 24 VDC)	3 mA
Input protection	High impedance with overvoltage protection
Filtered ON/OFF delay	25 ms (20 Hz. max. counting rate)
Fastest response	1 ms (400 Hz. max. counting rate)
Pulse counting options	Count up, pulse timing and pulse rate (16 or 32 bit reporting)

Discrete Output Channels	
Output voltage range	10 - 30 VDC
Maximum output power at ambient	0.6A per channel, 4.8A per module
Maximum output power up to 60°C	0.4A per channel, 3.2A per module
Maximum output power from 60°C to 75°C	0.2A per channel, 1.6A per module
Minimum load	1 mA
Inrush current	5 Amps (100 ms surge)
Typical on resistance	0.3 Ohms (Drop 0.3 VDC @ 1 Amp)
All channels scan rate	1 ms

Analog Input Channels	
Analog input range	4 - 20 mA
A/D resolution	16 bits (0.003%) or 10 bits (0.1%) when using Fast Analog option
Full scale accuracy	+/- 0.02% (at 20 °C, 16 bit mode)
Temperature coefficient	+/- 50 ppm per °C (span and offset)
Input impedance (resistance)	100 ohms
Short circuit protection	Self-resetting fuses
DMRR (differential mode)	66 dB @ 50/60 Hz
Fastest update time [# of chan.]	880 ms [all] at 16-bit; 145 ms [all] at 14-bit; 1 ms [2] at 10-bit

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Analog Output Channels	
Analog output range	4-20 mA, 0-20 mA, 0-5 VDC
D/A resolution	16 bits (less than 1 uA)
Full scale accuracy	+/-0.02% (at 20°C); All ranges after calibration
4 - 20 mA full scale accuracy	+/-0.02% (at 20°C); Before calibration
0 - 20 mA full scale accuracy	+/-0.1% (at 20°C); Before calibration
Temperature coefficient	+/- 50 ppm per °C (span and offset)
Maximum output settling time	5 ms (to .05%)
Maximum load resistance (@ 24 V)	750 Ohms
Maximum load resistance (@ 10 V)	300 Ohms
Short circuit protection	Current limiting protection
0 - 5 VDC full scale accuracy	+/-0.5% (at 20°C); Before calibration
Minimum load resistance (0 - 5 VDC)	20K Ohms

E3-32DI24-1 I/O Specifications

Discrete Input Channels	
Voltage range	10 - 30 VDC
Input polarity	Sourcing
Guaranteed ON voltage	9 VDC
Guaranteed OFF voltage	5.0 VDC
Guaranteed OFF current	2 mA DC
Input resistance	10K Ohms
Input current (@ 24 VDC)	3.0 mA
Input protection	High impedance with overvoltage protection; Channel 1 in high-speed mode has 150V isolation (terminals 43 and 44)
Filtered ON/OFF delay	25 ms (20 Hz. max. counting rate)
Fastest response	1 ms (400 Hz. max. counting rate)
Special fast counting rate	Up to 50 KHz on channels 1 and 2 (Chan 1 isolated, terms 43 and 44)
Pulse counting options	Count up, pulse timing and pulse rate (16 or 32 bit reporting)
Scan rate (all channels)	1 ms

E3-16DI24-1 I/O Specifications

Discrete Input Channels	
Voltage range	10 - 30 VDC
Input polarity	Sourcing
Input isolation	150 Volts (16 channels modules only)
Guaranteed ON voltage	9 VDC
Guaranteed OFF voltage	5.0 VDC
Guaranteed OFF current	2 mA DC
Input resistance	10K Ohms
Input current (@ 24 VDC)	3.0 mA
Input protection	High impedance with overvoltage protection
Filtered ON/OFF delay	25 ms (20 Hz. max. counting rate)
Fastest response	1 ms (400 Hz. max. counting rate)
Special fast counting rate	Up to 2 KHz on channels 1 and 2
Pulse counting options	Count up, pulse timing and pulse rate (16 or 32 bit reporting)
Scan rate (all channels)	1 ms

E3-16DIAC-1 I/O Specifications

Discrete Input Channels	
Voltage range	60 - 140 VAC
Input polarity	Sourcing
Input isolation	150 Volts (16 channels modules only)
Guaranteed ON voltage	55 VAC
Guaranteed OFF voltage	35 VAC
Input resistance	10K Ohms
Input protection	High impedance with overvoltage protection
Filtered ON/OFF delay	25 ms (20 Hz. max. counting rate)
Fastest response	1 ms (400 Hz. max. counting rate)

E3-32DO24-1 I/O Specifications

Discrete Output Channels	
Output Voltage range	10 - 30 VDC
Maximum output power	0.5 Amps per channel, 8A per module
Maximum off state leakage	0.01 mA (less than 10 uA)
Short circuit protection	Self-resetting fuses
Minimum load	1 mA
Inrush current	5 Amps (100 ms surge)

| Typical ON resistance | 0.3 Ohms (Drop 0.3 VDC @ 1 Amp) |
| All channels scan rate | 1 ms |

E3-16DO24-1 I/O Specifications

Discrete Output Channels	
Output Voltage range	10 - 30 VDC
Maximum output power	0.5 Amps per channel, 8A per module
Maximum off state leakage	0.01 mA (less than 10 uA)
Short circuit protection	Self-resetting fuses
Minimum load	1 mA
Inrush current	5 Amps (100 ms surge)
Typical ON resistance	0.3 Ohms (Drop 0.3 VDC @ 1 Amp)
Input isolation	150 Volts (16 channel modules only)
All channels scan rate	1 ms

E3-16DORLY-1 I/O Specifications

Discrete Output Channels	
Output Voltage range	10 - 30 VDC / AC
Relay type	14 NO (Form A) and 2 NO/NC (Form C)
Maximum output power	0.5A Per channel, 8A module
Maximum off state leakage	0.01 mA (less than 10 uA)
Minimum load	1 mA
Short circuit protection	Self-resetting fuses
Inrush current	5 Amps (100 ms surge)
Typical ON resistance	0.3 Ohms (Drop 0.3 VDC @ 1 Amp)
Input isolation	150 Volts (16 channel modules only)
All channels scan rate	1 ms

E3-32AI20M-1 I/O Specifications

Analog Input Channels	
Analog input range	4 - 20 mA
A/D resolution	16 bits (0.003%) or 10 bits (0.1%) when using Fast Analog option on channels 1 or 2 only
Full scale accuracy	+/- 0.20% (at 20 °C, 16 bit mode)
Temperature coefficient	+/- 50 ppm per °C (span and offset)
Input impedance (resistance)	100 Ohms
Short circuit protection	Self-resetting fuses
DMRR (differential mode)	66 dB @ 50 / 60 Hz
Fastest update time [# of chan.]	880 ms [all] at 16-bit; 145 ms [all] at 14-bit; 1 ms [2] at 10-bit

E3-32AI10V-1 I/O Specifications

Analog Input Channels	
Analog input range	0 to +10 VDC
A/D resolution	16 bits (0.003%)
Full scale accuracy	+/- 0.02% (at 20 °C, 16 bit mode)
Temperature coefficient	+/- 50 ppm per °C (span and offset)
Input impedance (resistance)	200 Kohms (200K ohms)
DMRR (differential mode)	66 dB @ 50 / 60 Hz
Fastest update time [# of chan.]	880 ms [all] at 16-bit; 145 ms [all] at 14-bit; 1 ms [2] at 10-bit

E3-16AI20M-1 I/O Specifications

Analog Input Channels	
Analog input range	4 - 20 mA
A/D resolution	16 bits (0.003%) on any channel or 10 bits (0.1%) when using Fast Analog option on Channels 1 or 2 only
Full scale accuracy	+/- 0.20% (at 20 °C, 16 bit mode)
Temperature coefficient	+/- 50 ppm per °C (span and offset)
Input impedance (resistance)	100 Ohms
Short circuit protection	Self-resetting fuses
DMRR (differential mode)	66 dB @ 50 / 60 Hz
Fastest update time [# of chan.]	880 ms [all] at 16-bit; 145 ms [all] at 14-bit; 1 ms [2] at 10-bit

E3-16ISO20M-1 I/O Specifications

Analog Input Channels	
Analog input range	4 - 20 mA
A/D resolution	16 bits (0.003%)
Full scale accuracy	+/- 0.02% (at 20 °C, 16 bit mode)
Temperature coefficient	+/- 50 ppm per °C (span and offset)
Input impedance (resistance)	100 Ohms
Short circuit protection	Self-resetting fuses
DMRR (differential mode)	66 dB @ 50 / 60 Hz
Fastest update time [# of chan.]	200 ms for all 16 channels
Common mode input voltage	Between two input terminals: +/- 60 VDC; Between inputs and ground: 300 volts

E3-16ISOTC-1 I/O Specifications

Analog Input Channels	
Analog input ranges	+/-250 mV and Thermocouples
Thermocouples supported	J, K, E, R, T, B, L, N & S
A/D resolution	16 bits (0.003%)
Full scale accuracy	+/- 0.02% (at 20 °C, 16 bit mode)
Temperature coefficient	+/- 50 ppm per °C (span and offset)
Input impedance (resistance)	200K Ohms
DMRR (differential mode)	66 dB @ 50 / 60 Hz
Fastest update time	200 ms for all 16 channels
Thermocouple accuracy typical	+/- 0.5 °C; Before calibration
Common mode input voltage	Between two input terminals: +/- 60VDC; Between inputs and ground: 300 volts

E3-10RTD-1 I/O Specifications

Analog Input Channels	
RTD input range	-200 - 850 °C
RTD overall accuracy	0.05% or 0.5 °C
A/D resolution	16 bits (0.003%)
Temperature coefficient	+/- 50 ppm per °C (span and offset)
RTD type	100 Ohm Platinum
RTD alpha	0.00385 or 0.00392
RTD connections	2 or 3-wire
Scan time	550 ms for all 10 channels
Max lead wire resistance	100 Ohms per side balanced
RTD excitation current	250uA pulsed to reduce self-heating

E3-16AI8AO-1 I/O Specifications

Analog Input Channels	
Analog input range	4 - 20 mA
A/D resolution	16 bits (0.003%) on any channel or 10 bits (0.1%) when using Fast Analog option on Channel 1 or 2 only
Full scale accuracy	+/- 0.20% (at 20 °C, 16 bit mode)
Temperature coefficient	+/- 50 ppm per °C (span and offset)
Input impedance (resistance)	100 Ohms
Short circuit protection	Self-resetting fuses
DMRR (differential mode)	66 dB at 50/60 Hz
Fastest update time [# of chan.]	880 ms [all] at 16-bit; 145 ms [all] at 14-bit; 1 ms [2] at 10-bit

Analog Output Channels	
Analog output range	4 - 20 mA
D / A resolution	16 bits (less than 1 uA)
Full scale accuracy	+/-0.02% (at 20°C)
Temperature coefficient	+/- 50 ppm per °C (span and offset)
Maximum output settling time	5 ms (to 0.05%)
Load resistance (@ 24V)	0 - 750 Ohms
Load resistance (@ 10V)	300 Ohms
Short circuit protection	Current limiting

E3-8AO20M-1 I/O Specifications

Analog Output Channels	
Analog output range	4 - 20 mA
D / A resolution	16 bits (less than 1 uA)
Full scale accuracy	+/-0.02% (at 20°C)
Temperature coefficient	+/- 50 ppm per °C (span and offset)
Maximum output settling time	5 ms (to 0.05%)
Load resistance (@ 24V)	0 - 750 Ohms
Load resistance (@ 10V)	300 Ohms
Short circuit protection	Current limiting

Red Lion Software Tools

Red Lion supplies the "mission oriented" tools you need for every step of your project from the initial specification, through startup, to years of trouble free operation. Configuration information flows between Red Lion windows, saving you time (you don't have to enter data multiple times) and dramatically reducing data entry errors. Refer to the on-line help in the Red Lion Crimson® 3.0 software for complete details.

Web Server

The I/O module has an embedded web server for configuration, calibration and maintenance of these modules. Refer to Chapter 9 of this manual for further information.

Crimson 3.0

Crimson 3.0 is the programming and configuration software for many Red Lion products. It is an alternative method for configuring the Dual Ethernet I/O Modules especially when they will be under the control of a Red Lion RTU, process controller or HMI panel.

Download the Crimson 3.0 software from the Red Lion website on the Support->Software & Firmware page.

OPC or DDE

Kepware® or other commercial OPC (OLE for Process Control) and embedded device communication driver packages that support Sixnet or Modbus protocol generally provide access to Windows® applications via OPC and/ or DDE (Dynamic Data Exchange) protocols. An OPC/DDE server allows any Windows OPC/DDE client application to access Red Lion I/O registers directly over Ethernet or serial ports.

There are two Kepware servers available: KepServer® and KepServerEX®. When an OPC command is received by the KepServer, it sends the appropriate Modbus RTU protocol command over a serial port or Ethernet to the remote station or module. The KepServerEX functions in the same manner, but it sends Sixnet Universal protocol instead of Modbus RTU protocol. The I/O registers are referenced by the tag names assigned using the Red Lion Crimson 3.0 Windows software.

Chapter 2 Installation

Introduction

This chapter contains the information and procedures necessary to unpack, inspect, install and connect the Red Lion Dual Ethernet E3 I/O Module.

Unpacking

Remove all the equipment from the packaging, and store the packaging in a safe place.

Inspection

Please ensure the shipping package contains the following items in undamaged condition:

1. 1 E3 I/O module
2. 1 Quick Start Guide

If the package contents are damaged:

1. Contact your carrier.
2. File any damage claims with the carrier

Quick Setup Guide

The following steps can help with the installation and use of the Red Lion Dual Ethernet I/O module(s). Refer to the subsequent sections for details.

1. **Mount the Hardware:** These I/O modules snap onto standard DIN-Rail in the typical fashion. Alternatively they can be mounted directly to any flat surface.
2. **Connect Power Wiring to the Unit:** Connect 10-30 VDC power to the power input screws. A Class 2 power source is recommended because it has built-in current limiting to protect against short circuits. However, it is not required.
3. **Connect I/O:** Make your field wiring connections between the I/O module's screw terminals and your peripheral equipment. Refer to the module's I/O wiring guide and the remote equipment's user manuals for I/O connection details.
4. **Install Communication Wiring:** Make the necessary Ethernet, USB, and/or RS485 communication connections between the I/O modules and other devices (such as a master I/O polling device).
5. **Set Configuration Jumpers:** Remove the configuration door and move the Network Mode and DI COM jumpers to the desired settings. Note that the Network Mode jumper is found on the back of the configuration door and the DI COM jumper resides inside the module.
6. **Turn On the Power:** Turn on the 10-30 VDC power. Observe the status (OK) LED. Typically a solid ON indicates proper operation. A blinking LED may indicate that the unit needs to be configured. The (OK) LED only comes on when both P1 and P2 are powered up. **Chapter 8** provides details on the LED status lights.

7. **USB Driver Selection.**

    a. Install Crimson 3.0 Gold Build 675 or later.

    b. Go to the Start-Programs-Red Lion Controls-Drivers to find the E3 USB Driver files.

    c. Click on the file that matches your Windows® operating system architecture. Click E3 USB Driver (64-bit) for 64-bit versions of Windows (this will apply for most) or E3 USB Driver (32-bit) for 32-bit versions of Windows.
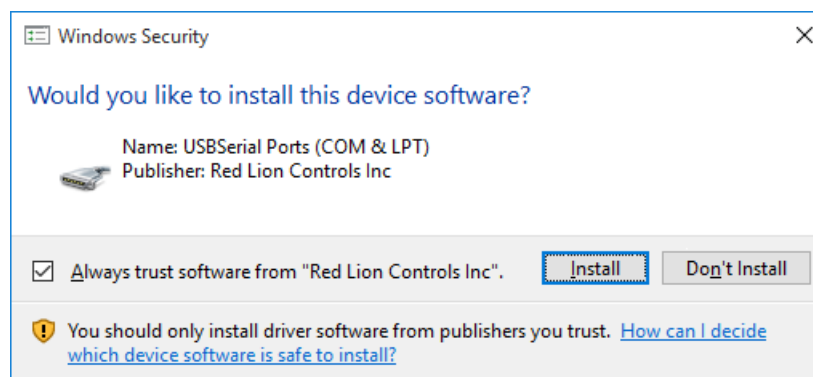
Driver Selection (Windows 10®and Windows 7®)
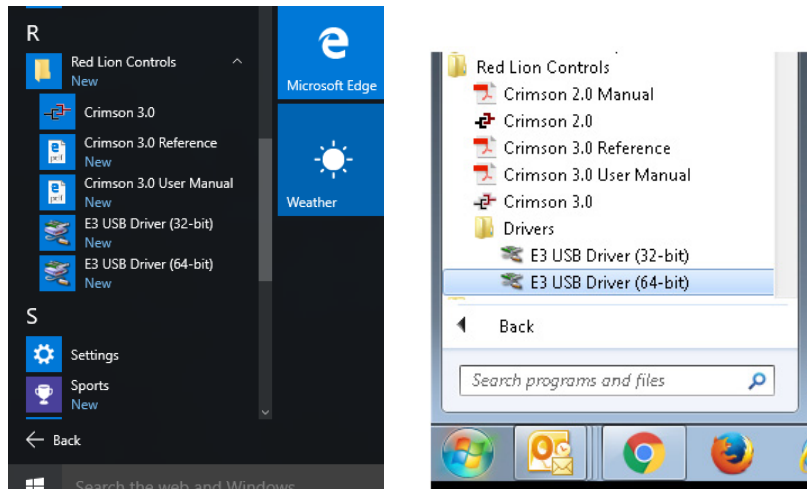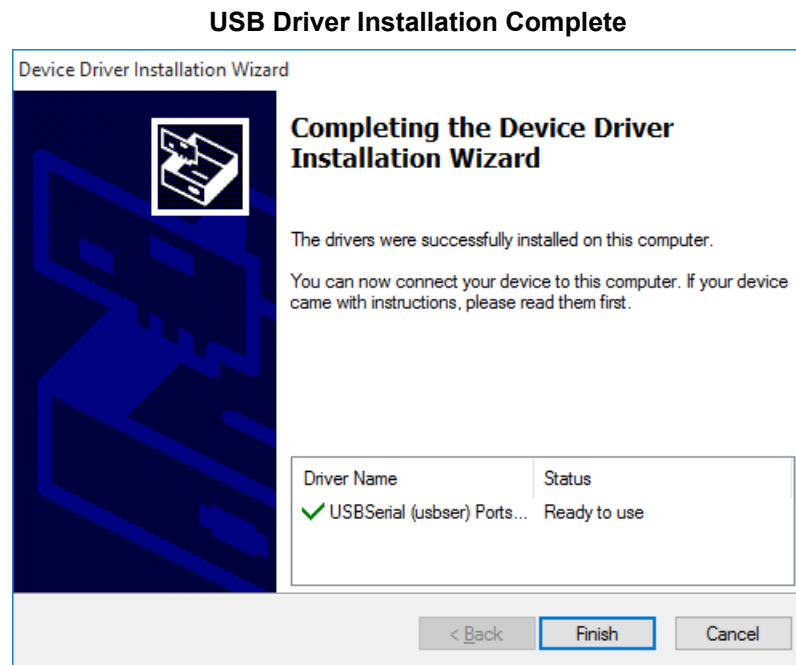

8. **USB Installation:**

    a. When the windows security window asks "Would you like to install this device software?" click Install.

    b. Click Next when the device driver installation wizard starts.

    c. When complete the installation wizard will indicate that the USB Serial driver is ready to use.

Windows Security Window

d. Verify the USB Device Driver is completed.

USB Driver Installation Complete

e. Resume Installation as per the instructions in the Quick Start Guide.

9. **Configure Using the Web Server:** Alternatively, the web server embedded with the I/O module may be used to make configuration changes in the I/O module. To access the web server first, open a web browser (Internet Explorer®, Chrome™ or Firefox® supported). Enter the I/O module's IP address into the web browser's address bar (default IP address from the factory is 192.168.1.21).

10. **Test the Hardware:** Use the Test I/O feature in the web server or Crimson 3.0 software to verify proper operation of all I/O modules in your system. Refer to the web server or Crimson 3.0 on-line help system for further instructions.

11. **Configure your I/O Master:** Refer to the user manual for your I/O master software or hardware on how to configure and run Modbus or Sixnet protocol polling of these I/O modules.

For technical support refer to the "Service Information" and "Product Support" information page for more details. If you still need assistance, please contact Red Lion Support at 1-877-432-9908.

Installing/Mounting

Read the following warning before beginning the installation:

Lire l'avertissement suivant avant de commencer l'installation:

	WARNING: Never install or work on electrical equipment or cabling during periods of lightning activity. Never connect or disconnect power when hazardous gases are present.
	ALERTE: Ces produits sont des unités d'interface opérateur qui doivent être utilisés à l'intérieur des panneaux de commande. Ces appareils sont destinés à une utilisation en Classe I, Division 2, zones dangereuses, applications de contrôle industriel. L'enclos doit être adapté à l'environnement.

Mechanical Dimensions

Refer to the drawings below for the basic mechanical dimensions.
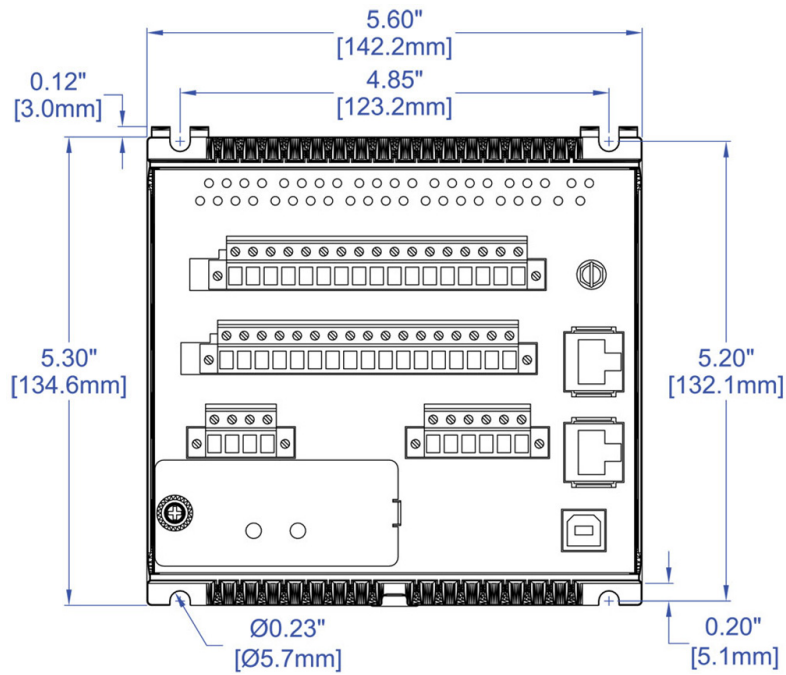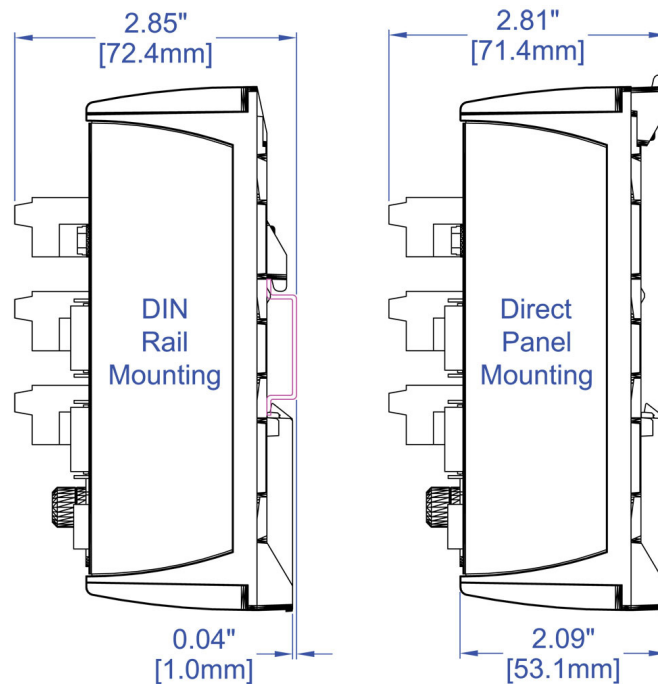
Figure 1. Front View


Figure 2. Side View

Movable Feet

These modules have two movable feet to support either DIN rail mounting or direct panel mounting. The default location from the factory is for DIN rail mounting. Refer to the image on the left.

For direct panel mounting, move the feet to locations shown in the right hand image. Each foot is held in place by one screw. Make sure the screws are tightened securely (6 in-lbs recommended) after moving the feet.

Figure 3. Movable Feet

Feet Location for DIN Rail Mounting
(factory default location)

Feet Location for
Direct Panel Mounting
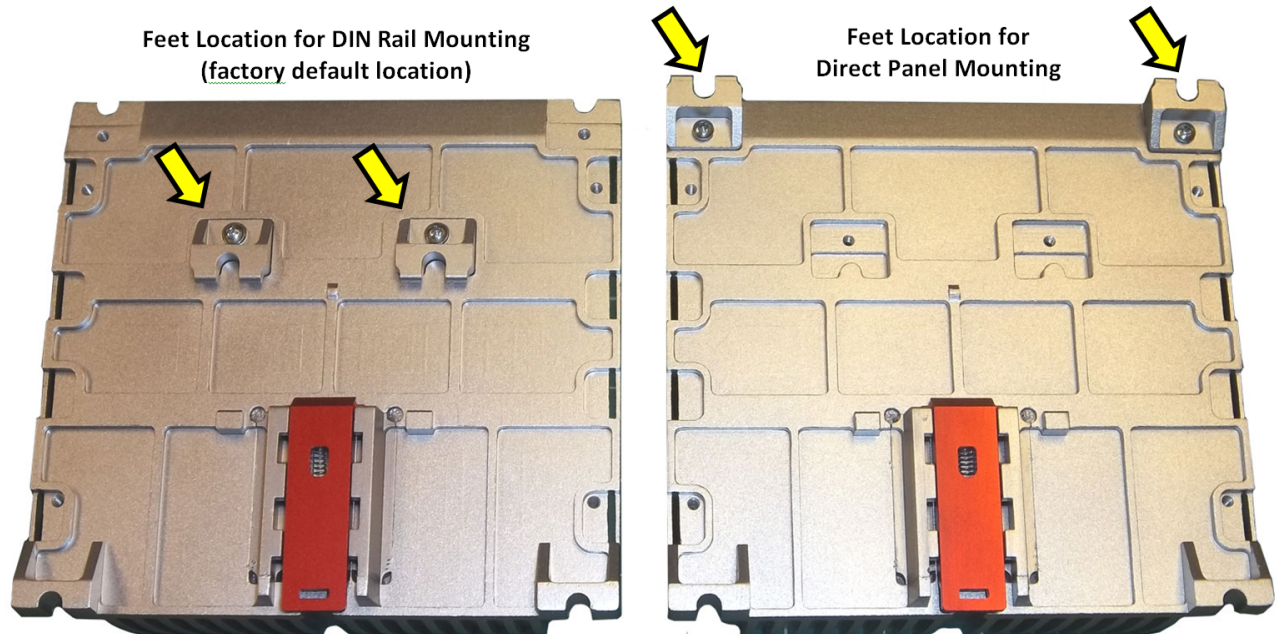
> **Note:** The red part in the image above is the spring loaded retention clip. See the sections on "DIN-Rail Mounting" and "Direct Panel Mounting" for usage.

DIN-Rail Mounting

The most common installation method is to snap these modules onto a DIN-Rail fastened to a sub panel. These modules support the TS35 (35mm "top hat" style per EN50022) which is the most common type.

Installation of a module to the DIN-Rail is easy. Follow these two steps:

1. Hook the back of the module (using the feet shown in the left image on the previous page) over the top of the DIN rail. Refer to the arrow 1 below.

2. As indicated by arrow 2, push in the bottom of the module until you here a click that indicates the spring-loaded retention clip has engaged the bottom of the DIN rail.

Figure 4. DIN-Rail Mounting
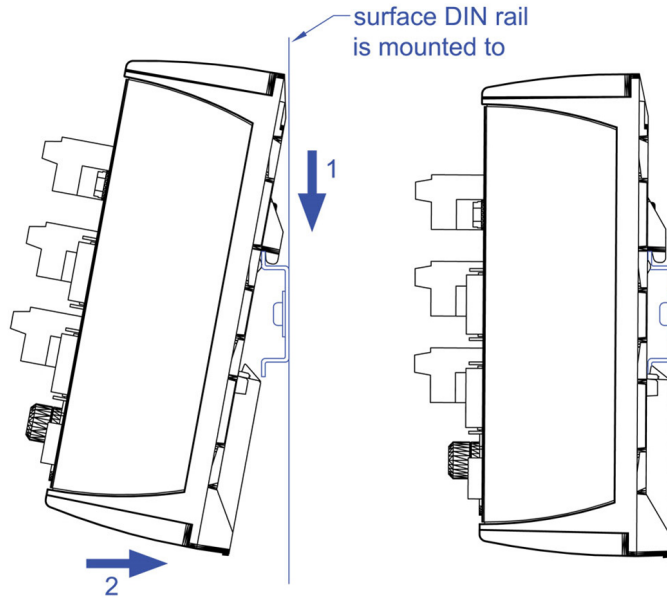
DIN Rail Removal

If removal of the module from the DIN-Rail is required, follow these steps:

1. Insert a small screw driver in the rectangular slot of the red retention clip. Then pry the clip downward while pushing on the top of the module. Refer to the arrows marked 1.
2. Once the clip disengages the bottom of the DIN-Rrail then the bottom should move away from the mounting surface. You can then lift the module from the DIN-Rail. Refer to the arrows marked 2.

Figure 5. DIN-Rail Removal
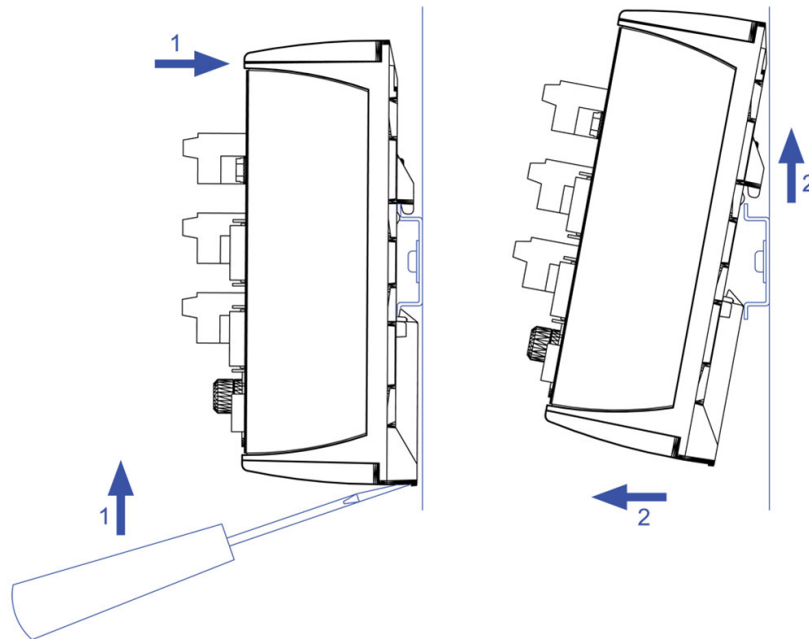
Direct Panel Mounting

These modules can be mounted to any flat surface with appropriate available space. First, make sure the two movable mounting feet have been moved into the top positions as shown in the section above on "Movable Feet". Then use the mechanical diagram below to mark the locations of the mounting feet on your mounting surface. Use the appropriate screws to mount the module. The type of screw will depend on the mounting surface and method. The mounting holes will support up to a 10-32 SAE screw or M5 metric.

Figure 6. Dimensions for Direct Panel Mounting
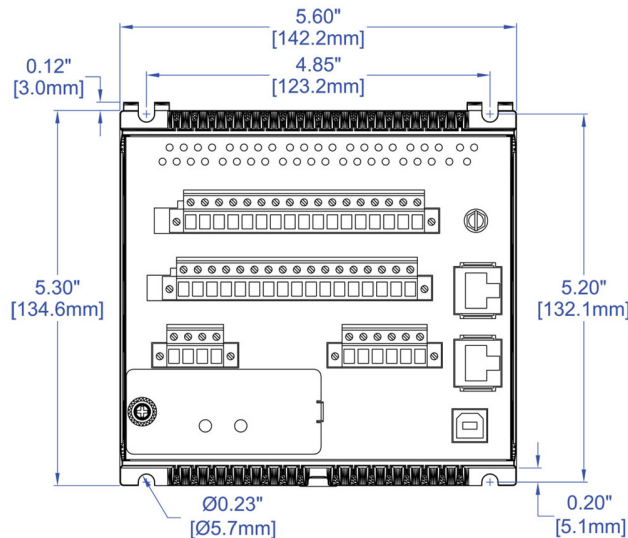
The use of a lock washer and flat washer is recommended. For larger screws, such as 10-32 and M5, a clipped (D shaped) washer will be needed. The washer is not available from Red Lion Controls, but it may be sourced from many other vendors (example: McMaster 96025A147).

**Clipped Washer
Example**

Shock and Vibration Guidelines

These modules complied with the standards and test conditions listed below while mounted on a standard TS35 DIN-Rail. However, in applications with moderate to heavy vibration and/or shock it is recommended to direct-panel mount these modules whenever possible. The direct-panel mounting method will provide the best resistance against shock and vibration. To prevent connections from loosening over time we also recommend securing any loose communication and I/O wiring as close to the module as possible.

IEC 60870-2-2 Vibration

- Sine vertical: 9-200Hz 2G, 200-500Hz 1.5G, 5 sweep cycles
- Sine transverse: 9-200Hz 2G, 200-500Hz 1.5G, 5 sweep cycles
- Sine longitudinal: 9-200Hz 2G, 200-500Hz 1.5G, 5 sweep cycles
- Per Maritime Spec: 2-13.2, amplitude ± 1 mm 13.2-100Hz, 0.7G

IEC 600068-2-6 Vibration

- Per Maritime Specification: 2-13.2Hz, amplitude ± -1 mm., 13.2-100Hz, 0.7G

IEC 600068-2-27 Shock

- Half sine, 15G, 11ms duration
- 18 shocks in each direction (three mutually perpendicular axes)
- Positive and negative directions for a total of 36 shocks each axis

IEC 60870-2-2 Class Cm Shock

- Half sine, 31G, 11ms duration
- 18 shocks in each direction (three mutually perpendicular axes)
- Positive and negative directions for a total of 36 shocks each axis

Please note that during the above tests sturdy DIN-Rail end-clamps were used on either side of the product to prevent the modules from sliding on the DIN-Rail. If your application will also experience vibration and/or shock, and you are using DIN-Rail mounting then the use of suitable end-clamps may also be required. End-clamps with an all-metal latching mechanism are recommended. You must also make sure the DIN-Rail is properly fastened to your panel or mounting surface. It is recommended that at least every 2" or 50mm be fastened with a screw (6-32 minimum), lock washer and fender washer.

red lion®

Chapter 3   Jumper Settings

Locating the Jumpers

The quick configuration jumpers are located under the data flash and configuration options door. This door is located in the lower left of the module. It is removed by loosening the thumb-screw and pulling the door away from the module.

> **Note:** Turn power to the module off when making changes to the configuration jumper settings. Changes to the settings will not take effect until power to the module is restored.
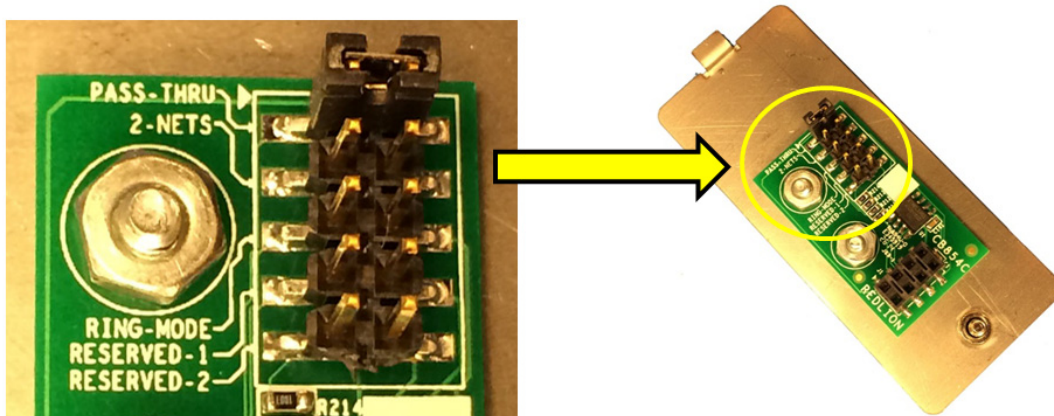
Figure 7. Jumpers Location
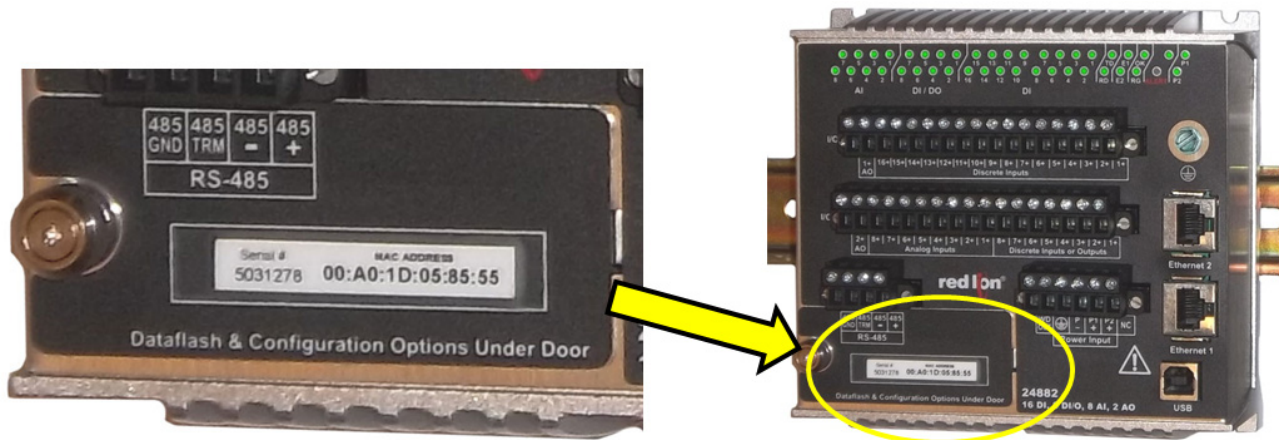
Setting the Network Mode Jumper

This jumper sets the network configuration for the two ("dual") Ethernet ports. It is located on the inside of the configuration door. Refer to the images below. The default is "2-Nets" (dual network) mode.

Figure 8. Network Mode Jumper Location

Important: Before connecting the I/O Module to an Ethernet network, it is necessary to first set the Network Mode jumper to insure that unwanted connection paths are not created.

Network Modes

Three network modes are currently available.

Pass-thru (Ethernet Message Pass-thru): An unmanaged switch in the module passes Ethernet traffic between the ports. This option allows I/O modules to be daisy-chained without the need for external Ethernet switches.

Ring: This option allows the two Ethernet ports to act as Real-Time Ring switch ports. This mode should only be used if this module will be placed in a closed ring consisting of other similarly configured I/O modules, and Real-Time Ring switches.

IMPORTANT: When switching to and from Ring mode you must ensure the modules are not connected in a closed ring. If a ring is present when ring mode is disabled it may be adversely affect the performance of your network.

Two Networks (2-Nets or Dual Networks): In this option, traffic is blocked between the two Ethernet Ports so that the I/O module can be connected to two independent networks. Each Ethernet port has a separate MAC address and requires its own IP address. Both ports must be on a separate subnet.

Choose the desired mode and set the jumper accordingly. Then reassemble the door onto the module.

Note: If the jumper is completely removed from the configuration door the unit will default to the **"Two Networks"** mode, because this is the least likely to cause network problems.

Note: The default communication mode is to follow the jumper, so initial setup does not require configuration. When the setting is set to something other than "follow the jumper" the setting must match the jumper setting; otherwise there could be a conflict on the network.

Setting the DI COM Jumper

The Discrete Input Common "DI COM" is located under the configuration door as shown below. This jumper sets a select number of discrete input circuits as either "Sourcing" or "Sinking" on certain types of modules only (as listed

below). All discrete inputs are Sourcing (by default) and the first 8 channels can be Sinking (by jumper). The number of inputs affected by this setting will vary by module type.

Figure 9. DI COM Jumper
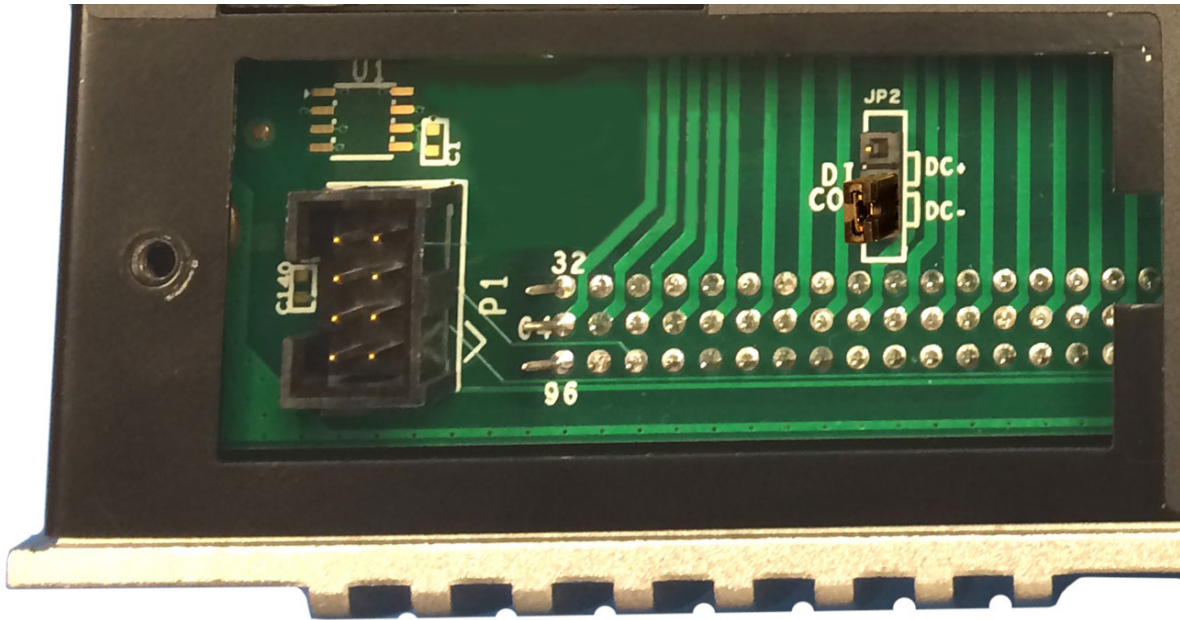
Part Number (Module w/Base)	Total # of Discrete Ins	Group of DI Allocated for Sourcing or Sinking
E3-MIX24880-1	24	First 8
E3-MIX24882-1	24	First 8
E3-MIX20884-1	20	Channels 5 -12
E3-32DI24-1	32	All 32

Note: This jumper is not applicable on other I/O modules that offer individually isolated discrete inputs (such as the E3-16DI24-1 and E3-16DIAC-1 modules) where sinking or sourcing can be wired on individual input pairs.

IMPORTANT: Before connecting and powering up the I/O Module, it is necessary to first set the **"DI COM"** jumper.

Determine Sinking or Sourcing Mode

The default jumper setting is sourcing (jumper to "DC-") which is appropriate for most situations in which a positive voltage is applied to an input to indicate an "ON" condition. Select Sinking (jumper to "DC+") for "ON" inputs corresponding to ground closures that require a positive reference as an opposing return connection. (See both jumper circuits below.)

Choose the mode that fits your application and set the jumper accordingly. Reassemble the module subassembly to the base subassembly.

Figure 10. Sinking or Sourcing Mode
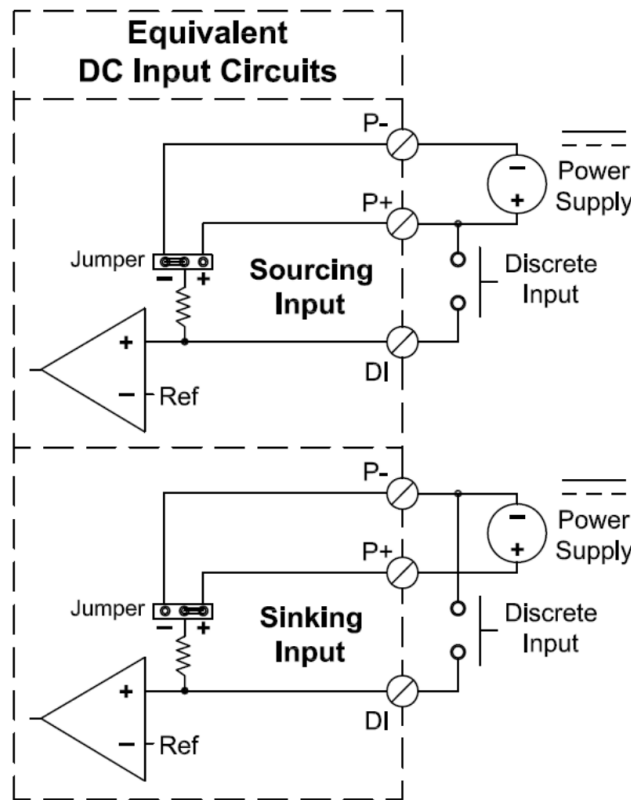
Configuring the Module for Sinking and Sourcing

Once the module is reinstalled and power is applied, the module will automatically read the DI COM jumper setting and configure the module accordingly.

If you are configuring the module from the web server, you can view the jumper setting from the "Discrete Options" configuration page. Note that the parameter "Source/Sink mode" will display the corresponding jumper setting as "Sink" or "Source".

If you are configuring the module from the Crimson 3.0 Windows software from the Discrete Options configuration screen, go to the "Source/Sink mode" drop-down menu and select the mode that matches the jumper setting, otherwise a conflict will arise on the affected discrete inputs. The "Follow the Jumper" selection directs the firmware to use the setting as it is set in the hardware jumper. Otherwise, this configuration setting should match what the hardware jumper is set to.

Chapter 4　　　Power Wiring

Power Requirements

These modules can be powered from any suitable DC power source of 10 to 30 VDC. The most common voltages to power these modules are 24 VDC and 12 VDC. A Class 2 power source is recommended because it has built-in current limiting to protect against short circuits.

Current Requirements

To calculate the supply current requirements, add the wattage required for these modules and other units in use. Next, divide the total wattage by the DC power source voltage. Then, add any current needed for user instrumentation loops and output loads. It's recommended that you size your power supply to have at least twice the power required. This allows for startup current surges and other unpredicted current draws.

Power Wiring

There are a few screw terminals associated with powering the module.

Power 1+ (P1+): Positive power input provides redundant power for the module intelligence, communications plus all input and analog outputs. Please note that this screw terminal will not power discrete outputs.

Power 2+ (P2+): Power supply negative return is common to all internal functions except individually isolated I/O channels on some modules.

Return - (P-): Power supply negative return is common to all internal functions except individually isolated I/O channels on some modules.

Chassis: Chassis to earth ground connections. There are two screws for this purpose. The first is inside the power input screw block. The second is a separate green screw on the cover. Both screws should be connected to a panel or earth ground for best performance.

WD Out: The Watchdog Output indicates a failure.

NC: This screw terminal is currently not used so no connection should be made.
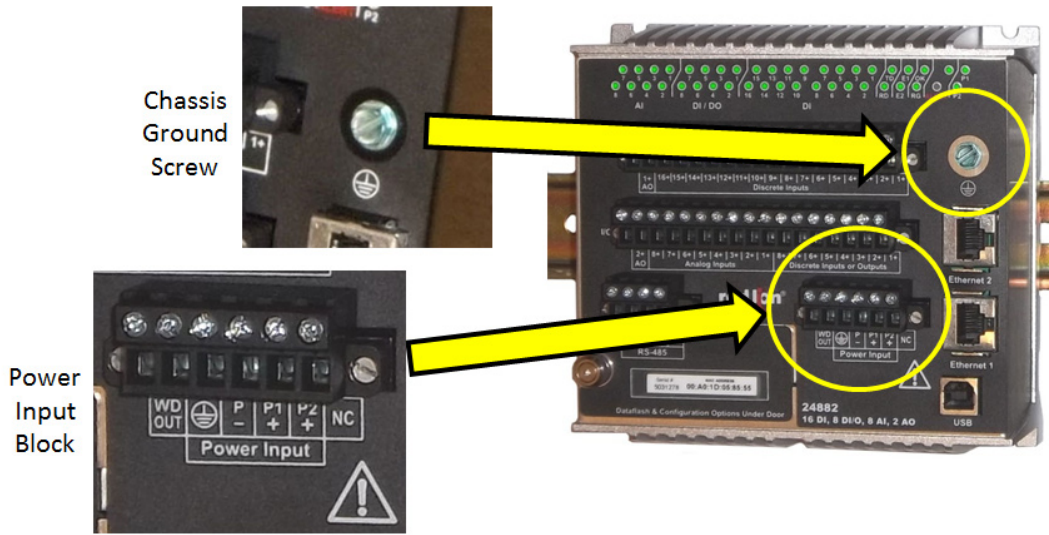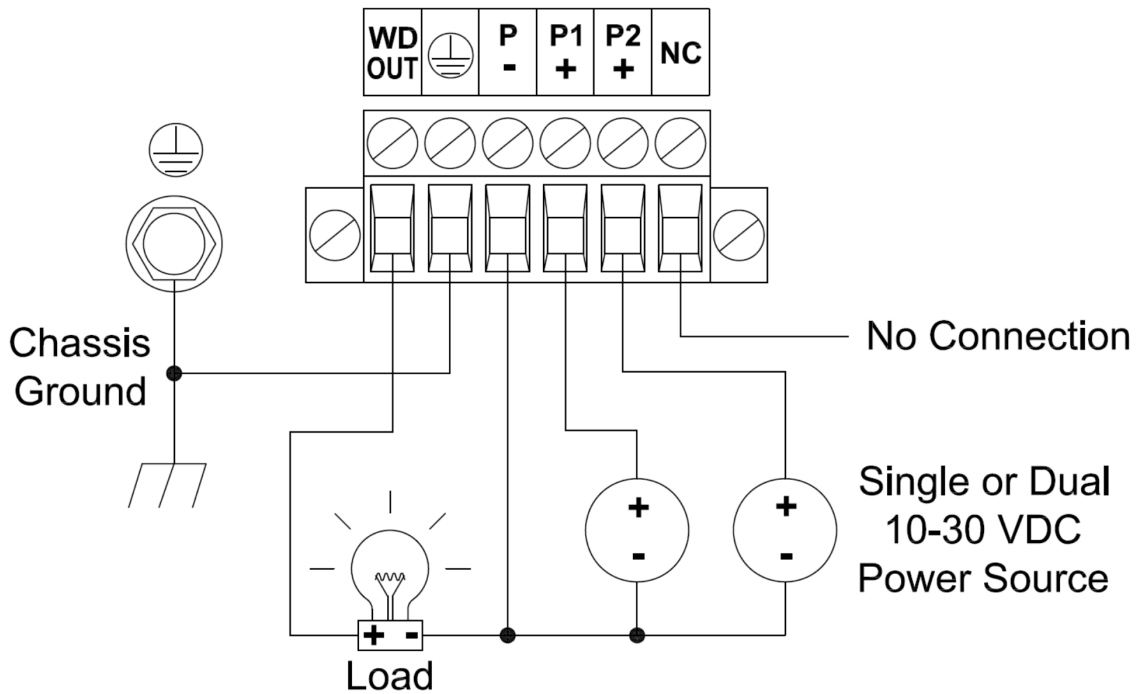
Figure 11. Screw Terminals


Figure 12. Power and Ground Wiring Diagram

Note: As shown above, for best grounding please ground the chassis ground screw in the connector and the green ground screw on the enclosure.

Chapter 5   Communications Wiring

RS485 Wiring

This port provides a RS485 (2-wire, half duplex only) connection between modules or to other RS485 equipment. Screw terminals are available for RS485+, RS485-, RS485 GND and RS485 Termination as shown in the images below.

Figure 13. RS485 Screw Terminals
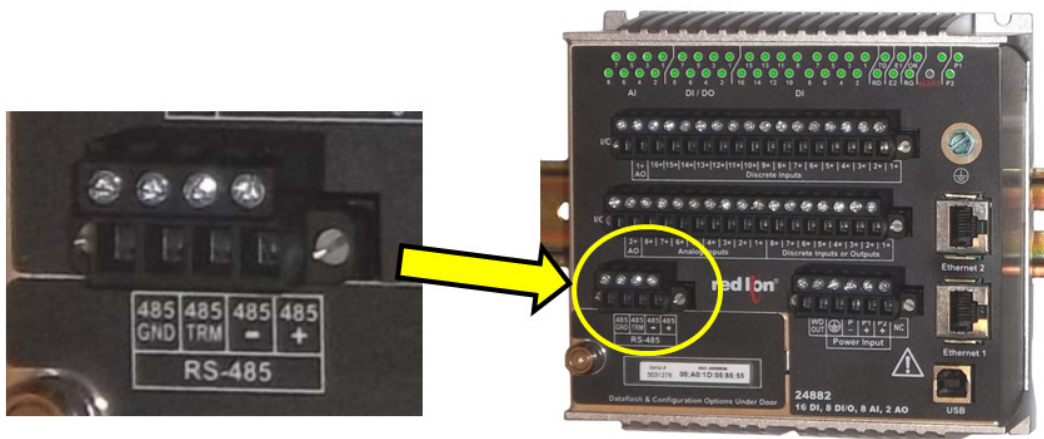
In order to assure proper communication, you should connect (+) to (+) and (-) to (-) between units. However, since there is no standard for RS485 terminal designations you may need to connect (+) to (-) and (-) to (+) in some cases. No damage to the module will result if incorrectly connected. It is highly recommended that you tie the signal ground (RS485 GND) to an appropriate ground (if available) between all RS485 units. Make sure to use a good quality communication cable with three conductors (twisted is preferred) plus a shield. To prevent ground loops, the shield should be connected to chassis ground on only one end of any cable run.

> **Note:** If you have existing wiring that has only two conductors and a shield, you can use the shield to connect the signal grounds between stations. This is not optimal (especially for long cable runs) but should work in most situations.

The RS485 port is not isolated on most units (except the E3-10RTD-1 and E3-MIX20884-1), therefore you must use a common power ground between stations in order to connect the 485 signal grounds. Some applications make use of longer distances where a common ground may not be possible. When long distance connections are used, it is highly recommended that you use an optical isolator between devices without a common ground to assure proper, problem free operation.

RS485 Termination

All these units have RS485 termination components (150 ohm resistor and a 0.1 F capacitor connected in series) already inside. To terminate your RS-485 network at the I/O Module, just jumper the "485 -" screw to the "485 TRM" screw. Make sure to use the same type and size conductor as already used for your RS485 minus (-) connection. It is recommended that both end stations of your RS485 network be terminated. Avoid terminating more than two stations.

Figure 14. RS485 Termination Components
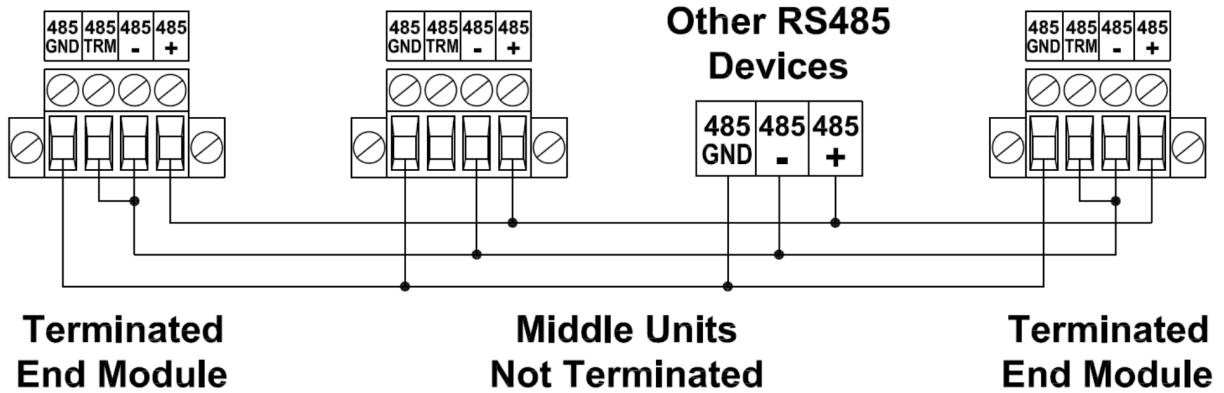
Ethernet

These modules provide two EIA-568 compliant Ethernet ports for ring or redundant network connections. The Ethernet ports support 10 Mbps and 100 Mbps speeds and will auto-detect the speed and duplex settings. The ports are also auto-crossover so either straight-wired or cross-wired cables can be used. Otherwise, please use standard Ethernet wiring practices and rules for making your connections.

Figure 15. Ethernet Ports
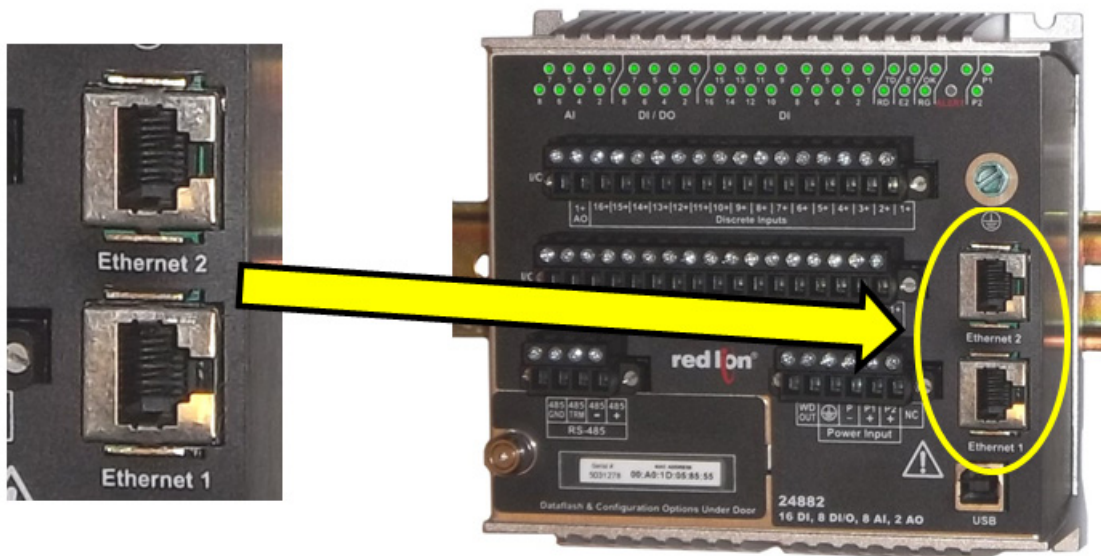
Ethernet Plug & Connector Pin Positions

Figure 16. Ethernet Plug and Pin Positions
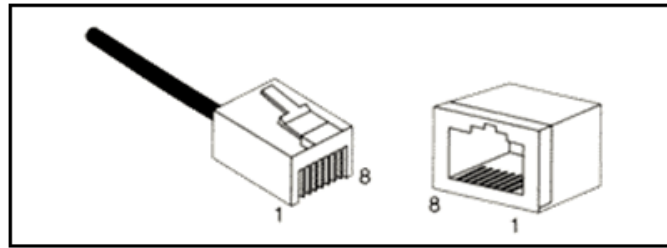
USB

The E3 module has a USB 2.0 Device interface on a Type B connector. Use a standard USB Type A to USB Type B cable (not provided) to connect this port to your PC. Refer to **Chapter 1** for more information on the functionality of this USB port.

Figure 17. USB Port
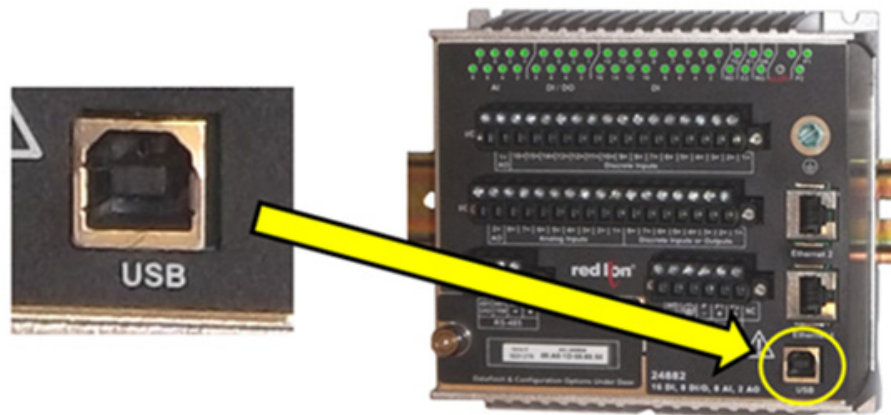
Typical USB Cable Shown
(Not provided)

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Chapter 6   Module Wiring / Screw Terminal Assignments

Screw Terminal Guidelines

The screw terminals used on these modules can accept 30 to 12 AWG wire. The screw size is M3 and the recommended torque is 0.6 Nm or 4.5 IN/LB.

I/O Wiring Blocks

These modules have two screw terminal blocks for making I/O wiring connections. These blocks are removable so the wiring can be attached with the blocks in place or with the blocks removed. The image below indicates what is referred to as the Upper Row and Lower Row. The blocks are locked down with screws on either end of the block. Make sure to tighten these screws to ensure best shock and vibration resistance.

Figure 18. I/O Wiring Blocks
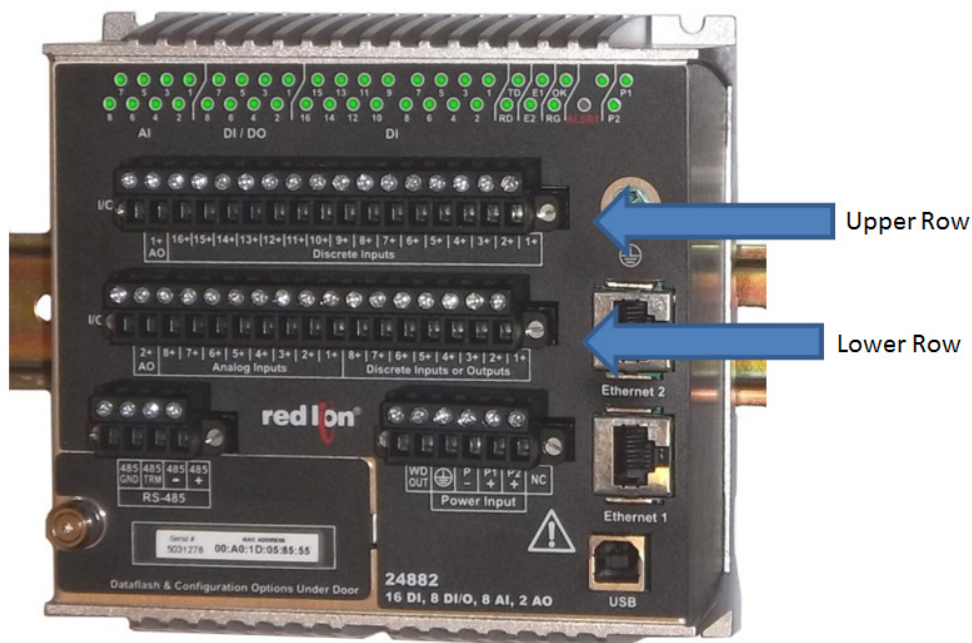
Note: NC stands for No Connection

I/O Wiring Overview

The table below lists the available I/O modules. The detailed wiring diagrams for each module are found in the pages that follow.

Part Number	Max di	Max do	Max ai	Max ao	Description
E3-MIX24880-1	24	8	8	-	Double density combination I/O
E3-MIX24882-1	24	8	8	2	Double density combination I/O with 2 AOs
E3-MIX20884-1	20	8	8	4	Combination I/O w/ 4 isolated DIs and 4 AOs
E3-32DI24-1	32	-	-	-	32 discrete inputs for double density
E3-16DI24-1	16	-	-	-	16 isolated discrete input channels, 10-30 VDC/VAC
E3-16DIAC-1	16	-	-	-	16 isolated discrete input channels, 120 VAC nominal
E3-32DO24-1	-	32	-	-	32 discrete outputs for double density
E3-16DO24-1	-	16	-	-	16 isolated discrete output channels
E3-16DORLY-1	-	16	-	-	16 isolated low-voltage relays
E3-32AI20M-1	-	-	32	-	32 analog inputs, 4-20 mA double density fused inputs
E3-32AI10V-1	-	-	32	-	32 analog voltage Inputs (0-10V)
E3-16AI20M-1	-	-	16	-	16 analog inputs (4-20 mA) high density fused inputs
E3-8AO20M-1	-	-	-	8	8 analog outputs (4-20 mA)
E3-16AI8AO-1	-	-	16	8	16 analog inputs, 8 analog outputs (4-20 mA) range
E3-10RTD-1	-	-	10	-	10 RTD inputs (2 or 3 wire)
E3-16ISOTC-1	-	-	16	-	16 isolated thermocouple and millivolt inputs
E3-16ISO20M-1	-	-	16	-	16 isolated analog inputs (4-20mA)

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Figure 19. I/O Wiring for E3-MIX24880-1

Screw Terminal Assignment

CNT+ 1	DI+ 16	DI+ 15	DI+ 14	DI+ 13	DI+ 12	DI+ 11	DI+ 10	DI+ 9	DI 8	DI 7	DI 6	DI 5	DI 4	DI 3	DI 2	DI 1	Upper Row
CNT- 1	AI+ 8	AI+ 7	AI+ 6	AI+ 5	AI+ 4	AI+ 3	AI+ 2	AI+ 1	DI24+ or DO8+	DI23+ or DO7+	D22+ or DO6+	DI21+ or DO5+	DI20+ or DO4+	DI19+ or DO3+	DI18+ or DO2+	DI17+ or DO1+	Lower Row

Module labeling

DI sinking on channels 1-8 only.

Note: The power to the I/O module and combination discrete inputs/outputs should be from the same power source. Use the power return (P-) as the common ground reference.

Note: Discrete input channels 1 - 8 can be sinking or sourcing as a group. This is determined by the jumper described in Chapter 3. The default is sourcing where each input is activated by applying a positive voltage (P+). Otherwise, when set for sinking then each input is activated by applying a power return (P-).

Equivalent Analog Input Circuit (4-20 mA)

Equivalent Discrete DC Input Circuit (Isolated)

Equivalent DC Output Circuit (sourcing only)

Figure 20. I/O Wiring for E3-MIX24882-1

Screw Terminal Assignment

AO+ 1	DI+ 16	DI+ 15	DI+ 14	DI+ 13	DI+ 12	DI+ 11	DI+ 10	DI+ 9	DI 8	DI 7	DI 6	DI 5	DI 4	DI 3	DI 2	DI 1	Upper Row
AO+ 2	AI+ 8	AI+ 7	AI+ 6	AI+ 5	AI+ 4	AI+ 3	AI+ 2	AI+ 1	DI24+ or DO8+	DI23+ or DO7+	D22+ or DO6+	DI21+ or DO5+	DI20+ or DO4+	DI19+ or DO3+	DI18+ or DO2+	DI17+ or DO1+	Lower Row

Module I/O Labeling

Note: Discrete input channels 1 - 8 can be sinking or sourcing as a group. This is determined by the jumper described in Chapter 3. The default is sourcing where each input is activated by applying a positive voltage (P+). Otherwise, when set for sinking then each input is activated by applying a power return (P-).
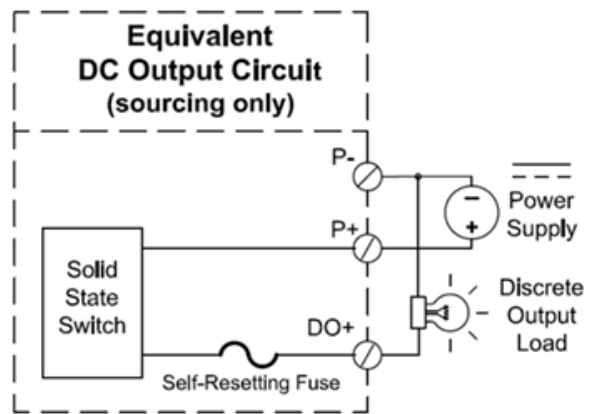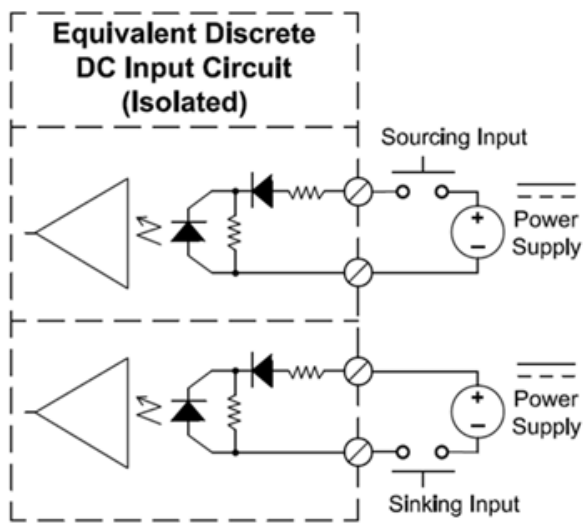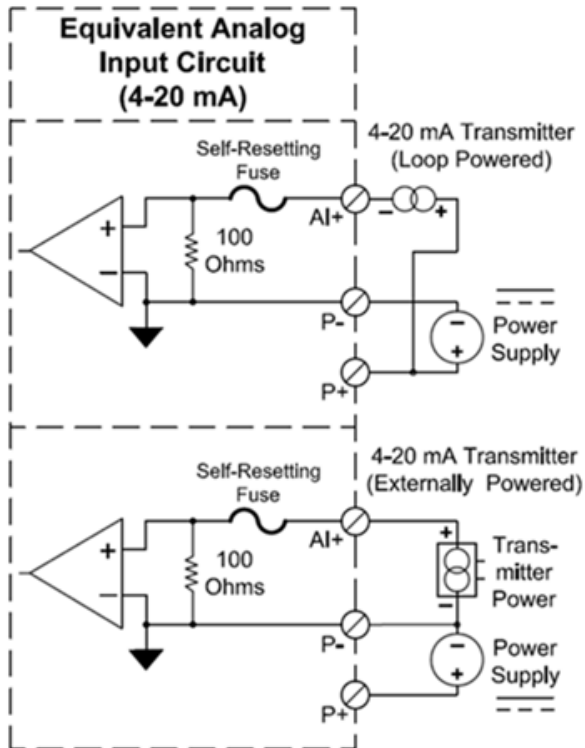
Equivalent Analog Input Circuit (4-20 mA)

Equivalent DC Output Circuit (sourcing only)

Equivalent DC Output Circuit (sourcing only)

Figure 21. I/O Wiring for E3-32DI24-1

Screw Terminal Assignment

CNT+ 1	DI 16	DI 15	DI 14	DI 13	DI 12	DI 11	DI 10	DI 9	DI 8	DI 7	DI 6	DI 5	DI 4	DI 3	DI 2	DI 1	Upper Row
CNT- 1	DI 32	DI 31	DI 30	DI 29	DI 28	DI 27	DI 26	DI 25	DI 24	DI 23	DI 22	DI 21	DI 20	DI 19	DI 18	DI 17	Lower Row

Module Labeling
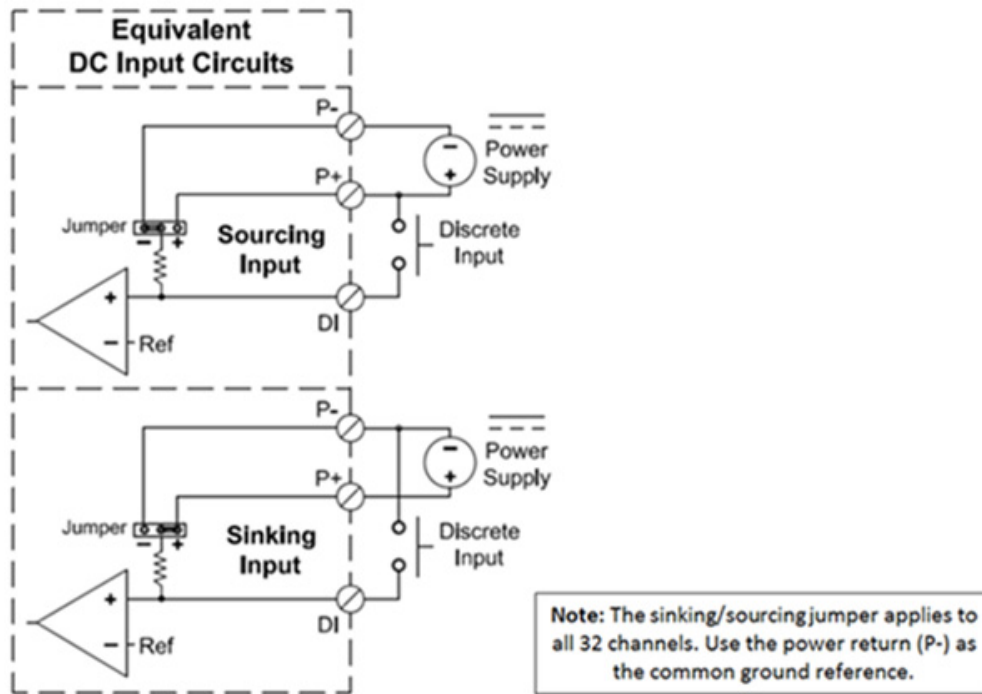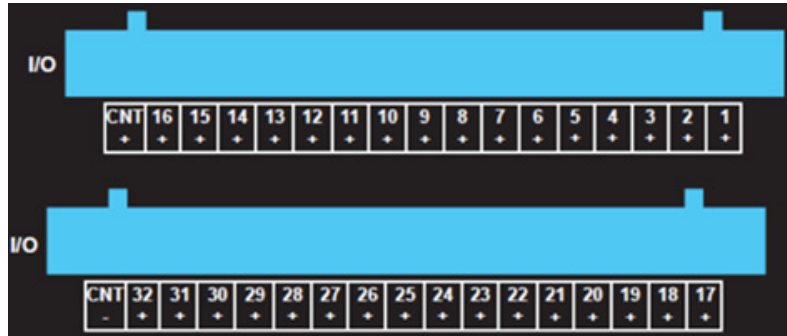
Note: Discrete input channels 1 - 32 can be sinking or sourcing as a group. This is determined by the jumper described in Chapter 3. The default is sourcing where each input is activated by applying a positive voltage (P+). Otherwise, when set for sinking then each input is activated by applying a power return (P-).
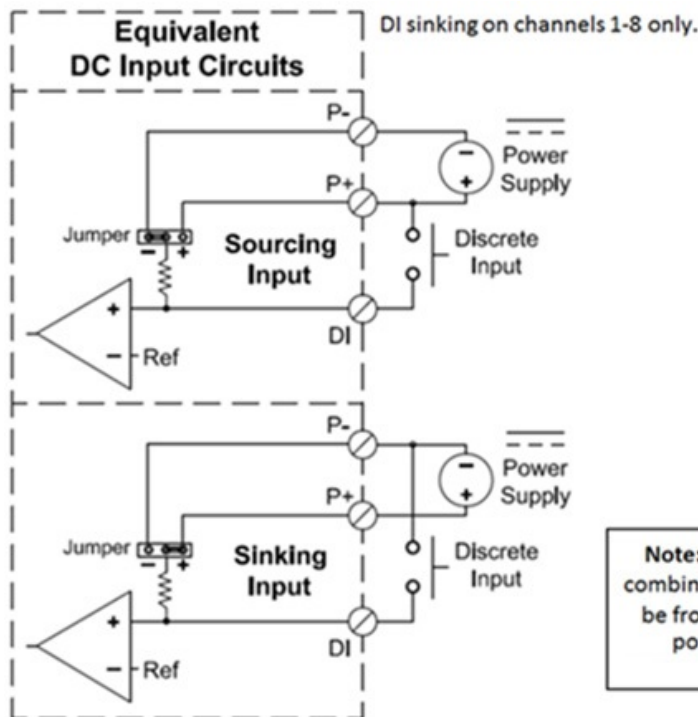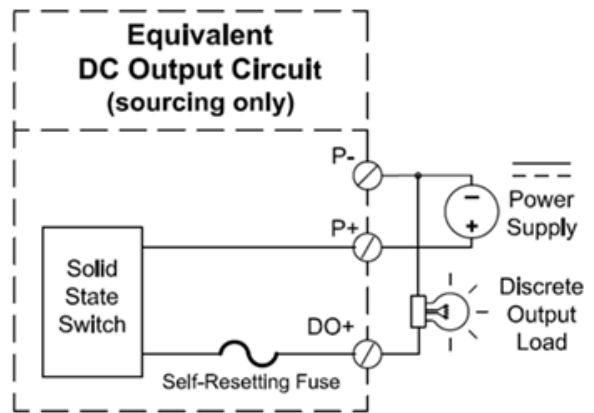
Figure 22. I/O Wiring for E3-32DO24-1

Screw Terminal Assignment

NC	DO+ 16	DO+ 15	DO+ 14	DO+ 13	DO+ 12	DO+ 11	DO+ 10	DO+ 9	DO+ 8	DO+ 7	DO+ 6	DO+ 5	DO+ 4	DO+ 3	DO+ 2	DO+ 1	Upper Row

NC	DO+ 32	DO+ 31	DO+ 30	DO+ 29	DO+ 28	DO+ 27	DO+ 26	DO+ 25	DO+ 24	DO+ 23	DO+ 22	DO+ 21	DO+ 20	DO+ 19	DO+ 18	DO+ 17	Lower Row

Module Labeling

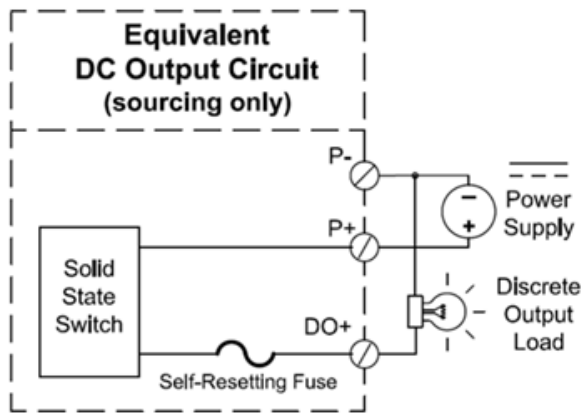**Note:** All 32 channels are sourcing only. Use the power return (P-) as the common ground reference.

Figure 23. I/O Wiring for E3-32AI20M-1

Screw Terminal Assignment

NC	AI+ 16	AI+ 15	AI+ 14	AI+ 13	AI+ 12	AI+ 11	AI+ 10	AI+ 9	AI+ 8	AI+ 7	AI+ 6	AI+ 5	AI+ 4	AI+ 3	AI+ 2	AI+ 1	Upper Row
NC	AI+ 32	AI+ 31	AI+ 30	AI+ 29	AI+ 28	AI+ 27	AI+ 26	AI+ 25	AI+ 24	AI+ 23	AI+ 22	AI+ 21	AI+ 20	AI+ 19	AI+ 18	AI+ 17	Lower Row

I/O Labeling

Note: Use the power return (P-) as the common ground reference.

Figure 24. I/O Wiring for E3-32AI10V-1

Screw Terminal Assignment

NC	AI+ 16	AI+ 15	AI+ 14	AI+ 13	AI+ 12	AI+ 11	AI+ 10	AI+ 9	AI+ 8	AI+ 7	AI+ 6	AI+ 5	AI+ 4	AI+ 3	AI+ 2	AI+ 1	Upper Row

NC	AI+ 32	AI+ 31	AI+ 30	AI+ 29	AI+ 28	AI+ 27	AI+ 26	AI+ 25	AI+ 24	AI+ 23	AI+ 22	AI+ 21	AI+ 20	AI+ 19	AI+ 18	AI+ 17	Lower Row

I/O Labeling

Note: Use the power return (P-) as the common ground reference.

Figure 25. I/O Wiring for E3-16DI24-1

Screw Terminal Assignment

	DI- 8	DI+ 8	DI- 7	DI+ 7	DI- 6	DI+ 6	DI- 5	DI+ 5	DI- 4	DI+ 4	DI- 3	DI+ 3	DI- 2	DI+ 2	DI- 1	DI+ 1	
nc	DI- 8	DI+ 8	DI- 7	DI+ 7	DI- 6	DI+ 6	DI- 5	DI+ 5	DI- 4	DI+ 4	DI- 3	DI+ 3	DI- 2	DI+ 2	DI- 1	DI+ 1	Upper Row
nc	DI- 16	DI+ 16	DI- 15	DI+ 15	DI- 14	DI+ 14	DI- 13	DI+ 13	DI- 12	DI+ 12	DI- 11	DI+ 11	DI- 10	DI+ 10	DI- 9	DI+ 9	Lower Row

I/O Labeling
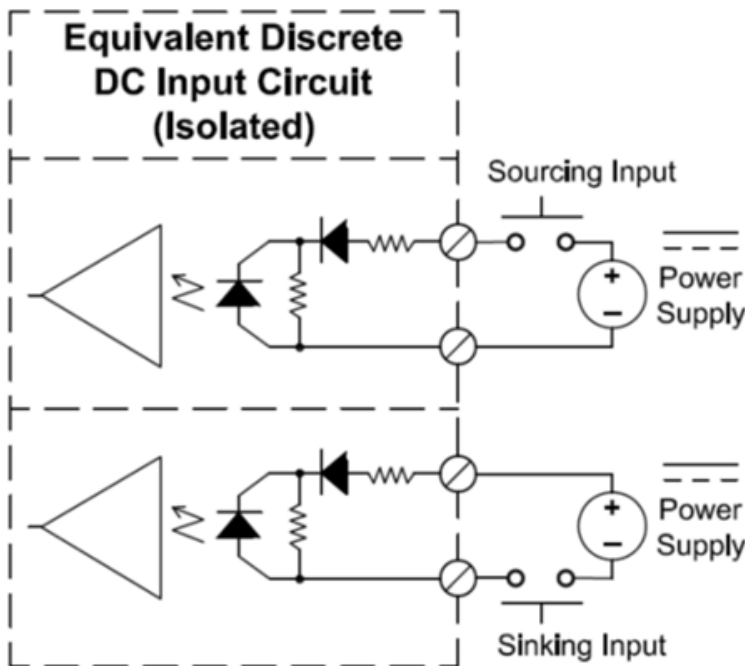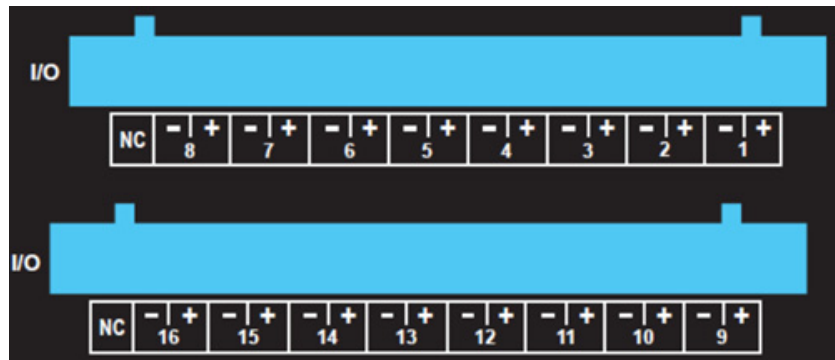
Equivalent Discrete DC Input Circuit (Isolated)

Sourcing Input

Power Supply

Sinking Input

Power Supply

Note: This module has individually isolated I/O and therefore two screw terminals per channel.

Figure 26. I/O Wiring for E3-16DIAC-1

Screw Terminal Assignment

nc	DI-N 8	DI+H 8	DI-N 7	DI+H 7	DI-N 6	DI+H 6	DI-N 5	DI+H 5	DI-N 4	DI+H 4	DI-N 3	DI+H 3	DI-N 2	DI+H 2	DI-N 1	DI+H 1	Upper Row

nc	DI-N 16	DI+H 16	DI-N 15	DI+H 15	DI-N 14	DI+H 14	DI-N 13	DI+H 13	DI-N 12	DI+H 12	DI-N 11	DI+H 11	DI-N 10	DI+H 10	DI-N 9	DI+H 9	Lower Row

I/O Labeling

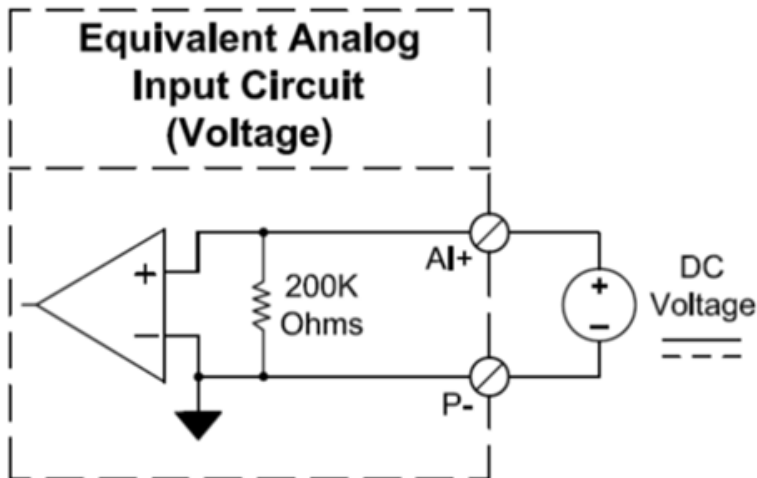Note: This module has individually isolated I/O and therefore two screw terminals per channel.

Figure 27. I/O Wiring for E3-16DO24-1

Screw Terminal Assignment

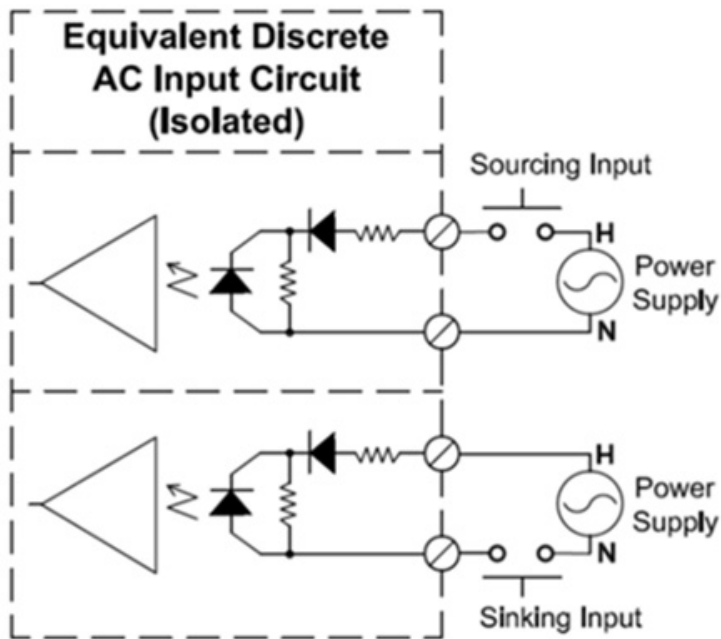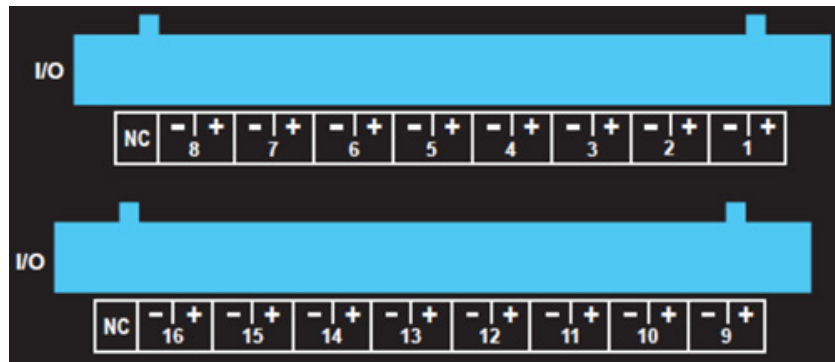|																	
nc	DO- 8	DO+ 8	DO- 7	DO+ 7	DO- 6	DO+ 6	DO- 5	DO+ 5	DO- 4	DO+ 4	DO- 3	DO+ 3	DO- 2	DO+ 2	DO- 1	DO+ 1	Upper Row
nc	DO- 16	DO+ 16	DO- 15	DO+ 15	DO- 14	DO+ 14	DO- 13	DO+ 13	DO- 12	DO+ 12	DO- 11	DO+ 11	DO- 10	DO+ 10	DO- 9	DO+ 9	Lower Row

I/O Labeling

Note: This module has individually isolated I/O and therefore two screw terminals per channel.

Figure 28. I/O Wiring for E3-8AO20M-1

Screw Terminal Assignment

	No upper row populated															Upper Row

nc	GND (P-)	GND (P-)	GND (P-)	GND (P-)	GND (P-)	GND (P-)	GND (P-)	GND (P-)	AO+ 8	AO+ 7	AO+ 6	AO+ 5	AO+ 4	AO+ 3	AO+ 2	AO+ 1	Lower Row

I/O Labeling
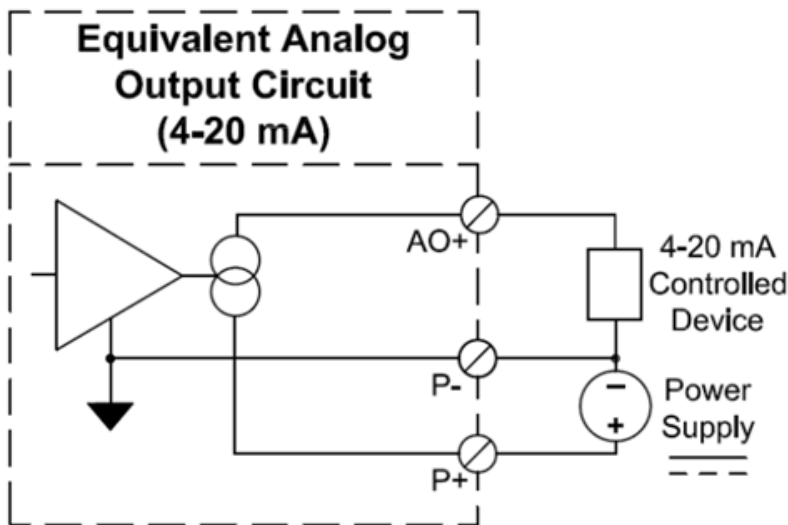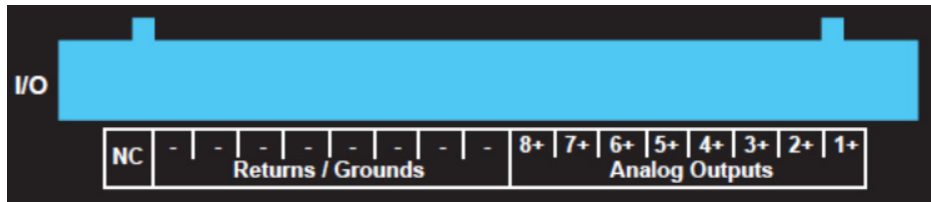
Note: The ground screws are common with the power return (P-).

Figure 29. I/O Wiring for E3-16AI20M-1

Screw Terminal Assignment

nc	AI+ 16	AI+ 15	AI+ 14	AI+ 13	AI+ 12	AI+ 11	AI+ 10	AI+ 9	AI+ 8	AI+ 7	AI+ 6	AI+ 5	AI+ 4	AI+ 3	AI+ 2	AI+ 1	Upper Row
nc	GND (P-)	GND (P-)	GND (P-)	GND (P-)	GND (P-)	GND (P-)	GND (P-)	GND (P-)	GND (P-)	GND (P-)	GND (P-)	GND (P-)	GND (P-)	GND (P-)	GND (P-)	GND (P-)	Lower Row

I/O Labeling
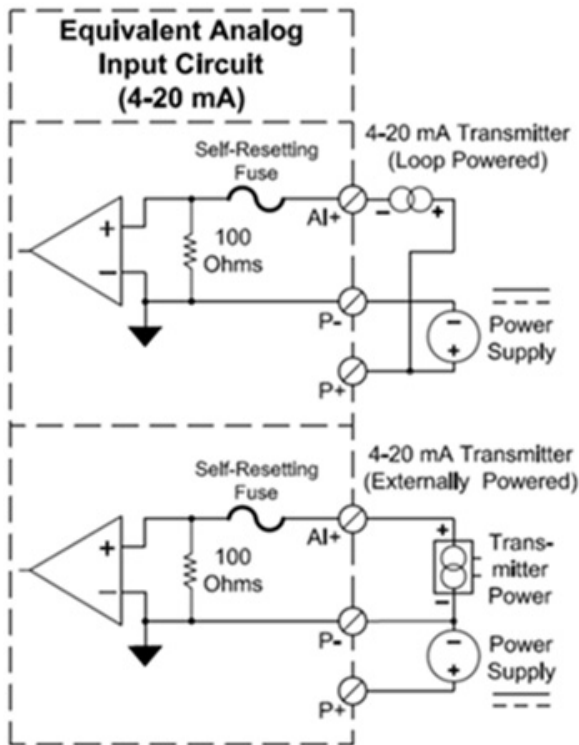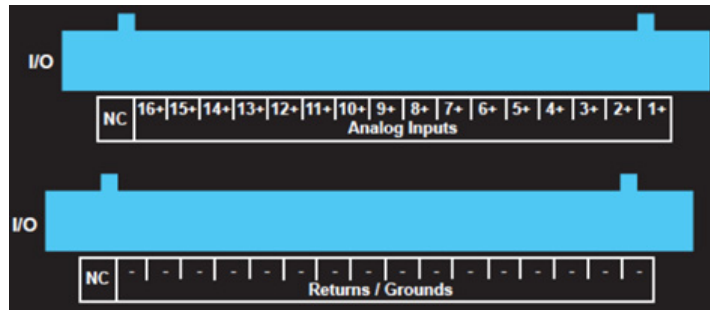
Note: The ground screws are common with the power return (P-).

Figure 30. I/O Wiring for E3-16AI8AO-1

Screw Terminal Assignment

nc	AI+ 16	AI+ 15	AI+ 14	AI+ 13	AI+ 12	AI+ 11	AI+ 10	AI+ 9	AI+ 8	AI+ 7	AI+ 6	AI+ 5	AI+ 4	AI+ 3	AI+ 2	AI+ 1	Upper Row

nc	GND (P-)	GND (P-)	GND (P-)	GND (P-)	GND (P-)	GND (P-)	GND (P-)	GND (P-)	AO+ 8	AO+ 7	AO+ 6	AO+ 5	AO+ 4	AO+ 3	AO+ 2	AO+ 1	Lower Row

I/O Labeling
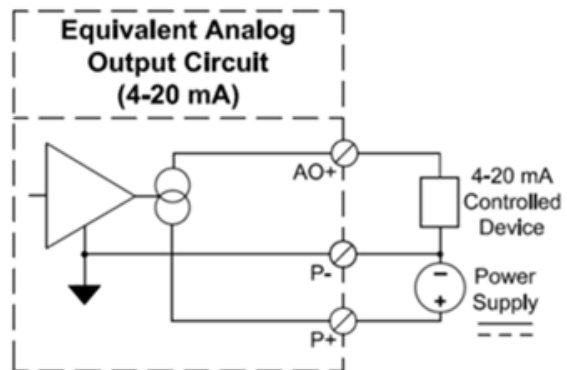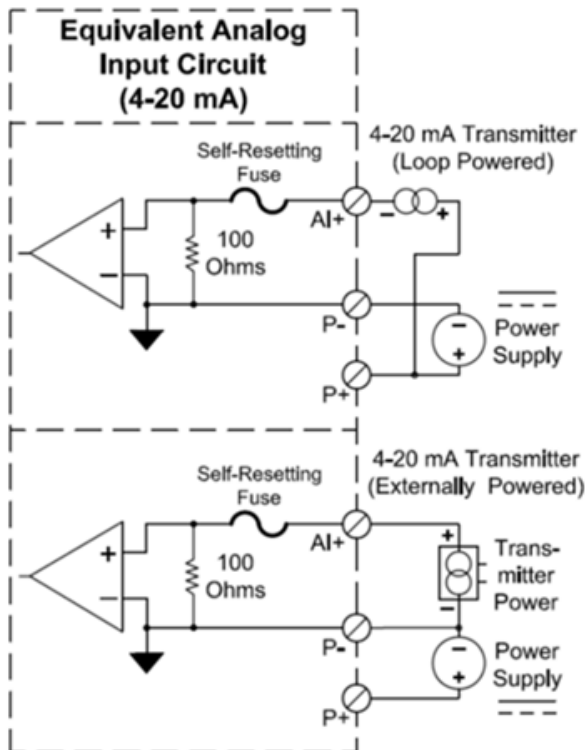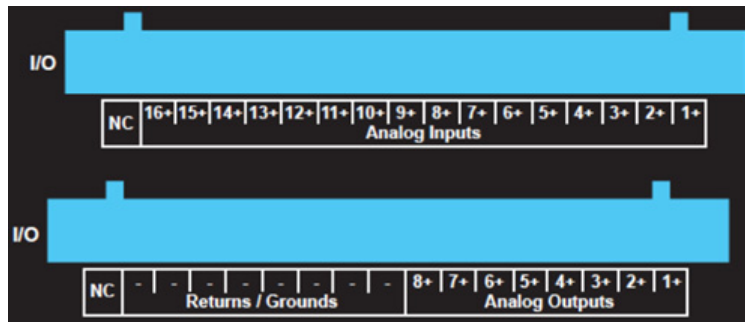
Note: The ground screws are common with the power return (P-).

Figure 31. I/O Wiring for E3-10RTD-1

Screw Terminal Assignment

| NC	NC	RTN 9	SNS 9	EXC 9	RTN 7	SNS 7	EXC 7	RTN 5	SNS 5	EXC 5	RTN 3	SNS 3	EXC 3	RTN 1	SNS 1	EXC 1	Upper Row
NC	NC	RTN 10	SNS 10	EXC 10	RTN 8	SNS 8	EXC 8	RTN 6	SNS 6	EXC 6	RTN 4	SNS 4	EXC 4	RTN 2	SNS 2	EXC 2	Lower Row

I/O Labeling

Note: For 2-wire RTDs just connect the Sense and Return screws. For 4-wire RTDs just leave the 4th wire unconnected.
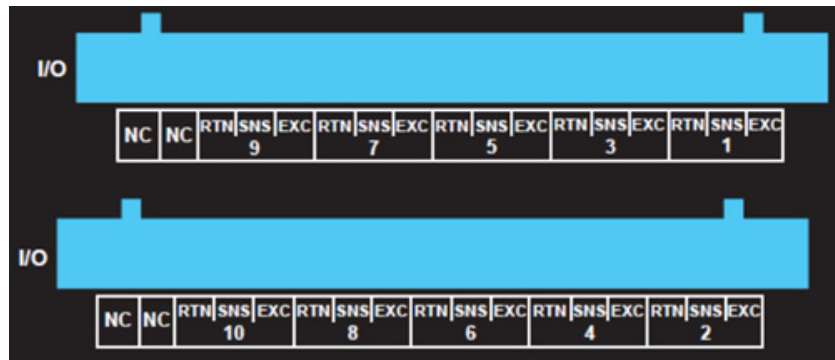
Figure 32. I/O Wiring for E3-16ISOTC-1

Screw Terminal Assignment

nc	TC- 8	TC+ 8	TC- 7	TC+ 7	TC- 6	TC+ 6	TC- 5	TC+ 5	TC- 4	TC+ 4	TC- 3	TC+ 3	TC- 2	TC+ 2	TC- 1	TC+ 1	Upper Row

nc	TC- 16	TC+ 16	TC- 15	TC+ 15	TC- 14	TC+ 14	TC- 13	TC+ 13	TC- 12	TC+ 12	TC- 11	TC+ 11	TC- 10	TC+ 10	TC- 9	TC+ 9	Lower Row

I/O Labeling

Note: This module has individually isolated I/O and therefore two screw terminals per channel. For shielded thermocouples, tie the shield to the module's chassis ground.

Figure 33. I/O Wiring for E3-16ISO20M-1

Screw Terminal Assignment

nc	AI- 8	AI+ 8	AI- 7	AI+ 7	AI- 6	AI+ 6	AI- 5	AI+ 5	AI- 4	AI+ 4	AI- 3	AI+ 3	AI- 2	AI+ 2	AI- 1	AI+ 1	Upper Row

nc	AI- 16	AI+ 16	AI- 15	AI+ 15	AI- 14	AI+ 14	AI- 13	AI+ 13	AI- 12	AI+ 12	AI- 11	AI+ 11	AI- 10	AI+ 10	AI- 9	AI+ 9	Lower Row

I/O Labeling
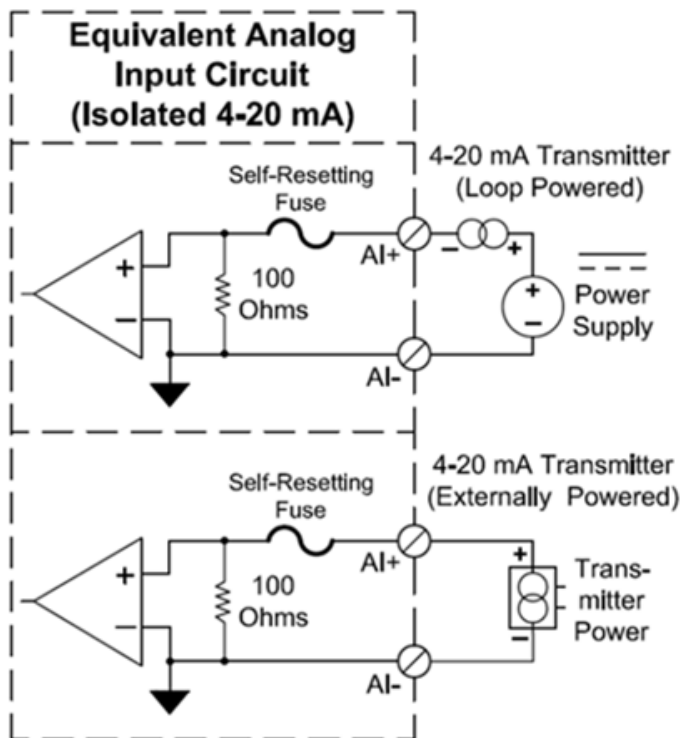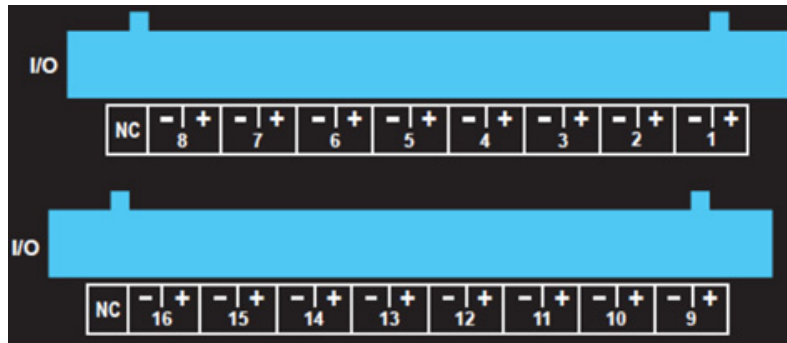
Note: This module has individually isolated I/O and therefore two screw terminals per channel. For shielded thermocouples, tie the shield to the module's chassis ground.
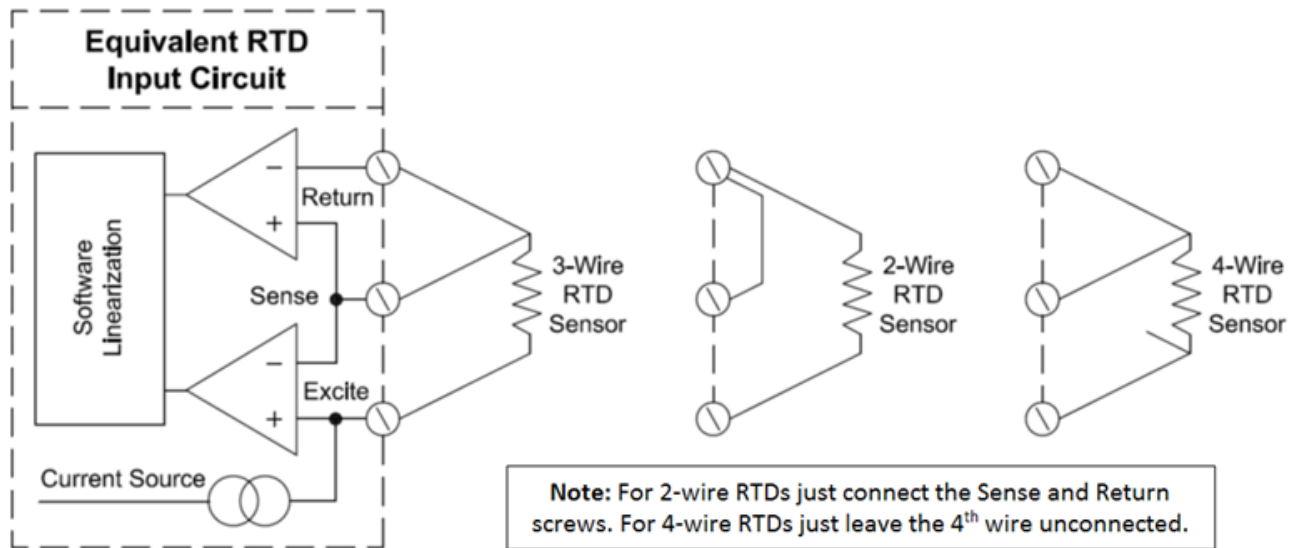
Figure 34. I/O Wiring for E3-16DORLY-1

Screw Terminal Assignment

NO 15	COM 15	NC 15	NO 14	NO 13	NO 12	NO 11	NO 10	NO 9	NO 8	NO 7	NO 6	NO 5	NO 4	NO 3	NO 2	NO 1	Upper Row
NO 16	COM 16	NC 16	COM 14	COM 13	COM 12	COM 11	COM 10	COM 9	COM 8	COM 7	COM 6	COM 5	COM 4	COM 3	COM 2	COM 1	Lower Row

I/O Labeling

Red Lion® Series E3 I/O™ Module Hardware Guide
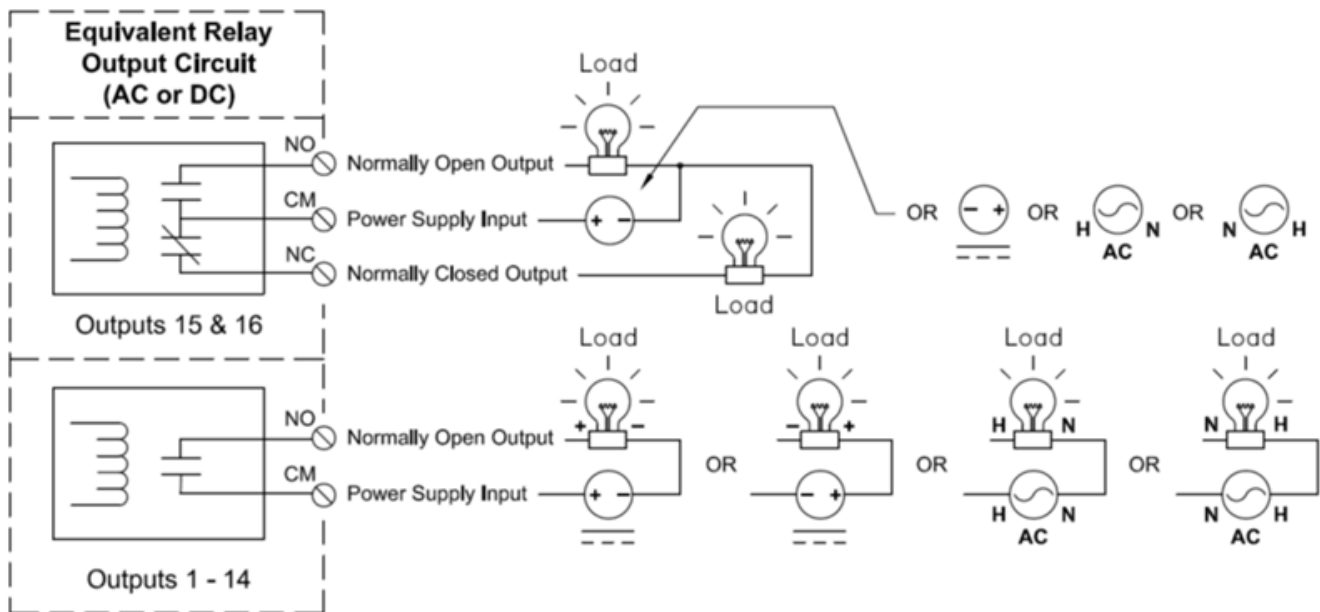
Figure 35. I/O Wiring for E3-MIX20884-1

Screw Terminal Assignment

DI14+ or DO1+	DI13+ or DO1+	DI 12	DI 11	DI 10	DI 9	DI 8	DI 7	DI 6	DI 5	DI- 4	DI+ 4	DI- 3	DI+ 3	DI- 2	DI+ 2	DI- 1	DI+ 1	Upper Row

AO+ 4	AO+ 3	AO+ 2	AO+ 1	AI+ 8	AI+ 7	AI+ 6	AI+ 5	AI+ 4	AI+ 3	AI+ 2	AI+ 1	DI20+ or DO1+	DI19+ or DO1+	DI18+ or DO1+	DI17+ or DO1+	DI16+ or DO1+	DI15+ or DO1+	Lower Row

I/O Labeling
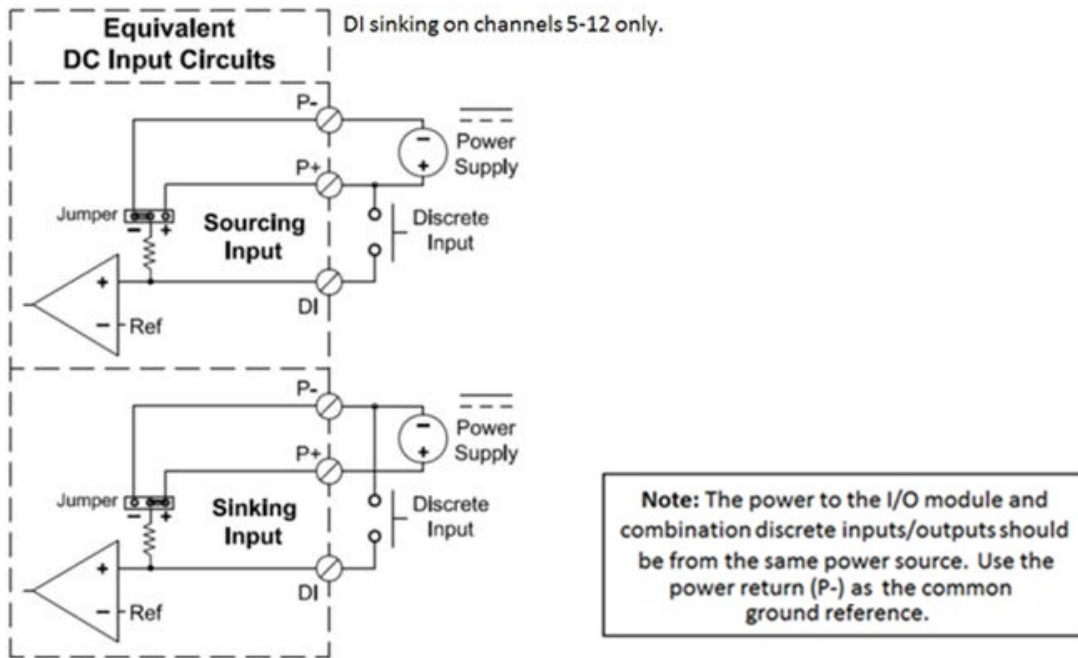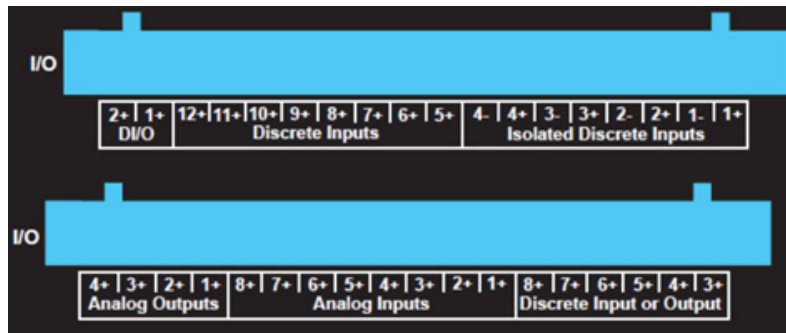
Note: Discrete input channels 5 - 12 can be sinking or sourcing as a group. This is determined by the jumper described in Chapter 3. The default is sourcing where each input is activated by applying a positive voltage (P+). Otherwise, when set for sinking then each input is activated by applying a power return (P-).

Equivalent Analog Input Circuit (4-20 mA)

Equivalent Analog Output Circuit (4-20 mA)

Equivalent Discrete DC Input Circuit (Isolated)

DI channels 1-4 only.

Equivalent DC Output Circuit (sourcing only)
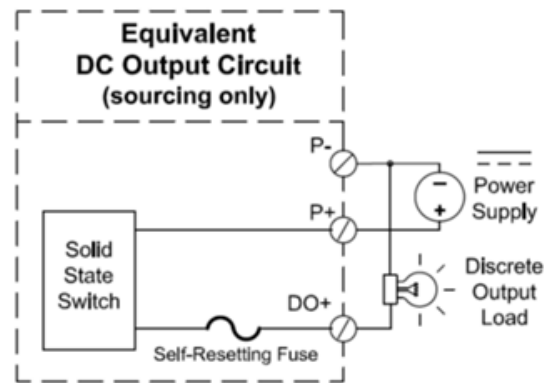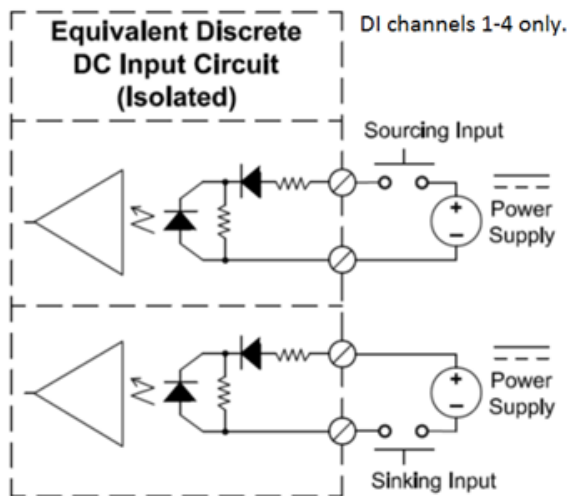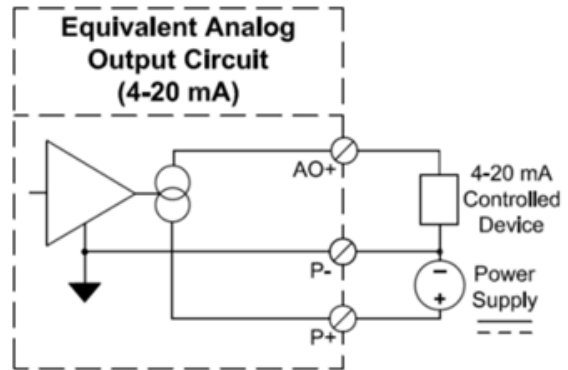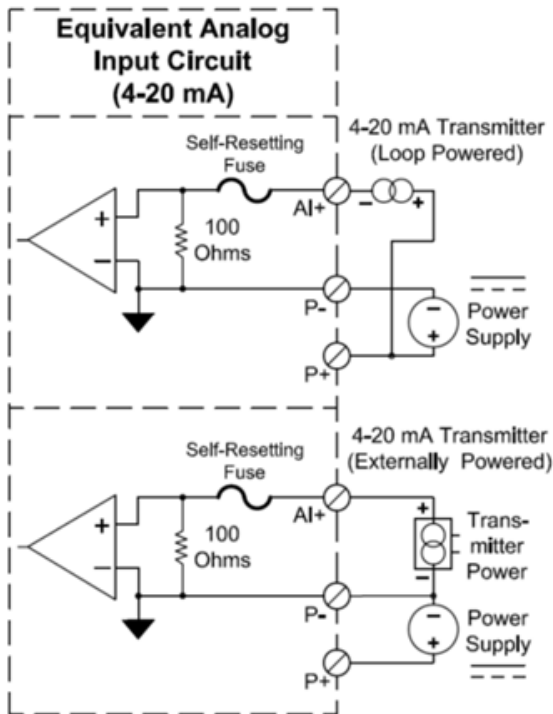
Chapter 7   I/O Functions

This chapter describes the characteristics of the various I/O functions found in this family of I/O modules. Each topic in this chapter identifies which modules in the Red Lion I/O product family include each feature.

High Density Discrete Inputs

Applicable to: E3-MIX24880-1 (DI9-24), E3-MIX24882-1 (DI9-24), E3-MIX20884-1 (DI5-20)

Standard high density discrete inputs accept input voltages in the range of the specified power supply voltage (10 to 30 VDC, 5-30 VDC on E3-MIX20884-1) and are referenced to the power return (-) to simplify field wiring. These inputs are the "sourcing type" which means they indicate an ON condition when a positive voltage source, above the threshold level, is applied to them. These inputs may be filtered to make them immune to short duration voltage spikes or mechanical contact bounce by configuring them for "Slow Response", which is approximately 6 ms per channel.

Sourcing / Sinking Discrete Input Option

Applicable to: E3-MIX24880-1 (DI1-8), E3-MIX24882-1 (DI1-8), E3-MIX20884-1 (DI5-12), E3-32DI24-1 (all 32 DI)

These discrete inputs may be configured as a group for sourcing inputs (ON when positive voltage is applied) or sinking inputs (switch closures to ground). The default configuration is sourcing. There is a selection jumper in the module that is easily accessed by removing the data flash and configuration options door. To properly set this jumper please refer to "DI COM Jumper Setting" in **Chapter 3** of this manual and follow the directions. Also make sure the module's software configuration is set to match the jumper setting, or set to "Follow Jumper".

Isolated Discrete Inputs

Applicable to: E3-MIX20884-1 (DI1-4), E3-16DI24-1 (all 16 DI), E3-16DIAC-1 (all 16 DI)

These inputs utilize two screws per input channel so that each input is isolated from all other channels and the module's internal circuitry. Except for the isolation characteristic, these inputs have the same characteristics as the high density inputs, including the counter functionality.

Discrete Input Counter Feature

Applicable to: E3-MIX24880-1, E3-MIX24882-1, E3-MIX20884-1, E3-32DI24-1, E3-16DI24-1, E3-16DIAC-1

Counter Modes: Count Up, Pulse Timing and Pulse Rate

To enable counters (16 registers: AX8 though AX23 or 12 registers AX8 through AX19 on E3-MIX20884-1), using Crimson 3.0 or the module's web interface, go to the "Discrete Options" screen and check the "Enable Counters" checkbox. Go to the "Analog Input Channels" screen, select a cell and a pull down menu is displayed. Select the mode of operation for each counter function.

In all 16 bit upward counting modes, the analog input register increases from 0 -32767, then wraps around to -32768 - 0. If the "Report all Counters as 32 Bit Values" checkbox is selected (Analog Options screen), the long integer input register (consecutive pair of analog registers) increases from 0 -2,147,483,647, then -2,147,483,648 and back to 0.

The menu selections for each of the available counter modes and their default resolutions are:

Pulse Accumulator

> **Up Counter:** 16 bit (or 32 bit) upward accumulator of input pulses.

Run Time

> **Run Time Sec:** This is the On-time Timer feature that counts the time the associated input is in the ON state. Output is in seconds.

> **Run Time Min:** This is the On-time Timer feature that counts the time the associated input is in the ON state. Same as above, except the output is in Minutes.

Pulse Rate Timing

These 16 bit registers record the pulse timing for the following timing intervals: 0.1 sec (100 ms), 0.2 sec (200 ms), 1.5 sec (500 ms), 1 second, 2 seconds, 5 seconds, 10 seconds, 30 seconds, or 60 seconds.

> **ON Pulse Width:** Time in ms between consecutive leading (OFF to ON) and trailing (ON to OFF) edges.

> **OFF Pulse Width:** Time in ms between consecutive leading (ON to OFF) and trailing (OFF to ON) edges.

Notes regarding pulse width measurements:

1. Pulses longer than the maximum size allowed by the register will result in an overflow condition (full scale 16-bit value equal to 65535).
2. Pulses shorter than 1 ms will not be accurately detected, resulting in erroneous values.
3. If no edge is ever detected by an input, the result will read as $0000. Timing only begins when an edge is detected.

High Speed Counters

Applicable to: E3-MIX24880-1, E3-MIX24882-1, E3-MIX20884-1, E3-32DI24-1, E3-16DI24-1

High speed counters can be enabled on the first two to four channels. In the web server or Crimson 3.0 software "Discrete Options" configuration page, check "Enable high speed counters on Channel #" to enable this mode. This special mode functions in the same manner as the discrete input count feature for the corresponding input, except that the maximum count rate is increased to 50 kHz (except only 2kHz on the E3-16DI24-1).

> **Note:** On the E3-MIX24880-1 and E3-32DI24-1 modules only, if high speed counting is enabled on the first discrete input channel then you must use the two counter input screw terminals (CNT+ and CNT-). The normal screw terminal (DI1+) for this channel will be ignored. If the high speed counting option is not selected, then the pulses are counted from the normal discrete input screw terminal in the manner typical of all other input channels. This isolated channel is capable of counting up to 50kHz (3,000,000 pulses/min).

> **Note:** On the E3-16DI24-1 module only the first two isolated high-speed counters are capable of counting up to 2kHz (120,000 pulses/min).

Slow / Fast Response for All Discrete Inputs

In the web server or Crimson 3.0 software, select "fast response" to use no input filtering. DC input changes as fast as 1 ms will be detected. Selecting the "Slow response" setting will tell the module to look for stable inputs for approximately 25 ms. Use this setting to filter contact bounce, which often happens while counting mechanical switch closures in noisy environments.

Combination Discrete Inputs / Outputs

Applicable to: E3-MIX24880-1 (17-24), E3-MIX24882-1 (17-24), E3-MIX20884-1 (13-20)

These channels have both input and output capabilities. Output functionality for a given channel may be individually enabled in the "Feature" column of the Discrete Options configuration window. For compatibility with I/O drivers that write I/O in fixed blocks, all eight output registers are always assigned. Only outputs that are enabled may be turned ON. Other output values will be masked in the I/O module.

All eight channels are always active as inputs. Channels that do not have their output function enabled can be used as inputs. For channels configured as outputs, the input functionality can be used to detect faults in the corresponding outputs.

> **Important Note:** The supply voltage used to power input devices connected to the combination I/O channels must match the supply voltage used to power the I/O module to avoid leakage paths or damage to the I/O circuitry on these modules. It is recommended that the same power supply be used to power the I/O module and input devices connected to these special I/O channels. If a voltage source is applied to the eight combination I/O channels that exceed the voltage supplied to the rest of the I/O module, unintended current paths may result.

High Density Discrete Outputs

Applicable to: E3-32DO24-1

High density discrete outputs provide:

- Individual maximum outputs rated for 0.5 Amp per channel, 8 Amps total per module. Short duration inrush current as high as 2 Amps is permissible.
- Sourcing switched output power at the voltage supplied to the module's supply voltage input (less a nominal voltage drop in the output's power switching device).
- Current limiting is not provided on the outputs of this module.

Isolated Discrete Outputs

Applicable to: E3-16DO24-1

Isolated discrete outputs provide:

- Individually isolated outputs rated for 0.5 Amp per channel at temperatures up to 60 °C. (0.75 Amps at higher temperatures). Current limiting provided on each output.
- Two screw terminals, isolated from all other outputs and the module's internal circuitry, for each channel.
- Any voltage up to the rating of the module may be applied to each individual output.

Isolated Output Relays

Applicable to: E3-16DORLY-1

Isolated discrete output relays provide:

- Individually isolated outputs rated for 0.5 Amp per channel.
- Two screw terminals, isolated from all other outputs and the module's internal circuitry, for each channel.
- Any voltage up to the rating of the module may be applied to each individual output.

Time Proportioned Outputs (TPO)

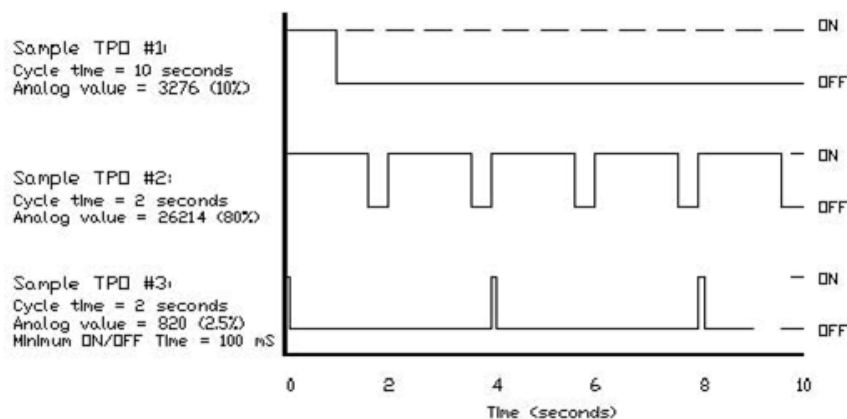### Applicable to: E3-MIX24880-1, E3-MIX24882-1, E3-MIX20884-1, E3-32DO24-1, E3-16DO24-1

The discrete output channels in all Red Lion I/O modules are capable of functioning as time proportioned outputs. Time proportioned outputs pulse ON and OFF with a duty cycle proportional to an analog value stored in a corresponding analog output register. TPO outputs are a low cost way to get smooth proportional control of heaters and other process variables. Typically, TPO analog output registers are assigned to the output of PID or other control logic in a control program. Use the module's web interface or the Crimson 3.0 software to set pulse cycling as fast as 10 ms or as slow (many minutes) as your system dynamics require. Each output may be individually configured as a TPO or ordinary discrete output.

In this example, TPO #1 has a 10 second cycle time and the analog value is 3276 (10% of full scale, which is typically 32767). The output will be ON for 1 second and OFF for 9 seconds during each 10 second period.

TPO #2 has a 2 second cycle time and the analog value is 26214 (80% of full scale). The output will be ON for 1.6 seconds and OFF for 0.4 seconds during each 2 second period.

TPO #3 has a 2 second specified cycle time, an analog value of 820 (2.5% of full scale) and a minimum ON/OFF time of 100 ms. Since the minimum cycle time is 100 ms and the calculated ON time is only 50 ms, the cycle time is readjusted by a factor of 2 to maintain the time proportion. The output will be ON for 100 ms and OFF for 3.9 seconds before repeating.

> **Note:** Non-integral remainders of time are carried forward to the next cycle, to maintain long-term accuracy. (In Example TPO #3, the below minimum time is carried forward to the next time cycle. When the below minimum value is calculated, no ON time is set for that cycle.

4 -20 mA Analog Input Wiring

Applicable to: E3-MIX24880-1, E3-MIX24882-1, E3-MIX20884-1, E3-32AI20M-1, E3-16AI20M-1, E3-16AI8AO-1

The analog input channels accept 4-20 mA signals from a variety of devices and are protected by self-resetting current shunts to prevent shunt overheat/damage. One screw terminal is provided for each input signal. All analog inputs return to a common ground (terminal 8 or 6 depending on model). Refer to illustration: Base Power & Communications Wiring Diagram in **Chapter 5**.

Open Loop Detection on 4-20 mA Inputs

This module can detect and report an open instrumentation loop on its analog inputs. By allowing the module to report a negative value if the current falls below 4 mA, low limit logic in your DCS, PLC, RTU or computer can signal the loss of current.

To enable this feature, go to the web interface's "Analog Input Channels" configuration screen and select the corresponding "Feature 1" column. A dropdown menu will appear. Select the "-Below 4 mA" setting for each desired channel. Click on the Help button for further information.

Isolated Analog Inputs

Applicable to: E3-16ISO20M-1

The analog input channels accept 4-20 mA signals from a variety of devices. The inputs are isolated to prevent ground loops and reduce inter-channel noise.

Voltage Range Analog Inputs

Applicable to: E3-16ISO20M-1

The analog input channels accept 4-20 mA signals from a variety of devices. The inputs are isolated to prevent ground loops and reduce inter-channel noise.

High Speed Analog Inputs

Applicable to: All modules with analog inputs

The first two analog inputs on all modules with non-isolated analog inputs may be configured as high speed analog inputs. Analog input channels configured in this manner will update as fast as 1 ms but resulting in a reporting resolution of only 10 bits.

Note: By default, analog inputs integrate their 16 bit reported results to provide outstanding noise rejection. The scan time of these 16 bit inputs will vary with user configuration settings.

Analog Outputs

Applicable to: E3-MIX24882-1, E3-MIX20884-1, E3-8AO20M, E3-16AI8AO-1

Analog outputs on all applicable I/O modules in this product family have a 4-20 mA output range and may be incremented (varied) with a full 16 bit resolution corresponding to the value in the associated analog output (AY) register.

> **Note:** Analog outputs on the E3-MIX20884-1 have software selectable ranges of 0-20 mA, 4-20 mA, and 0-10 VDC.

RTD Inputs

Applicable to: E3-10RTD-1

The RTD inputs are applicable on the 10 channel RTD module. A 2 or 3 wire, 100 Ohm platinum resistance temperature detector can be used to measure temperature.

Thermocouple and mV Inputs

Applicable to: E3-16ISOTC-1

The thermocouple and mV input range is 250mV. Each channel may be configured as a thermocouple or mV range input via software (Crimson 3.0 and/or web browser). The thermocouple types supported are J,K,E,R,T,B,C,N,S.

Four cold junction compensation (CJC) temperatures are provided in the module to determine screw terminal temperatures of all 16 channels. Each CJC temperature sensor is positioned underneath the screw terminals and measures the temperature of four screw terminals. These temperatures can be read using Sixnet UDR or Modbus protocol at AI:17 -20 (3:0017-3:0020). The first sensor (AI:17) measures the screw terminal temperature of channels 1-4 (AI:1-4). The second (AI:18) measures the screw terminal temperature of channels 5-8 (AI:5-8). The third (AI:19) measures the screw terminal temperature of channels 9-12 (AI:9-12). The fourth (AI:20) measures the screw terminal temperature of channels 13-16 (AI:13-16).

The cold junction compensation temperatures reported are redundant and provide error reporting. If any of the CJC sensors fail, report an inaccurate temperature or valid temperature cannot be ascertained the module will fall back to the linear average of the remaining sensors, the last known good value or 25°C depending on the failure state. This way the thermocouple channels will always report the most accurate value possible even if one or more or all the CJC temperature sensors fail. The four failure states, the error reported and the corresponding fallback state are defined below.

GOOD (measured screw terminal temperature): In this state there are no error conditions found. All the CJC sensors (AI:17-20) will report only the measured temperature.

DEAD (-1000): In this state the module firmware has determined that one or more CJC sensors are non-responsive to communication polling. In this state the sensor(s) reported temperature value will change to -1000. When the sensor is in the DEAD state the module firmware will substitute the linear average of the remaining GOOD CJC sensors on that module for the DEAD sensor. The substitution will ensure the temperature reported on the associated thermocouples is still accurate even though the CJC sensor is not working.

FAULTY (-2000): In this state the module will determine if the CJC sensors are reading realistic values. If one or more of the CJC sensors are reporting unrealistic temperature values then the value reported in the analog registers will be -2000. The valid temperature range is hard-coded at -50 to +100°C (outside the modules operating temperature with some overhead to account for ambient temperature fluctuations). When the CJC sensor is in the FAULTY state the module firmware will substitute the linear average of the remaining GOOD CJC sensors on that module for the DEAD sensor. The substitution will ensure the temperature reported on the associated thermocouples is still accurate even though the CJC sensor is not reporting the correct temperature.

QUESTIONABLE (-3000): This condition determines if one or two sensors don't agree with the other sensors by comparing each CJC temperature sensor with adjacent sensors. If the CJC sensor differs by 10°C or more from an adjacent CJC sensor it is considered QUESTIONABLE and the reported value will be -3000. When the sensor is in the QUESTIONABLE state the module firmware will substitute the linear average of the remaining GOOD CJC sensors on that module for the DEAD sensor. The substitution will ensure the temperature reported on the associated thermocouples is still accurate even though the CJC sensor is not reporting the correct temperature.

INDETERMINATE (-4000): When none of the CJC sensors can agree on the temperature reported, the temperature on all the sensors will be -4000. This condition may occur if all the sensors are in a QUESTIONABLE state or two sensors are reporting a bogus temperature. This is a multiple failure mode, which must be INDETERMINATE for functional sensors. DEAD or FAULTY sensors will continue to report that state. When a CJC sensor is determined to be INDETERMINATE the module firmware will substitute the CJC sensor value with 25 degrees C when the module is initialized on power-up or the last known good value. The substitution will ensure the temperature reported on the associated thermocouples is as accurate as possible even though the CJC sensor is not reporting the correct temperature.

Watchdog Output

Applicable to: All I/O modules

A microprocessor in the module continuously monitors several user-selected system functions. Additionally, an independent CPU watchdog microprocessor in the module also monitors the main CPU and can be used to indicate a failure of the main CPU. The watchdog options are (as selected in the web interface or Crimson 3.0 software):

- Power 1 Failure
- Power 2 Failure
- Ethernet Ring Failure
- Watchdog CPU Monitor
- I/O Poll Timeout
- Heartbeat Timeout

The default state of the Watchdog Output is ON (True). If an error condition in any one of the user-selected parameters is detected, the Watchdog will output an OFF (False) state.

The default watchdog time period is 3 seconds, and may be set as high as 65 seconds to allow for telemetry equipment or application-related program delays. The timer period selected will apply individually to each watchdog function selected.
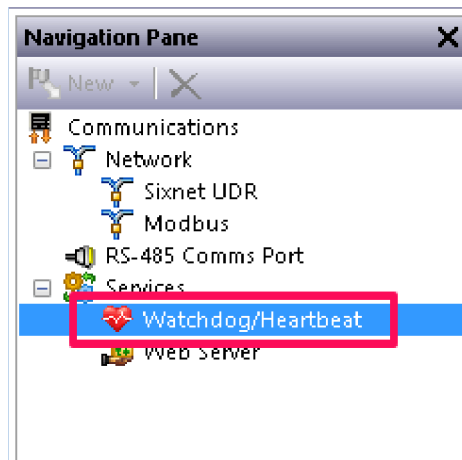
Heartbeat Monitor

Applicable to: All I/O modules

The heartbeat monitor is a software selection in the "Watchdog/Heartbeat Monitor" configuration page. When the heartbeat timeout option is selected the module firmware will monitor a discrete register of choice (virtual or physical) for a heartbeat toggle. When a heartbeat toggle has not been received on the given heartbeat register within the given Heartbeat Timeout period the module can be configured to drop outputs (virtual and/or physical). This can be used as a fail-safe in case the Controller, RTU, or SCADA system writing the outputs to the Red Lion modules fails. Please see the Crimson 3.0 or web user interface help for more information on how to configure this feature.

How to create a heartbeat in a graphite HMI and transfer it to the E3 I/O.

1. To enable heartbeat timeout open the Crimson 3.0 Navigation pane and go to Communication → Services → Watchdog/Heartbeat.

2. Once the Watchdog/Heartbeat Monitor settings window appears, enable the Heartbeat Timeout feature under Heartbeat Timeout Actions and select the Heartbeat I/O Register Address that will be toggled in the dual Ethernet I/O module. In this case Discrete Output (DO) 65 is used.

   Note: Any DO address in the dual Ethernet I/O module may be used as the Heartbeat I/O Register, but it is usually best to use a register in the modules memory at DO 33 or beyond. Only Discrete Input (DI) registers 65 and beyond may be used since registers 1-64 are reserved for physical inputs or module status tags.
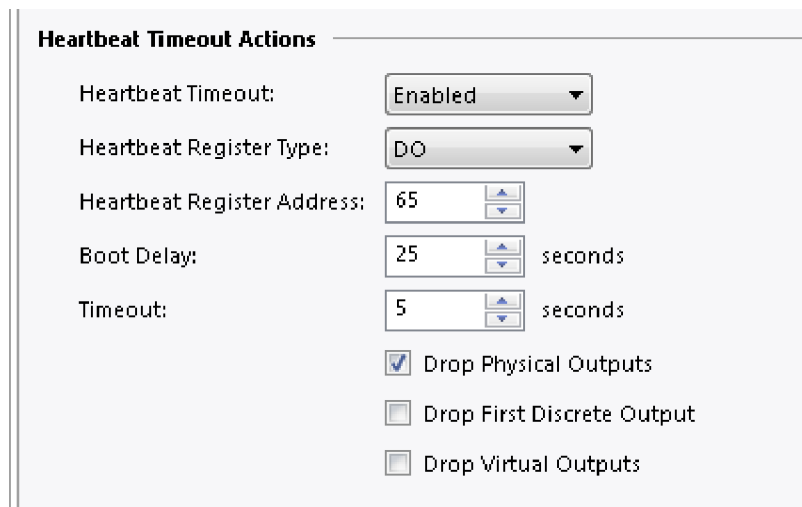
3. Next, a heartbeat must be configured in the Red Lion HMI. A General Flag Tag must be created from the Data Tags dialog window. Click on the Data Tags button in the Crimson 3.0 Navigation pane.

4. In the Data Tags dialog window, type: **GetNow()%2** in the Source field.
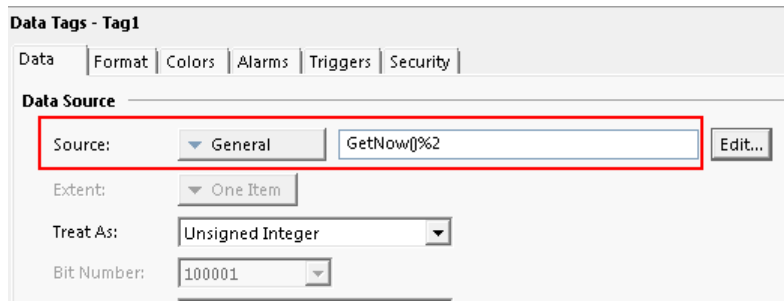
5. Now we need to transfer the Flag Tag to the dual Ethernet I/O module. To do that add the Dual Ethernet I/O module as a device on the Network port configured for Red Lion E3 Master TCP/IP driver. First enable IP communication on the Communications → Network screen setting the IP of the HMI to a compatible Subne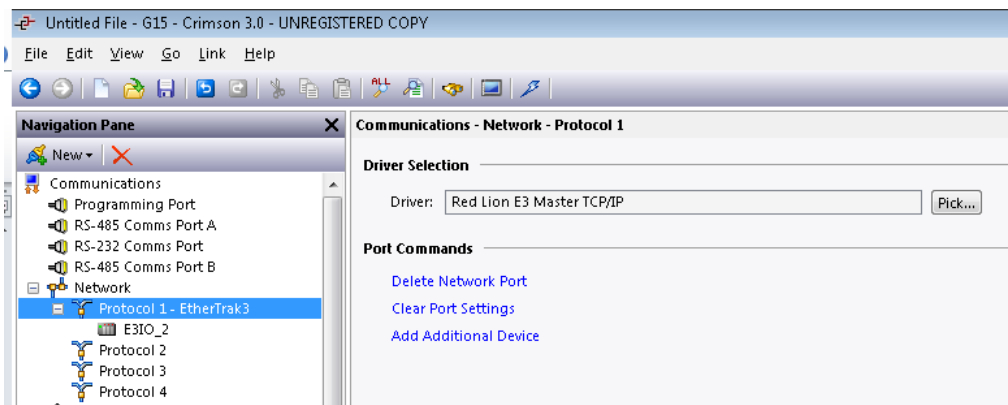t. Next, click on the Communications → Network → Protocol 1 screen in the navigation pane. Select Red Lion → E3 Master TCP/IP driver in the drivers selection button in the navigation pane.

6. Add a block I/O to the E3IO configuration for the dual Ethernet I/O module with a block size of 1 for one discrete bit. DO 65 was used in this case to match to heartbeat register setting in the in the E3 I/O module. Drag the heartbeat flag tag (created earlier) on to the newly created I/O Block. This action transfers the heartbeat tag to the E3 I/O and creates a heartbeat that the E3 I/O will monitor.

Modbus register Addresses

Applicable to: All I/O modules

The I/O available in each I/O module is the same (Discrete Inputs: 512, Discrete Outputs: 512, Analog Inputs: 256, Analog Outputs: 256). However, the way I/O addresses are allocated varies slightly from module to module depending on the on-board I/O available. The top level page of the I/O Channels section in Crimson 3.0 software provides a summary of available I/O channels and how they are allocated in that particular module. The Modbus address table is also located in the E3 I/O User Manual.

Chapter 8 Communications

Dual Ethernet Mode Configuration Alternatives

Use either the web server within the module or the Crimson® 3.0 Windows-based configuration tool to configure the two Ethernet ports.

> **Note:** The Dual Ethernet Mode selected in this option must match the jumper setting in the base. Refer to **Chapter 3 "Setting the Network Mode Jumper"** in this document.

> **Note:** If the jumper is missing, the setting in the base defaults to the "Two Networks" mode.

> **Note:** The red alert LED on a Dual Ethernet module will blink if the configuration setting mismatches the hardware jumper setting.

> **Note:** The default state of this configuration option is "follow the Jumper", so the initial set up can be done without the configuration of the Red Lion Crimson 3.0 software.

In the Ethernet configuration screen, choose one of these four options that is appropriate for your application (refer to the Help files for additional configuration information):

Ethernet Passthru: An unmanaged switch in the module passes Ethernet traffic between the ports. This option allows I/O modules to be daisy-chained without the need for external switches.

Ring Switch: This option allows the two Ethernet ports to act as Real-Time Ring switch ports. This mode should only be used if this module will be placed in a closed ring consisting of other similarly configured I/O modules, and Real-Time Ring switches.

> **Note:** Closing the ring when this mode is disabled will adversely affect network communications. Close the ring only after this mode is configured, open the ring before disabling this mode.

Two Networks: In this option, traffic is blocked between the two Ethernet Ports so that the I/O module can be connected to two independent networks. Each Ethernet port will require its own IP address.

Follow the Jumper: When this option is selected the communications mode configuration setting in the Crimson 3.0 software will follow the state of the network mode hardware jumper on the base. The alert LED will not blink because of a jumper mismatch in this mode.

Communication Ports Overview

These I/O modules have the following communication ports and connectors:

	Two Ethernet Ports	USB Port Style	RS485 Port Style
Applicable to all modules	RJ45 (shielded)	Type B (shielded)	Screw Terminals

Ethernet Port

10/100BaseT dual Ethernet ports are found on all units. Standard RJ45 connectors are provided with standard 802.11 pin-outs. These ports have fixed unique MAC addresses. The IP addresses can be set with the Red Lion Crimson 3.0 software or through a web browser. Further details are available in the Crimson 3.0 documentation or the web browser documentation.

Use data-quality (not voice-quality) twisted pair cable rated category 5 with standard RJ45 connectors. For best performance use shielded cable. These modules have an auto-crossover feature and may be connected with either straight through or cross-over type cables.

The protocols supported are different depending on how you are using the port. When the module is used in a slave mode UDP/IP and TCP/IP protocols maybe used. When using the I/O transfer feature in the module (master mode) only the UDP/IP protocol may be utilized.

USB Port

The USB port is intended for configuring the module only. It is possible to make I/O requests through the USB port in Universal (native) protocol. This port may not be configured as a Modbus port.

RS485 Port

This port is found on the base for all Red Lion I/O Modules. It provides a RS485 (2-wire, half duplex only) connection to other RS485 equipment. Screw terminals are available for RS485+, RS485-, RS485 GND and RS485 Termination **Chapter 8** for details on wiring your RS485 port.

These Red Lion I/O modules can act as Ethernet to RS485 converters and "Passthru" (pass-through) Modbus or Sixnet messages from Ethernet to RS485. In this "Passthru" mode, these modules do not convert protocols. If a module's serial port is configured for Modbus Passthru mode, then you must communicate to the gateway over Ethernet with Modbus/TCP or Modbus/UDP. If the module's serial port is configured for Sixnet Passthru mode, then you must communicate to the gateway over Ethernet with the Sixnet® protocol.

RS485 Modes of Operation

The Red Lion I/O Modules can be configured with the web server or the Crimson 3.0 Windows software using the modes of operation listed in the table below.

Select the protocol that the I/O module will send or respond to.

Sixnet Universal Binary and Modbus RTU Master	This port will transmit requests in Universal Binary and Modbus RTU protocols. (Requests can be "Passthru" messages or I/O Transfers as defined with this module's configuration.)
Sixnet Universal Hex and Modbus ASCII Master	This port will transmit requests in Universal Hex and Modbus ASCII protocols. (Requests can be "Passthru" messages or I/O Transfers as defined with this module's configuration.)
Sixnet Slave	The port will respond to Sixnet Universal protocol requests in either Hex or Binary Format.
Modbus RTU Slave	The port will respond to requests in Modbus RTU protocol.
Modbus ASCII Slave	The port will respond to Modbus ASCII requests.
Disabled	No protocol supported. Port is inactive.

Chapter 9   Status LEDs

Status LED Location

Each of these I/O modules has an array of LEDs on its front panel. These LEDs can be useful for system diagnostics. The image below shows the LEDs found on a typical "MIX" module. The group of LEDs on the right are common for all modules. These display communication and system status. The group on the left will vary depending on the module's I/O type and quantity. These display I/O status. Refer to the image below for more information.
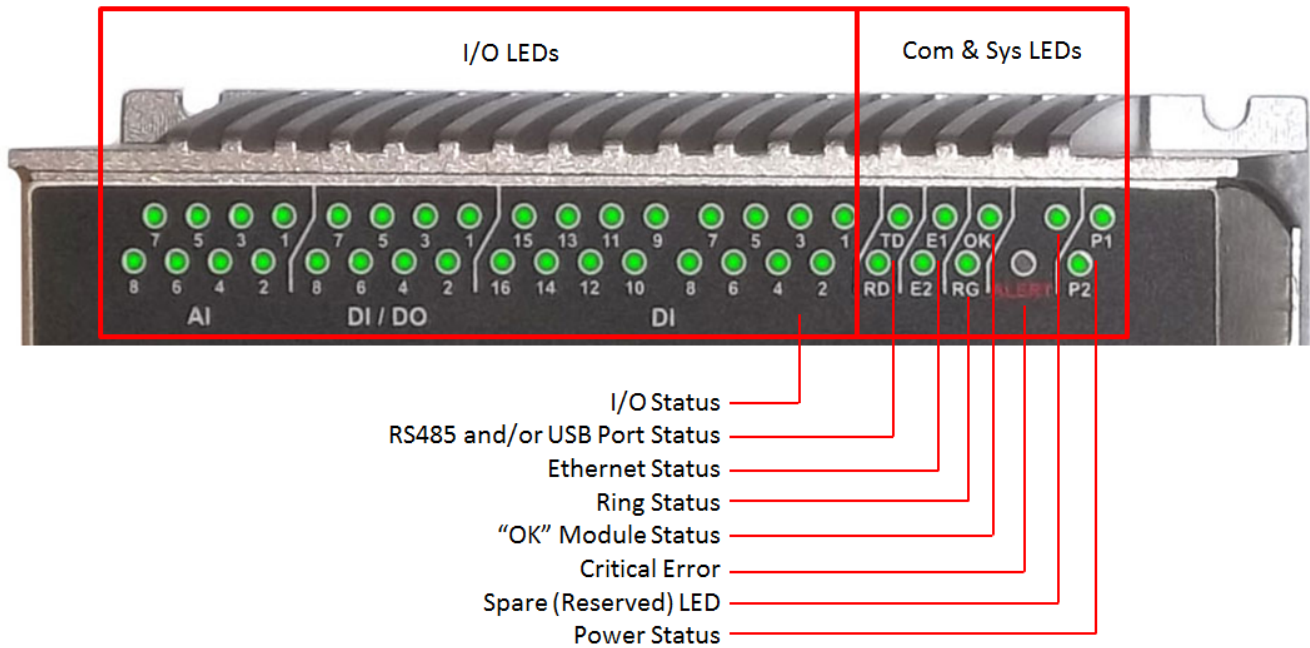
Power LED Indication

Each module has 2 green Power LED's which are Power 1 and Power 2. These LEDs are associated with the 2 possible power sources of the I/O module. If a power supply is connected to the associated screw terminal, the corresponding LED will be ON.

Alert LED Indication

There is a single red ALERT LED used to display critical errors in the module. The ALERT LED has the following behavior:

State	Description
Full OFF	Everything is OK.
2 ON Blips repeating	Bad configuration data has been loaded to the module. Try re-loading the configuration.
3 ON Blips repeating	Hardware DI jumper does not match loaded configuration.
1 OFF Blip repeating	Could not open configuration file (file corrupt in memory).
2 OFF Blips repeating	File System Fatal Error (corrupt flash memory).
3 OFF Blips repeating	Fatal Hardware Failure.

OK LED Indication

There is a single green OK LED used to display the status of the module. It has the following functions:

State	Description
ON Solid	The OK LED will be in a steady ON state when both P1 and P2 power inputs are powered and all configured rings have continuous ring integrity.
OFF Completely	The OK LED will be OFF if either P1 and/or P2 is not powered or if any one of the active rings for this switch is a member of, encounters a segment failure.
Blinking	To verify communication and target switch selection, you can request the module to "wink" (10 blinks/sec) its OK LED to visually identify the unit. This function is controlled through the Windows configuration and maintenance software tools.

Ring LED Indication

The "RG" LED is illuminated if the Ethernet ring is closed (complete Ethernet ring) and not illuminated if a ring is not configured. Other active ring conditions are as follows:

State	Description
Blinking	A blinking LED (500 ms ON, 500 ms off), is an indication of an incomplete ring, but ring ports see an adjacent ring partner.
Blip	An LED Blip (100 ms ON, 900 ms OFF) is an indication that there is a missing ring partner.
ON Solid	The RING is complete and there are no segment faults.

Ethernet Link Activity Indication

Each Ethernet port (E1 and E2) has a single corresponding green LED which is used to indicate link and activity. The LED's have the following behavior.

State	Description
OFF Completely	Unlinked / Disconnected.
ON Solid	Linked (either 10/100 speed).
Blinking	Linked and activity is present.

TR / RD Activity Indication

Depending on the option selected by the user, the TD / RD LEDs indicate activity. The LED micro-controller will pulse stretch an indication that data has been received or transmitted. The user configuration choices are:

- Any serial port (default).
- USB port
- RS485 port

Discrete LED Indication

Discrete LEDs are status indicators for physical outputs or inputs based on corresponding binary tags as defined below.

Status LED	Description
Discrete Outputs	Discrete Outputs each have a single associated green LED. This LED is ON when the output is ON and off when the output is OFF.
Discrete Inputs	Discrete Inputs each have a single associated green LED. This LED is ON when the input is ON and off when the input is OFF.
Blinking for Inputs	When the frequency of an input (such as a counter signal) is increased, the LED will follow the input state up to approximately 20Hz, and will stop increasing its blinking rate further. This prevents the scan rate of the LED's from falling lock-step with the input frequency which could result in erratic LED behavior or patterns in the blink rate. This state does not apply to relay modules.

Analog Input Status

The 4-20 mA, RTD, thermocouple and millivolt analog inputs have LED's that correspond to the following configuration:

State	Description
ON Solid	This will be in a steady ON state if the read value is between 4 mA and 20 mA (zero and full scale) or when the RTD, thermocouple (burnout disabled) or millivolt is detected.
Blinking	This LED will be blinking if the value is between 1 mA and 4 mA, or greater that 20 mA (outside the normal operating range). Please note that calibration settings may alter the exact threshold for this state. Note: This state does not apply to the RTD, thermocouple or millivolt modules.
OFF Completely	In 4 to 20 mA channels when the value is less than 1 mA. In RTD temperature channels when the RTD is not present/functional or the channel is disabled. In thermocouple channels the burnout is detected. In millivolt channels no signal is detected.

Chapter 10   Configuring Red Lion I/O Modules

Web Server Overview

These Red Lion I/O modules include an embedded web server. This is the primary and recommended means for configuring I/O modules as stand-alone, independent devices ready to communicate with I/O polling masters (process controllers). Users can use a standard web browser to access web pages to configure and maintain the module and to validate changes.

Features include:

- Communications Options
- I/O Configuration
- Maintenance and Monitoring
- Analog Calibration
- Advanced Tools
- Password Security

Access the web server by connecting the Ethernet port of any PC to either of the Ethernet ports on the Red Lion unit. Use a standard Ethernet patch cable (either straight or crossed-wired will work).

Please note that security options, including disabling the web server altogether, may be set using the Crimson 3.0 configuration software.

Access the web server by simply pointing your browser to the IP address of the I/O module.
Example: 192.168.1.21

Note: Recommended web browsers are Internet Explorer, Mozilla Firefox and Chrome. When using Internet Explorer please disable native XMLHTTP by going to Tools→Internet Options→Advanced.

Setting the IP Address

The default IP address, as shipped from the factory is: 192.168.1.21

Change the IP address by accessing the web server pointed to the current IP address. You can also change the IP address using the Crimson 3.0 software, via the Ethernet port or the USB port.

Red Lion Crimson 3.0 Software

As an alternative to configuring I/O modules with their embedded web server is the Red Lion Crimson 3.0 configuration software. This Windows software is strongly recommended because it is easier to manage configuration archives via Crimson 3.0 database files.

Refer to the online help within Crimson 3.0 for more information on using this software. Install from www.redlion.net.

Service and Support Information

Service Information

We sincerely hope that you never experience a problem with any of our products. If you do need service, call Red Lion at 1-877-432-9908 for Technical Support. A trained specialist will help you determine the source of the problem. Many problems are easily resolved with a single phone call. If it is necessary to return a unit to us, an RO (Repair Order) can be obtained on the Red Lion website.

Red Lion tracks the flow of returned material with our RO system to ensure speedy service. You must include this RO number on the outside of the box so that your return can be processed immediately.

Be sure to have your original purchase order number and date purchased available.

We suggest that you give us a repair purchase order number in case the repair is not covered under our warranty. You will not be billed if the repair is covered under warranty.

Please supply us with as many details about the problem as you can. The information you supply will be written on the RO form and supplied to the repair department before your unit arrives. This helps us to provide you with the best service, in the fastest manner. Repairs are completed as soon as possible. If you need a quicker turnaround, ship the unit to us by air freight. We give priority service to equipment that arrives by overnight delivery.

We apologize for any inconvenience that the need for repair may cause you. We hope that our rapid service meets your needs. If you have any suggestions to help us improve our service, please give us a call. We appreciate your ideas and will respond to them.

For Your Convenience:

Please fill in the following and keep this manual with your Red Lion system for future reference:

P.O. #:_____   Date Purchased: _____

Purchased From:_____

Serial Number: _____

Product Support

Technical Support:
Phone: +1 877 432-9908
Fax: +1 717 764-0839
E-mail: support@redlion.net
Hours: 8:00 am to 5:00 pm EST

Customer Service:
Phone: +1 877 432-9908
Fax: +1 717 764-0839
E-mail: customer.service@redlion.net
Hours: 8:00 am to 6:00 pm EST

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