EOTec MX Multiplexer System

Bi-Directional Control & Communications User Manual

Ultra ELECTRONICS

Original Instructions

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Standards & Safety

The EOTec MX Multiplexer Modules from Ultra Electronics have been designed to meet the following standards.

The EOTec MX Multiplexer Series of products all meet the requirements for CE marking per EN61326-1.

The EOTec MX Multiplexer Series of products are all FM approved for use in hazardous locations Class I, Division 2, Groups A, B, C & D, T4. Ambient temperature -40°C To +85°C Max.

FM11ATEX0067X

ATEX Special Conditions of Safe Use
1. Modules shall be installed in an enclosure which maintains an ingress protection rating of IP54 and meets the enclosure requirements of EN60079-0 and EN60079-15.
2. The EOTec modules shall be installed in DIN rail with DIN end clamps mounted on both sides of the module set.
3. The DIN rail must be connected to Protective Earth in order to provide modules with a Protective Earth connection.
4. Do not disconnect equipment connections or modules when energized.

When operating, do not look directly into the transmit optical port or use magnification or focusing equipment to view optical output.

IEC 60825-1, Class 1 Laser Product
FDA 21 CFR 1040.10 & 1040.11

CAUTION: Use of controls and/or adjustments or the performance of procedures other than those specified herein may result in hazardous radiation exposure.

Lightning Danger: Do not work on equipment during periods of lightning activity.

Ultra Electronics Protected Technology Policy

ULTRA ELECTRONICS, NSPI protects your investment in with long-term planned technology and our unique Protected Technology Policy. We will continue to support the specified capabilities of standard ULTRA ELECTRONICS products for at least five years (twenty years for Industrial Managed Switches). We plan each product improvement and new feature to be upward compatible with existing designs and installations. Our goals are to make each new software release bring new power to your ULTRA ELECTRONICS systems and have every existing feature, applications program and data file continue to work. We protect your investment even further with a liberal five-year trade-in policy. Exchange standard products for upgraded versions of the same product to take advantage of new features and performance improvements at any time for five years. A prorated trade-in allowance will be given for your existing equipment. ULTRA ELECTRONICS protects your long term productivity with state-of-the-art planned technology and continued support.

ULTRA ELECTRONICS Statement of Limited Warranty

ULTRA ELECTRONICS, NSPI, manufacturer of ULTRA ELECTRONICS, NSPI products, warrants to Buyer that products, except software, manufactured by ULTRA ELECTRONICS, NSPI will be free from defects in material and workmanship. ULTRA ELECTRONICS, NSPI's obligation under this warranty will be limited to repairing or replacing, at ULTRA ELECTRONICS, NSPI's option, the defective parts within one year of the date of installation, or within 18 months of the date of shipment from the point of manufacture, whichever is sooner. Products may be returned by Buyer only after permission has been obtained from ULTRA ELECTRONICS, NSPI. Buyer will prepay all freight charges to return any products to the repair facility designated by ULTRA ELECTRONICS, NSPI. This limited warranty does not cover losses or damages which occur in shipment to or from Buyer or due to improper installation, maintenance, misuse, neglect or any cause other than ordinary commercial or industrial applications. In particular, ULTRA ELECTRONICS, NSPI makes no warranties whatsoever with respect to implied warranties of merchantability or fitness for any particular purpose. All such warranties are hereby expressly disclaimed. No oral or written information or advice given by ULTRA ELECTRONICS, NSPI or ULTRA ELECTRONICS, NSPI's representative shall create a warranty or in any way increase the scope of this warranty. This limited warranty is in lieu of all other warranties whether oral or written, expressed or implied. ULTRA ELECTRONICS, NSPI's liability shall not exceed the price of the individual units, which are the basis of the claim. In no event shall ULTRA ELECTRONICS, NSPI be liable for any loss of profits, loss of use of facilities or equipment, or other indirect, incidental or consequential damages.

INSTALLATION AND HAZARDOUS AREA 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, ULTRA ELECTRONICS, NSPI 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.

WARNING (EXPLOSION HAZARD)   SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS 1, DIVISION 2 (ZONE 2).

WARNING (EXPLOSION HAZARD)   WHEN IN HAZARDOUS LOCATIONS, DISCONNECT POWER BEFORE REPLACING OR WIRING UNITS.

WARNING (EXPLOSION HAZARD)   DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NONHAZARDOUS.

Copyright & Trademarks

1. Introduction

This manual describes the uses for the EOTec MX Multiplexer, low cost fiber optic modem control and communications modules specially designed for providing analog control devices such 4-20mA or 0-10Vdc, digitally control devices such as dry contact closures, and communications devices such as RS-232/485 for industrial field applications.

Low cost fiber optic modem control and communications devices are swiftly being adopted by the industrial automation and control industry. Industrial applications often demand rugged, robust equipment that can provide high reliability in settings far removed from a comfortable, climate-controlled office environment.

Fiber optic technology provides many advantages for industrial control applications. These include EMI/RFI immunity, the ability to run fiber optic cable through hazardous areas, and the ability to connect long distance communication links. Modem devices attached to a network normally cannot tell the user what is happening elsewhere on the system. The EOTec MX Multiplexer has real-time alarms that are a vital feature to keep system administrators and operators informed when a problem exists in their control/communications network.

1.1. EOTec MX Multiplexer Modular Solution

The EOTec MX Multiplexer fiber optic modular solution is designed to give reliable operation in harsh industrial environments. Ultra Electronics provides a modular solution for addressing various control and communication requirements. To create the multiplexed fiber optic modular solution that meets your needs, begin with connecting two locations together using two bi-directional MX Multiplexer fiber optic base units, connect a suitable 15 to 30Vdc power supply to each base, and create a communication link with two fiber optic cables. Now, that you are established a link between your two locations as shown in Figure 1, you are ready to start adding I/O modules of your choice.

As shown in Figure 1, the fiber optic base modules are connected using Small Form-factor Pluggable (SFP) transceivers and fiber optic cable. The user can select either a multi-mode or single mode solution and select from four different transceivers depending on the distance required.

I/O modules can now be added to provide the solution desired. Bi-directional communications allows the user to place input and output modules on either side of the fiber. Each I/O module is plugged into the Base using the 10 + 2 Interconnection BUS (see Figure 2). Select either 2-Port or 4-Port I/O modules to form your solution. As few as 2 or up to 16 I/O ports can be supported in one network.
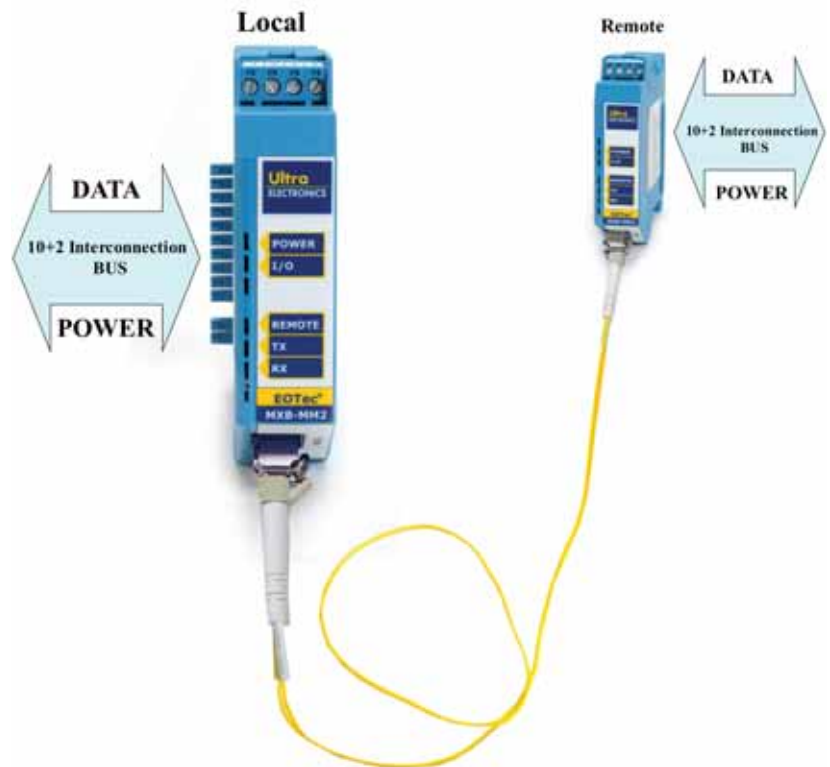
Figure 1: Fiber Optic Base Modules

Select I/O modules to provide analog data links (4-20mA or 0-10Vdc), digital data links (dry contacts), or RS232/485 communication links. All 16 channels can be of the same type or you can combine all three module types in one network. See the Multiplexer Hardware section for more information on module specifications.
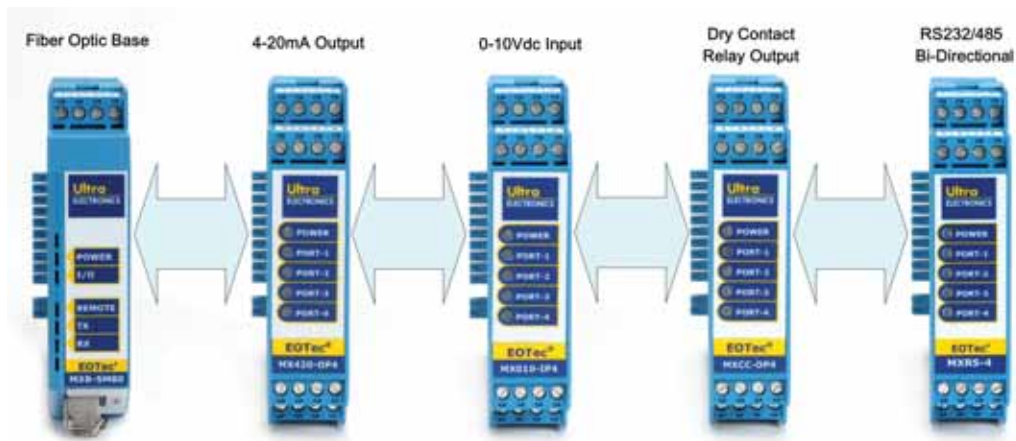
Figure 2: 10 + 2 Interconnection BUS

For the network to communicate properly, each input module must be mated as a pair with an output module on the opposite side of the fiber as shown in Figure 3. This pairing is created by setting internal switches inside these modules to the same address. The Base module uses this address to properly route the data flowing between these two modules. It does not matter what order the modules are assembled in each module stack.
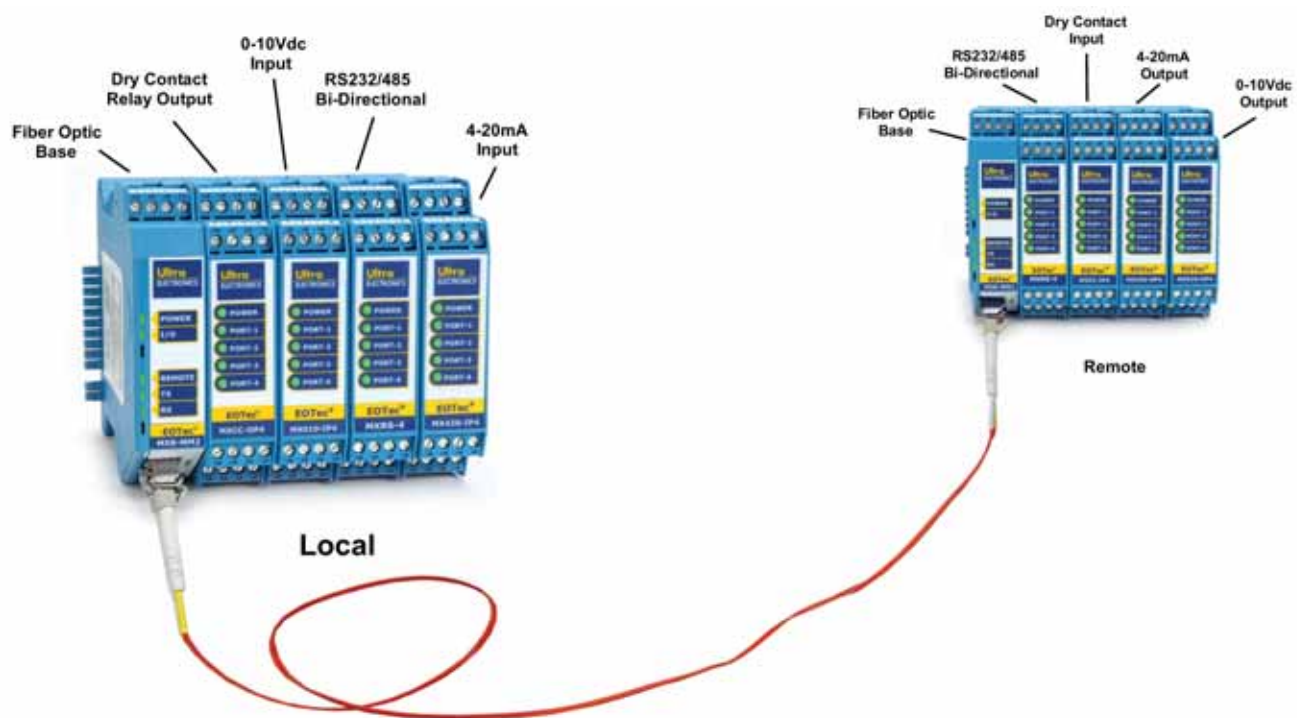
Figure 3: Mated Pairs

Each EOTec MX Multiplexer module comes with LED indicators for local determination of communication status. In addition, the base module comes with optional alarm relay contacts that can be wired to provide status information at a remote location. See the Troubleshooting section for more information on LED indicators.

2. EOTec MX Multiplexer Hardware

This chapter describes the EOTec MX Multiplexer product line and how it is designed to give reliable operation in harsh industrial environments. The Fiber Optic Base or MX Base unit (MXB) is the heart of the Ultra MX Multiplexer Stack and a direct optical connection between your local site and a remote area to be controlled or monitored. It can be used to link together either analog or digital control signals and provide noise immune communications over long distances.

2.1. MX Base: Products Designed for Industrial Applications

- High Performance Reliable Technology
 - > Update Rate: 57.6Khz, independent of number of modules or channels utilized
  - > Small Form-factor Pluggable (SFP) LC type optical connector
- Industrial Design for High Reliability
  - > Modular, flexible, scalable
  - > Operating temperature range -40 to +85C
  - > FM approved for Class I, Div 2, Groups A, B, C & D, T4
  - > ATEX listed II 3 G Ex nA nC IIC T4 Ta = -40 °C to 85 °C
  - > Standard 35 mm DIN-rail mounting
- Additional Features
  - > Remote alarm relay. Form-C (SPDT); 30Vdc @ 1A.
  - > Local and remote diagnostic LEDs
  - > Patch cords are available to convert to the optical connector type of your choice

Model	Specifications
MXB-MM2	**Input Power Range:** 15 to 30VDC. 150mA @ 24Vdc **Optical Fiber Type:** Multi-Mode; 1310nm **Optical Dynamic Range:** 8dB, 62.5/125 fiber (2k) **Screw Terminals:** Pluggable, Cage Clamp Screw Terminal Blocks (12 to 24 AWG) **Weight:** < 9 oz. **Enclosure Material:** Polyamide **Flammability Rating:** UL 94V-0 **Input Fuse:** 1.25A 125V Replacement fuses can be purchased from your Schurter distributor. Part number 3403.0167.11

MXB-SM15

Input Power Range:	15 to 30VDC. 150mA @ 24Vdc
Optical Fiber Type:	Single Mode; 1310nm
Optical Dynamic Range:	14dB, 9/125 fiber (15k)
Screw Terminals:	Pluggable, Cage Clamp Screw Terminal Blocks (12 to 24 AWG)
Weight:	< 9 oz.
Enclosure Material:	Polyamide
Flammability Rating:	UL 94V-0
Input Fuse:	1.25A 125V Replacement fuses can be purchased from your Schurter distributor. Part number 3403.0167.11

MXB-SM40

Input Power Range:	15 to 30VDC. 150mA @ 24Vdc
Optical Fiber Type:	Single Mode; 1310nm
Optical Dynamic Range:	29dB, 9/125 fiber (40k)
Screw Terminals:	Pluggable, Cage Clamp Screw Terminal Blocks (12 to 24 AWG)
Weight:	< 9 oz.
Enclosure Material:	Polyamide
Flammability Rating:	UL 94V-0
Input Fuse:	1.25A 125V Replacement fuses can be purchased from your Schurter distributor. Part number 3403.0167.11

MXB-SM80

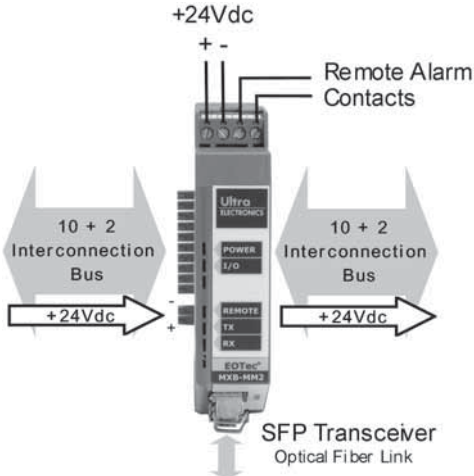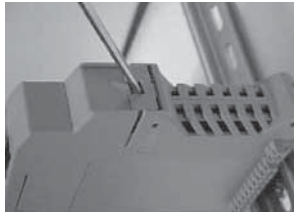|	
Input Power Range:	15 to 30VDC. 150mA @ 24Vdc
Optical Fiber Type:	Single Mode; 1310nm
Optical Dynamic Range:	29dB, 9/125 fiber (80k)
Screw Terminals:	Pluggable, Cage Clamp Screw Terminal Blocks (12 to 24 AWG)
Weight:	< 9 oz.
Enclosure Material:	Polyamide
Flammability Rating:	UL 94V-0
Input Fuse:	1.25A 125V Replacement fuses can be purchased from your Schurter distributor. Part number 3403.0167.11

2.1.1.   MX Base Operational Setting

Connecting to the Optical Base module is very simple. As seen in Figure 4, Power is connected through a removable cage clamp terminal block which will accept 12 to 24 gage wire. Also, on this same terminal block are two contacts which can be used to wire the internal alarm relay to a remote alarm device, e.g., horn; flashing light.

The remote alarm can be activated by either a closed or open relay. To make this selection, simply open the base enclosure as shown in Figure 5 and place the jumper to the appropriate position (see Figure 6). The default setting in the factory is 'O' to open the relay in an alarm condition. Alarm conditions are: No Power; Fiber Break (or disconnected); I/O Mismatch; the adjacent Transceiver is not receiving a transmission. For more information on alarm conditions please see Chapter 3 Installation or Chapter 4 Troubleshooting.

MXB Connections	MXB Operational Settings
 Figure 4: Mating Connections	Use a small screwdriver to press on the latches (indentations) at the top and bottom of the front housing cover. Slide housing forward to open. Alarm Jumper: A jumper sets the remote alarm relay. C = close on alarm. O = Open on alarm. *Figure 5: Latches* *Figure 6: Jumper*

MXB Regulatory Markings

INDUSTRIAL CONTROL EQUIP. FOR HAZ. LOC.
CLASS I, DIVISION 2, GROUPS A,B,C, & D, T4
Do not disconnect equipment unless area is known to be non-hazardous. Certified components for use in a suitable enclosure. Substitution of components or other equipment modification may impair suitability.
Ambient Temperature: -40 .. 85C Max
Electrical Rating: 24Vdc, 150mA

FM11ATEX0067X
II 3 G Ex nA nC IIC T4 Ta = -40 °C to 85 °C

The EOTec® MX Multiplexer modular Optical Base products, MXB-MM2, MXB-SM15, MXB-SM40, and MXB-SM80 comply with the essential requirements of the following applicable European Directives, and carry the CE marking accordingly: EMC Directive (EN 61326-1:2006).

For Safety requirements these products comply with Canada: CSA C22.2 No. 142, Process Control Equipment.

These products have been assessed against, and found to be in conformity with, approvals for hazardous locations and explosive atmospheres for USA and Canada. Also, the Essential Health and Safety Requirements (EHSR's) of the ATEX Directive 94/9/EC for use in potentially explosive atmospheres and display the adjacent markings as shown to the left in MXB Regulatory Markings.

2.2.   Analog Data Links: Products Designed for Flexibility

Analog Data Links can be added to the Ultra MX Multiplexer Stack to measure, control or report status from a local area to a remote site. Modules can be provided in either 4-20mA or 0-10Vdc I/O control and are available in either 2-Port or 4-Port varieties. A maximum of four modules can be stacked together with an MX Base module. MX Multiplexer I/O modules can be stacked together to provide from a minimum of 2 ports (one 2-Port module) to a maximum of 16 ports (four 4-Port modules) to support your solution. Analog Data Links are capable of either current to voltage or voltage to current conversions to meet your needs.

- • High Performance Reliable Technology
  - > Update Rate: 57.6Khz, independent of number of modules or channels utilized
  - > 0.01% @ 25 °C Reference Accuracy
  - > 0.08% / 50 °C Change Ambient Temperature Effect
  - > 16 Bit Signal Resolution
  - > 216 Sensitivity or 65,536 Steps
- • Industrial Design for High Reliability
  - > Modular, flexible, scalable
  - > Operating temperature range -40 to +85C
  - > FM approved for Class I, Div 2, Groups A, B, C & D, T4
  - > ATEX listed II 3 G Ex nA IIC T4 Ta = -40 °C to 85 °C
  - > Standard 35 mm DIN-rail mounting
- • Additional Features
  - > Capable of translating between Current and Voltage
  - > Replaceable Fuse

2.2.1.   The 4-20mA Process Loop – Input

4-20mA Input Model	2-Port Specifications
MX420-IP2	**Input Power Range:** 15 to 30VDC via the interconnection Bus from an MX Base Module (MXB-MM2, MXB-SM15, MXB-SM40 or MXB-SM80) **Current Rating:** 55mA @24Vdc **Input Impedance:** 50 Ohms **Operating Range:** 3.8 to 20.5mA **Voltage Conversion:** 4mA = 0Vdc; 20mA = 10Vdc **Scale:** 1ma = 0.625Vdc **Screw Terminals:** 2 – 4-20mA Process Loop Ports. Pluggable, Cage Clamp Screw Terminal Blocks (12 to 24 AWG) **Weight:** < 9 oz. **Enclosure Material:** Polyamide **Flammability Rating:** UL 94V-0 **Input Fuse:** 500mA 125V Replacement fuses can be purchased from your Schurter distributor. Part number 3403.0163.11

4-20mA Input Model	4-Port Specifications

MX420-IP4

Input Power Range:	15 to 30VDC via the interconnection Bus from an MX Base Module (MXB-MM2, MXB-SM15, MXB-SM40 or MXB-SM80)
Current Rating:	65mA @ 24Vdc
Input Impedance:	50 Ohms
Operating Range:	3.8 to 20.5mA
Voltage Conversion:	4mA = 0Vdc; 20mA = 10Vdc
Scale:	1ma = 0.625Vdc
Screw Terminals:	4 – 4-20mA Process Loop Ports. Pluggable, Cage Clamp Screw Terminal Blocks (12 to 24 AWG)
Weight:	< 9 oz.
Enclosure Material:	Polyamide
Flammability Rating:	UL 94V-0
Input Fuse:	500mA 125V Replacement fuses can be purchased from your Schurter distributor. Part number 3403.0163.11

MXB Regulatory Markings

INDUSTRIAL CONTROL EQUIP. FOR HAZ. LOC.

CLASS I, DIVISION 2, GROUPS A,B,C, & D, T4

Do not disconnect equipment unless area is known to be non-hazardous. Certified components for use in a suitable enclosure. Substitution of components or other equipment modification may impair suitability.

Ambient Temperature: -40 .. 85C Max

Electrical Rating: 24Vdc, 65mA

FM11ATEX0067X

II 3 G Ex nA IIC T4 Ta = -40 °C to 85 °C

The EOTec® MX Multiplexer modular 4-20mA Input products, MX420-IP2 and MX420-IP4 comply with the essential requirements of the following applicable European Directives, and carry the CE marking accordingly: EMC Directive (EN 61326-1:2006).

For Safety requirements these products comply with Canada: CSA C22.2 No. 142, Process Control Equipment.

These products have been assessed against, and found to be in conformity with, approvals for hazardous locations and explosive atmospheres for USA and Canada. Also, the Essential Health and Safety Requirements (EHSR's) of the ATEX Directive 94/9/EC for use in potentially explosive atmospheres and display the adjacent markings as shown to the left in 4-20mA Input Regulatory Markings.

The connections to a 4-20mA Input module are shown in Figure 7. Power is connected through the 10 + 2 Interconnection Bus when attached to the MX Base. As each module is stacked together, the 10 data signals and 2 power signals are passed to the newly connected module. Each Pluggable, Screw Terminal Block serves as a 4-20mA process loop input or port. A current loop can be created by connecting a loop transmitter to each port as shown in Figure 7.

4-20mA Input Connections
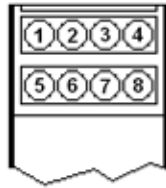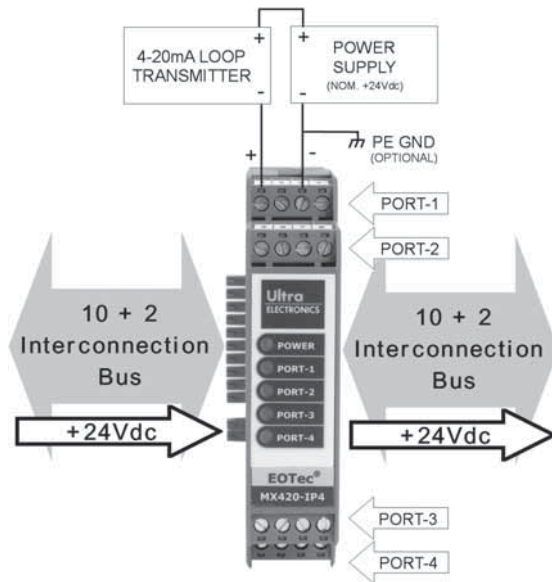
Figure 7: Mating Connections

2.2.2. The 4-20mA Process Loop – Output

4-20mA Out Model	2-Port Specifications
MX420-OP2	**Input Power Range:** 15 to 30VDC via the interconnection Bus from an MX Base Module (MXB-MM2, MXB-SM15, MXB-SM40 or MXB-SM80) **Current Rating:** 90mA @24Vdc **Max Loop Resistance:** 600 Ohms **Operating Range:** 3.8 to 20.5mA **Voltage Conversion:** 4mA = 0Vdc; 20mA = 10Vdc **Scale:** 1ma = 0.625Vdc **Screw Terminals:** 2 – 4-20mA Process Loop Ports. Pluggable, Cage Clamp Screw Terminal Blocks (12 to 24 AWG) **Weight:** < 9 oz. **Enclosure Material:** Polyamide **Flammability Rating:** UL 94V-0 **Input Fuse:** 500mA 125V Replacement fuses can be purchased from your Schurter distributor. Part number 3403.0163.11

4-20mA Out Model	4-Port Specifications

MX420-OP4

Input Power Range:	15 to 30VDC via the interconnection Bus from an MX Base Module (MXB-MM2, MXB-SM15, MXB-SM40 or MXB-SM80)
Current Rating:	130mA @24Vdc
Max Loop Resistance:	600 Ohms
Operating Range:	3.8 to 20.5mA
Voltage Conversion:	4mA = 0Vdc; 20mA = 10Vdc
Scale:	1ma = 0.625Vdc
Screw Terminals:	4 – 4-20mA Process Loop Ports. Pluggable, Cage Clamp Screw Terminal Blocks (12 to 24 AWG)
Weight:	< 9 oz.
Enclosure Material:	Polyamide
Flammability Rating:	UL 94V-0
Input Fuse:	500mA 125V Replacement fuses can be purchased from your Schurter distributor. Part number 3403.0163.11

4-20mA Output Connections
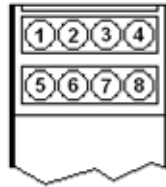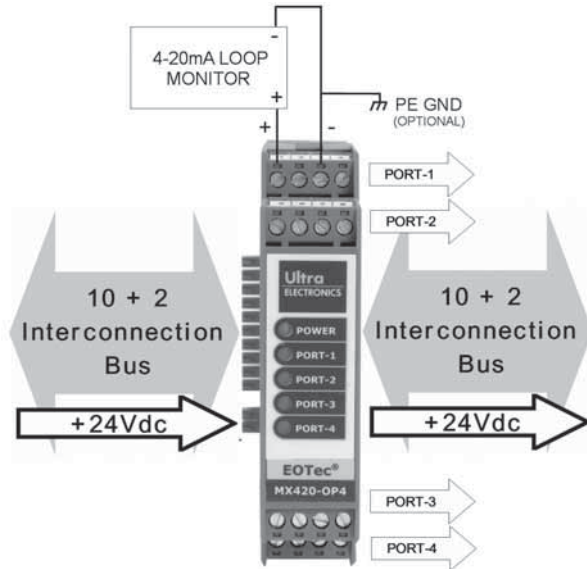
Figure 8: Mating Connections

The connections to a 4-20mA Output module are shown in Figure 8. Power is connected through the 10 + 2 Interconnection Bus when attached to the MX Base. As each module is stacked together, the 10 data signals and 2 power signals are passed to the newly connected module. Each Pluggable, Screw Terminal Block serves as a 4-20mA process loop output or port. A current monitor can be connected at each screw terminal block or port as shown in Figure 8.

4-20mA Output Regulatory Markings
INDUSTRIAL CONTROL EQUIP. FOR HAZ. LOC. **CLASS I, DIVISION 2, GROUPS A,B,C, & D, T4** Do not disconnect equipment unless area is known to be non-hazardous. Certified components for use in a suitable enclosure. Substitution of components or other equipment modification may impair suitability. Ambient Temperature: -40 .. 85C Max Electrical Rating: 24Vdc, 130mA   Ex FM APPROVED CE   FM11ATEX0067X II 3 G Ex nA IIC T4 Ta = -40 °C to 85 °C

The EOTec® MX Multiplexer modular 4-20mA Output products, MX420-OP2 and MX420-OP4 comply with the essential requirements of the following applicable European Directives, and carry the CE marking accordingly: EMC Directive (EN 61326-1:2006).

For Safety requirements these products comply with Canada: CSA C22.2 No. 142, Process Control Equipment.

These products have been assessed against, and found to be in conformity with, approvals for hazardous locations and explosive atmospheres for USA and Canada. Also, the Essential Health and Safety Requirements (EHSR's) of the ATEX Directive 94/9/EC for use in potentially explosive atmospheres and display the adjacent markings as shown to the left in 4-20mA Output Regulatory Markings.

2.2.3. The 0-10Vdc Process Management – Input

| 0-10Vdc Input Model	2-Port Specifications
MX010-IP2	**Input Power Range:** 15 to 30VDC via the interconnection Bus from an MX Base Module (MXB-MM2, MXB-SM15, MXB-SM40 or MXB-SM80) **Current Rating:** 50mA @24Vdc **Input Impedance:** 7G Ohms **Operating Range:** -125mV to 10.3125Vdc **Voltage Conversion:** 0Vdc = 4mA; 10Vdc = 20mA **Scale:** 1Vdc = 1.6mA **Screw Terminals:** 2 – 0-10Vdc Process Measurement Ports. Pluggable, Cage Clamp Screw Terminal Blocks (12 to 24 AWG) **Weight:** < 9 oz. **Enclosure Material:** Polyamide **Flammability Rating:** UL 94V-0 **Input Fuse:** 500mA 125V Replacement fuses can be purchased from your Schurter distributor. Part number 3403.0163.11

0-10Vdc Input Model	4-Port Specifications

MX010-IP4

Input Power Range:	15 to 30VDC via the interconnection Bus from an MX Base Module (MXB-MM2, MXB-SM15, MXB-SM40 or MXB-SM80)
Current Rating:	65mA @ 24Vdc
Input Impedance:	7G Ohms
Operating Range:	-125mV to 10.3125Vdc
Voltage Conversion:	0Vdc = 4mA; 10Vdc = 20mA
Scale:	1Vdc = 1.6mA
Screw Terminals:	4 – 0-10Vdc Process Measurement Ports. Pluggable, Cage Clamp Screw Terminal Blocks (12 to 24 AWG)
Weight:	< 9 oz.
Enclosure Material:	Polyamide
Flammability Rating:	UL 94V-0
Input Fuse:	500mA 125V. Replacement fuses can be purchased from your Schurter distributor. Part number 3403.0163.11

0-10Vdc Input Connections
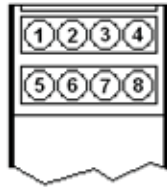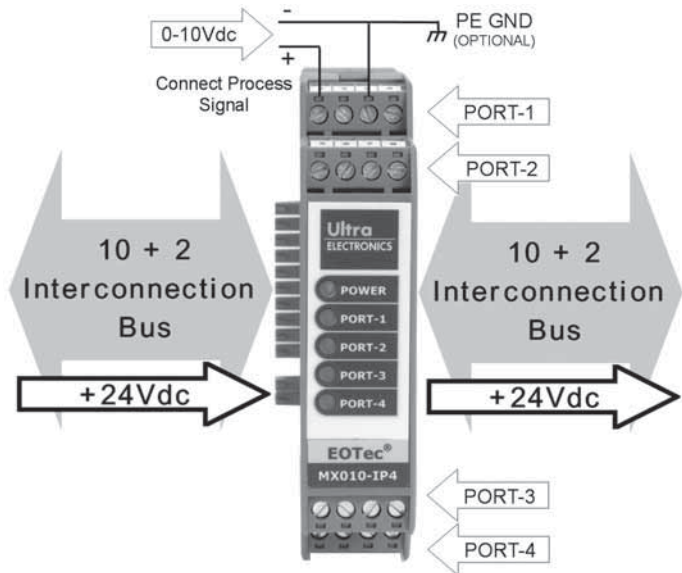
Figure 9: Mating Connections

The connections to a 0-10Vdc Input module are shown in Figure 9. Power is connected through the 10 + 2 Interconnection Bus when attached to the MX Base. Each Pluggable, Screw Terminal Block serves as a 0-10Vdc process management input or port. 0-10Vdc inputs can be created by connecting to each port as shown in Figure 9.

4-20mA Output Regulatory Markings
INDUSTRIAL CONTROL EQUIP. FOR HAZ. LOC.

INDUSTRIAL CONTROL EQUIP. FOR HAZ. LOC.

CLASS I, DIVISION 2, GROUPS A,B,C, & D, T4

Do not disconnect equipment unless area is known to be non-hazardous. Certified components for use in a suitable enclosure. Substitution of components or other equipment modification may impair suitability.

Ambient Temperature: -40 .. 85C Max

Electrical Rating: 24Vdc, 65mA

FM11ATEX0067X

II 3 G Ex nA IIC T4 Ta = -40 °C to 85 °C

The EOTec® MX Multiplexer modular 0-10Vdc Input products, MX010-IP2 and MX010-IP4 comply with the essential requirements of the following applicable European Directives, and carry the CE marking accordingly: EMC Directive (EN 61326-1:2006).

For Safety requirements these products comply with Canada: CSA C22.2 No. 142, Process Control Equipment.

These products have been assessed against, and found to be in conformity with, approvals for hazardous locations and explosive atmospheres for USA and Canada. Also, the Essential Health and Safety Requirements (EHSR's) of the ATEX Directive 94/9/EC for use in potentially explosive atmospheres and display the adjacent markings as shown to the left in 0-10Vdc Input Regulatory Markings.

2.2.4.   The 0-10Vdc Process Management – Output

| 0-10Vdc Output Model	2-Port Specifications
MX010-OP2	**Input Power Range:** 15 to 30VDC via the interconnection Bus from an MX Base Module (MXB-MM2, MXB-SM15, MXB-SM40 or MXB-SM80)
	Current Rating: 50mA @24Vdc
	Output Impedance: 70 Ohms Minimum
	Operating Range: -125mV to 10.3125Vdc
	Voltage Conversion: 0Vdc = 4mA; 10Vdc = 20mA Scale: 1Vdc = 1.6mA
	Screw Terminals: 2 – 0-10Vdc Process Measurement Ports. Pluggable, Cage Clamp Screw Terminal Blocks (12 to 24 AWG)
	Weight: < 9 oz.
	Enclosure Material: Polyamide
	Flammability Rating: UL 94V-0
	Input Fuse: 500mA 125V Replacement fuses can be purchased from your Schurter distributor. Part number 3403.0163.11

0-10Vdc Output Model	4-Port Specifications

MX010-OP4

Input Power Range: 15 to 30VDC via the interconnection Bus from an MX Base Module (MXB-MM2, MXB-SM15, MXB-SM40 or MXB-SM80)
Current Rating: 65mA @ 24Vdc
Output Impedance: 70 Ohms Minimum
Operating Range: -125mV to 10.3125Vdc
Voltage Conversion: 0Vdc = 4mA; 10Vdc = 20mA
Scale: 1Vdc = 1.6mA
Screw Terminals: 4 – 0-10Vdc Process Measurement Ports. Pluggable, Cage Clamp Screw Terminal Blocks (12 to 24 AWG)
Weight: < 9 oz.
Enclosure Material: Polyamide
Flammability Rating: UL 94V-0
Input Fuse: 500mA 125V
Replacement fuses can be purchased from your Schurter distributor. Part number 3403.0163.11

0-10Vdc Output Connections
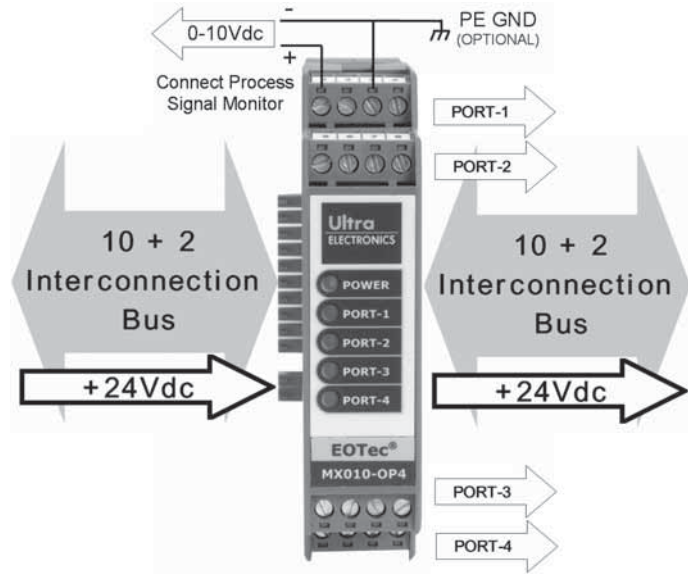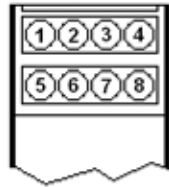
Figure 10: Mating Connections

The connections to a 0-10Vdc Output module are shown in Figure 10. Power is connected through the 10 + 2 Interconnection Bus when attached to the MX Base. Each Pluggable, Screw Terminal Block serves as a 0-10Vdc process management output or port. A 0-10Vdc output can be created by connecting to each port as shown in Figure 10.

0-10Vdc Input Regulatory Markings

INDUSTRIAL CONTROL EQUIP. FOR HAZ. LOC.
CLASS I, DIVISION 2, GROUPS A,B,C, & D, T4
Do not disconnect equipment unless area is known to be non-hazardous. Certified components for use in a suitable enclosure. Substitution of components or other equipment modification may impair suitability.
Ambient Temperature: -40 .. 85C Max
Electrical Rating: 24Vdc, 65mA

FM11ATEX0067X
II 3 G Ex nA IIC T4 Ta = -40 °C to 85 °C

The EOTec® MX Multiplexer modular 0-10Vdc Output products, MX010-OP2 and MX010-OP4 comply with the essential requirements of the following applicable European Directives, and carry the CE marking accordingly: EMC Directive (EN 61326-1:2006).

For Safety requirements these products comply with Canada: CSA C22.2 No. 142, Process Control Equipment.

These products have been assessed against, and found to be in conformity with, approvals for hazardous locations and explosive atmospheres for USA and Canada. Also, the Essential Health and Safety Requirements (EHSR's) of the ATEX Directive 94/9/EC for use in potentially explosive atmospheres and display the adjacent markings as shown to the left in 0-10Vdc Output Regulatory Markings.

2.2.5. Analog Data Link Operational Setting

Address Settings for Analog Data Link	
Use a small screwdriver to press on the latches (indentations) at the top and bottom of the front housing cover. Slide housing forward to open.	MODULE ADDRESS SETTING: A two position DIP switch, SW1, is used to set the address of the module and it must match the address of its mating module at the opposite end of the fiber link. Do not set two modules at the same end of the fiber link in one stack to the same address setting. Each module in a stack must have a different address to function properly. The 4 possible address settings are:

Figure 11: Latches *Figure 12: Switch*

SW1		
Address	Position 1	Position 2
00	OFF	OFF
01	OFF	ON
10	ON	OFF
11	ON	ON

Table 1: Address Settings

The address for an Analog Data Link can easily be set by first opening the module as shown in Figure 11 using a small screw driver to release the front cover latches at both the top and bottom of the module. Slide the housing front cover forward to reveal a small 2-position DIP switch marked SW1 (see Figure 12).

Using Table 1 set the address switches for both the I/O module remaining in the local area and the I/O module to be placed in the remote location (See Figure 13) to the same address. This creates a communication link between the two I/O modules which is known as a matched pair. When all I/O devices on each end of the fiber are matched in pairs, the I/O LED on the front of the MX Base (MXB) module will be light solid green.
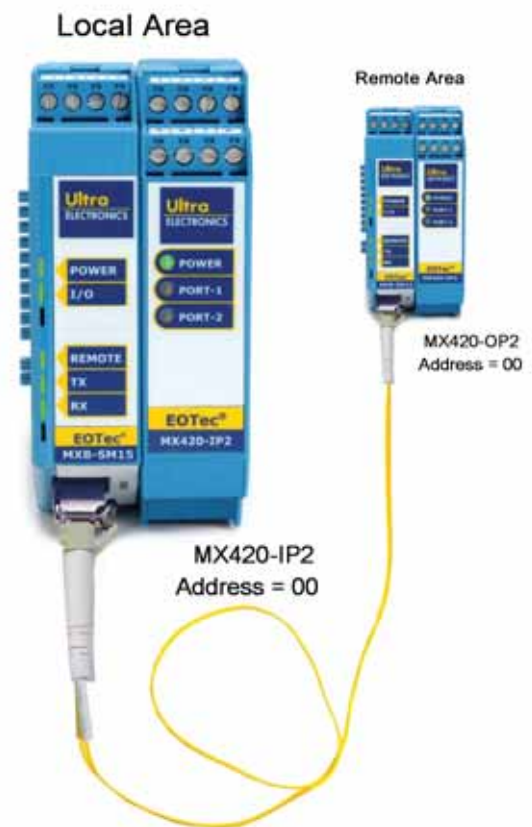
Figure 13: MX420 Matched Pair

2.2.6.   Current/Voltage Conversions Using Analog Data Links

All Analog Data Links are scaled properly to be compatible for current to voltage or voltage to current measurement conversions. To make a conversion between two analog data link locations, simply set the two modules required to the same address. As shown in Figure 14, two 4-20mA signals are applied to input ports 1 and 2 of the MX420-IP2 module in the Local area. The Base Module (MXB-MM2) in the Local area upon receiving these 4-20mA signals will translate them into a digital data stream and then send this information over the fiber cable as light pulses.

Once the Base Module (MXB-MM2) in the Remote area (Figure 14) receives these pulses it checks the address, identifies that it is connected to an I/O module (MX010-OP2) with that same address, and then sends the same digital data stream to that module. Since the attached I/O module in the remote area is a 0-10Vdc module it receives that digital data stream and coverts that data stream into an voltage signal equivalent to that of the current signal provided from the local area.

All Ultra Analog Data Links use the global standard scale as illustrated in Figure 15 and shall have a linear signal from -125mVdc to 10.3125Vdc for voltage data links and 3.8mA to 20.5mA for current data links. As long as the signal at each I/O port is within these parameters the Port LED shall be light solid green. There is one LED for each I/O port. Should your sensor malfunction and go to an over range condition, the port LED shall light solid red until that condition is remedied. Should your sensor break and go to an under range condition, the port LED shall blink red until that sensor can be repaired or replaced. An off condition has also been provided so that in the case of an unused I/O port the associated LED will remain off.

Figure 14: Conversion Pair

The scale for a current to voltage conversion is 1mA = 0.625Vdc or multiply the current input by 0.625 to calculate the proper voltage output. The scale for a voltage to current conversion is 1Vdc = 1.6mA. See Figure 15 for appropriate conversion scale.

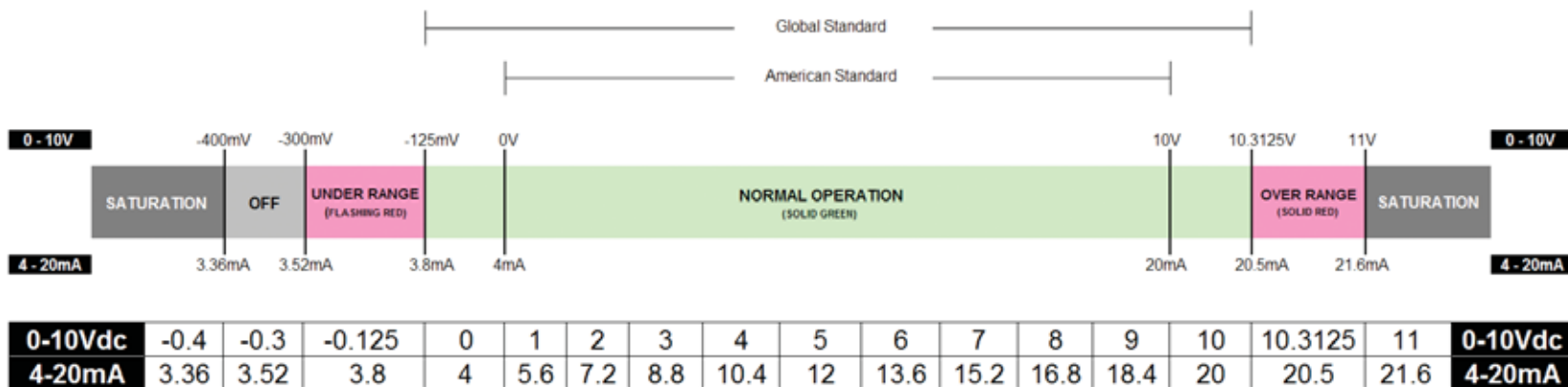| 0-10Vdc	-0.4	-0.3	-0.125	0	1	2	3	4	5	6	7	8	9	10	10.3125	11	0-10Vdc
4-20mA	3.36	3.52	3.8	4	5.6	7.2	8.8	10.4	12	13.6	15.2	16.8	18.4	20	20.5	21.6	4-20mA

Figure 15: Conversion Table

2.3. Digital Data Links: Products Designed for Reliability

Digital Data Links are also known as contact closures. When the two signals of an input port on Input Module make contact (shorted together) they activate a relay for that same port address of the Digital Data Link on the other side of the fiber. Because these devices only have two states they are commonly called "Digital" Data Links. These modules can be added to the Ultra MX Multiplexer Stack to control or report status from a local area to a remote site. Modules are available in either 2-Port or 4-Port varieties. A maximum of four modules can be stacked together with an MX Base module. MX Multiplexer I/O modules can be stacked together to provide from a minimum of 2 ports (one 2-Port module) to a maximum of 16 ports (four 4-Port modules) to support your solution.

- High Performance Reliable Technology
  - > Update Rate: 57.6Khz, independent of number of modules or channels utilized
  - > Input = Dry Contacts (Relay; Switch)
  - > Output = Form-C Relay (SPDT)
- Industrial Design for High Reliability
  - > Modular, flexible, scalable
  - > Operating temperature range -40 to +85C
  - > FM approved for Class I, Div 2, Groups A, B, C & D, T4
  - > In = ATEX listed II 3 G Ex nA IIC T4 Ta = -40 °C to 85 °C
  - > Out = ATEX listed II 3 G Ex nA nC IIC T4 Ta = -40 °C to 85 °C
  - > Standard 35 mm DIN-rail mounting
- Additional Features
  - > Replaceable Fuse

2.3.1. The Contact Closure – Input

Contact Closure Input Model	2-Port Specifications	
MXCC-IP2 	**Input Power Range:**	15 to 30VDC via the interconnection Bus from an MX Base Module (MXB-MM2, MXB-SM15, MXB-SM40 or MXB-SM80)
	Current Rating:	45mA @24Vdc
	Input:	Dry Contacts (Relay; Switch)
	Max Input Resistance:	1K Ohm
	Input Contact Rating:	+3.3Vdc @ 1mA (minimum)
	Screw Terminals:	2 – Dry Contact Ports. Pluggable, Cage Clamp Screw Terminal Blocks (12 to 24 AWG)
	Weight:	< 9 oz.
	Enclosure Material:	Polyamide
	Flammability Rating:	UL 94V-0
	Input Fuse:	500mA 125V Replacement fuses can be purchased from your Schurter distributor. Part number 3403.0163.11

Contact Closure Input Model	4-Port Specifications

MXCC-IP4

Input Power Range:	15 to 30VDC via the interconnection Bus from an MX Base Module (MXB-MM2, MXB-SM15, MXB-SM40 or MXB-SM80)
Current Rating:	50mA @24Vdc
Input:	Dry Contacts (Relay; Switch)
Max Input Resistance:	1K Ohm
Input Contact Rating:	+3.3Vdc @ 1mA (minimum)
Screw Terminals:	4 – Dry Contact Ports. Pluggable, Cage Clamp Screw Terminal Blocks (12 to 24 AWG)
Weight:	< 9 oz.
Enclosure Material:	Polyamide
Flammability Rating:	UL 94V-0
Input Fuse:	500mA 125V
	Replacement fuses can be purchased from your Schurter distributor. Part number 3403.0163.11

Contact Closure In Regulatory Markings

INDUSTRIAL CONTROL EQUIP. FOR HAZ. LOC.

CLASS I, DIVISION 2, GROUPS A,B,C, & D, T4

Do not disconnect equipment unless area is known to be non-hazardous. Certified components for use in a suitable enclosure. Substitution of components or other equipment modification may impair suitability.

Ambient Temperature: -40 .. 85C Max

Electrical Rating: 24Vdc, 65mA

FM11ATEX0067X

II 3 G Ex nA IIC T4 Ta = -40 °C to 85 °C

The EOTec® MX Multiplexer modular Contact Closure (CC) Input products, MXCC-IP2 and MXCC-IP4 comply with the essential requirements of the following applicable European Directives, and carry the CE marking accordingly: EMC Directive (EN 61326-1:2006).

For Safety requirements these products comply with Canada: CSA C22.2 No. 142, Process Control Equipment.

These products have been assessed against, and found to be in conformity with, approvals for hazardous locations and explosive atmospheres for USA and Canada. Also, the Essential Health and Safety Requirements (EHSR's) of the ATEX Directive 94/9/EC for use in potentially explosive atmospheres and display the adjacent markings as shown to the left in Contact Closure In Regulatory Markings.

The connections to a Contact Closure Input module are shown in Figure 16. Power is connected through the 10 + 2 Interconnection Bus when attached to the MX Base. As each module is stacked together, the 10 data signals and 2 power signals are passed to the newly connected module. Each Pluggable, Screw Terminal Block serves as a Contact Closure input or port. A contact closure can be created by connecting (or shorting) terminals 1 and 4 together on each port as shown in Figure 16.

Contact Closure Input Connections
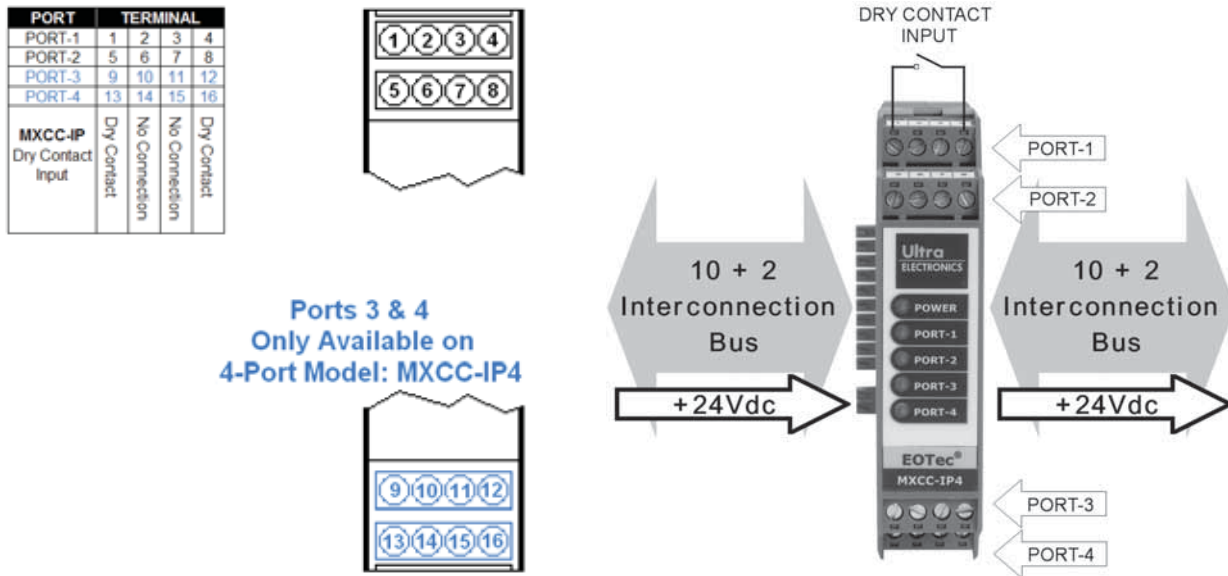
Figure 16: Mating Connections

2.3.2. The Contact Closure – Output

Contact Closure Output Model	2-Port Specifications
MXCC-OP2	**Input Power Range:** 15 to 30VDC via the interconnection Bus from an MX Base Module (MXB-MM2, MXB-SM15, MXB-SM40 or MXB-SM80) **Current Rating:** 60mA @24Vdc **Output Relay:** Form-C (SPDT) Contact Max. **Switching Voltage:** 220Vdc; 250Vac **Contact Current Rating:** 2A Continuous; 2A Switching **Switching Power:** 60W, 62.5VA **Screw Terminals:** 2 – Relay Contact Ports. Pluggable, Cage Clamp Screw Terminal Blocks (12 to 24 AWG) **Weight:** < 9 oz. **Enclosure Material:** Polyamide **Flammability Rating:** UL 94V-0 **Input Fuse:** 500mA 125V Replacement fuses can be purchased from your Schurter distributor. Part number 3403.0163.11

Contact Closure Output Model	4-Port Specifications

MXCC-OP4

Input Power Range:	15 to 30VDC via the interconnection Bus from an MX Base Module (MXB-MM2, MXB-SM15, MXB-SM40 or MXB-SM80)
Current Rating:	80mA @24Vdc
Output Relay:	Form-C (SPDT)
	Contact Max.
Switching Voltage:	220Vdc; 250Vac
Contact Current Rating:	2A Continuous; 2A Switching
Switching Power:	60W, 62.5VA
Screw Terminals:	4 – Relay Contact Ports. Pluggable, Cage Clamp Screw Terminal Blocks (12 to 24 AWG)
Weight:	< 9 oz.
Enclosure Material:	Polyamide
Flammability Rating:	UL 94V-0
Input Fuse:	500mA 125V
	Replacement fuses can be purchased from your Schurter distributor. Part number 3403.0163.11

Contact Closure In Regulatory Markings

INDUSTRIAL CONTROL EQUIP. FOR HAZ. LOC.

CLASS I, DIVISION 2, GROUPS A,B,C, & D, T4

Do not disconnect equipment unless area is known to be non-hazardous. Certified components for use in a suitable enclosure. Substitution of components or other equipment modification may impair suitability.

Ambient Temperature: -40 .. 85C Max

Electrical Rating: 24Vdc, 80mA

Ex

FM APPROVED C US

CE

FM11ATEX0067X

II 3 G Ex nA IIC T4 Ta = -40 °C to 85 °C

The EOTec® MX Multiplexer modular Contact Closure (CC) Output products, MXCC-OP2 and MXCC-OP4 comply with the essential requirements of the following applicable European Directives, and carry the CE marking accordingly: EMC Directive (EN 61326-1:2006).

For Safety requirements these products comply with Canada: CSA C22.2 No. 142, Process Control Equipment.

These products have been assessed against, and found to be in conformity with, approvals for hazardous locations and explosive atmospheres for USA and Canada. Also, the Essential Health and Safety Requirements (EHSR's) of the ATEX Directive 94/9/EC for use in potentially explosive atmospheres and display the adjacent markings as shown to the left in Contact Closure Out Regulatory Markings.

The connections to a Contact Closure Output module are shown in Figure 17. Power is connected through the 10 + 2 Interconnection Bus when attached to the MX Base. As each module is stacked together, the 10 data signals and 2 power signals are passed to the newly connected module. Each Pluggable, Screw Terminal Block serves as a Contact Closure output or relay port. When a contact closure is created by connecting (or shorting) terminals 1 and 4 together on Port-1 of the Input Module then the relay on Port-1 of the Output Module will energize. The relay for each output port has a jumper option to be either opened or closed when the relay is energized. The relay in Figure 17 is shown in the de-energized state.

Contact Closure Output Connections

Figure 17: Mating Connections
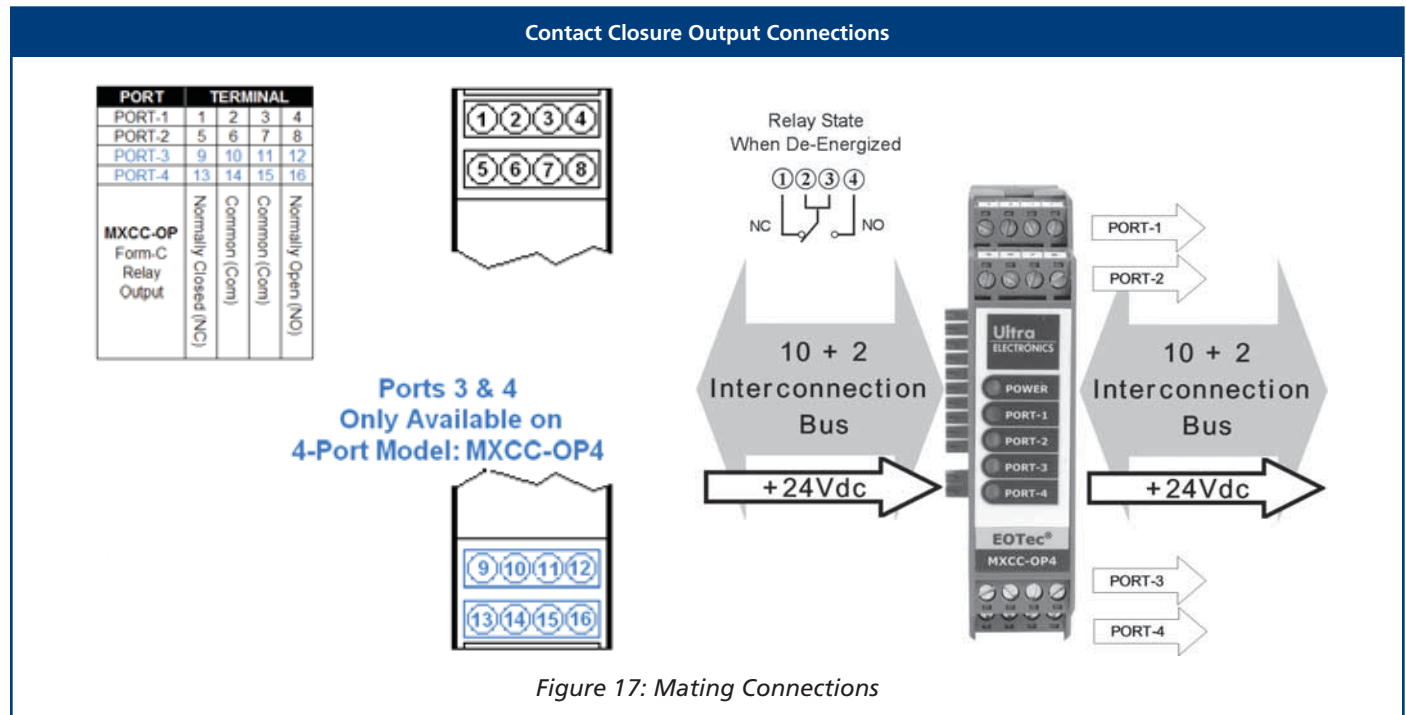
2.3.3.   Digital Data Link Operational Setting

Address Settings for Digital Data Link	27

Use a small screwdriver to press on the latches (indentations) at the top and bottom of the front housing cover. Slide housing forward to open.

Figure 18: Latches   *Figure 19: Switch*

MODULE ADDRESS SETTING: A two position DIP switch, SW1, is used to set the address of the module and it must match the address of its mating module at the opposite end of the fiber link. Do not set two modules at the same end of the fiber link in one stack to the same address setting. Each module in a stack must have a different address to function properly. The 4 possible address settings are:

SW1		
Address	Position 1	Position 2
00	OFF	OFF
01	OFF	ON
10	ON	OFF
11	ON	ON

Table 2: Address Settings

The address for a Digital Data Link can easily be set by first opening the module as shown in Figure 18 using a small screw driver to release the front cover latches at both the top and bottom of the module. Slide the housing front cover forward to reveal a small 2-position DIP switch marked SW1 (see Figure 19).

Using Table 2 set the address switches for both the I/O module remaining in the local area and the I/O module to be placed in the remote location (See Figure 20) to the same address. This creates a communication link between the two I/O modules which is known as a matched pair. When all I/O devices on each end of the fiber are matched in pairs, the I/O LED on the front of the MX Base (MXB) module will be light solid green.

Figure 20: MXCC Matched Pair

2.4. Communication Data Links: Products Designed for Simplicity

The RS232/485 Communication Links are very simple to configure and connect. Each module communicates bi-directionally over the fiber and can be set to either RS232 or RS485 by a flip of a switch. When set to RS232, either full or half duplex communication can be achieved. However, while set to RS485, only half duplex communication can be realized. Modules are available in either 2-Port or 4-Port varieties. A maximum of four modules can be stacked together with an MX Base module. MX Multiplexer I/O modules can be stacked together to provide from a minimum of 2 ports (one 2-Port module) to a maximum of 16 ports (four 4-Port modules) to support your solution. All 16 ports are independent of the others and each can be placed to different settings at the same time.

- High Performance Reliable Technology
  - > Update Rate: 57.6Khz, independent of number of modules or channels utilized
  - > Selectable baud rates from 9.6k to 230.4 k
  - > Communicates up to 80Km
  - > RS232 Half or Full Duplex
  - > RS485 Half Duplex only
- Industrial Design for High Reliability
  - > Modular, flexible, scalable
  - > Operating temperature range -40 to +85C
  - > FM approved for Class I, Div 2, Groups A, B, C & D, T4
  - > ATEX listed II 3 G Ex nA IIC T4 Ta = -40 °C to 85 °C
  - > Standard 35 mm DIN-rail mounting
- Additional Features
  - > Capable of translating between RS232 and RS485
  - > Replaceable Fuse

2.4.1. RS232/485 Communication – Bidirectional

RS232/485 Communication	2-Port Specifications
MXRS-2	**Input Power Range:** 15 to 30VDC via the interconnection Bus from an MX Base Module (MXB-MM2, MXB-SM15, MXB-SM40 or MXB-SM80) **Current Rating:** 75mA @24Vdc **Serial Communication:** RS-232 = Half or Full Duplex RS-485 = Half Duplex Only **Baud Rate:** RS-232 = 9.6K to 230.4K RS-485 = 9.6K to 230.4K **Screw Terminals:** 2 – RS232/485 Ports. Pluggable, Cage Clamp Screw Terminal Blocks (12 to 24 AWG) **Weight:** < 9 oz. **Enclosure Material:** Polyamide **Flammability Rating:** UL 94V-0 **Input Fuse:** 500mA 125V Replacement fuses can be purchased from your Schurter distributor. Part number 3403.0163.11

RS232/485 Communication	4-Port Specifications

MXRS-4

Input Power Range:	15 to 30VDC via the interconnection Bus from an MX Base Module (MXB-MM2, MXB-SM15, MXB-SM40 or MXB-SM80)
Current Rating:	100mA @24Vdc
Serial Communication:	RS-232 = Half or Full Duplex
	RS-485 = Half Duplex Only
Baud Rate:	RS-232 = 9.6K to 230.4K
	RS-485 = 9.6K to 230.4K
Maximum Devices and Cable Length:	RS232 = 1 Device; 50ft (15m)
	RS485 = 30 Devices; 2000ft (600m)
Screw Terminals:	4 – RS232/485 Ports. Pluggable, Cage Clamp Screw Terminal Blocks (12 to 24 AWG)
Weight:	< 9 oz.
Enclosure Material:	Polyamide
Flammability Rating:	UL 94V-0
Input Fuse:	500mA 125V
	Replacement fuses can be purchased from your Schurter distributor. Part number 3403.0163.11

The connections to a RS232/485 communications module are shown in Figure 21. Power is connected through the 10 + 2 Interconnection Bus when attached to the MX Base. As each module is stacked together, the 10 data signals and 2 power signals are passed to the newly connected module. Each Pluggable, Screw Terminal Block serves as a RS232/485 communications port. Choose the communications type, RS-232 or RS-485, you wish to use then wire each port according to your needs as shown in Figure 21. Each port has independent settings so they can be selected for different communication types and baud rates separately.

RS232/485 Module Connections

RS232/485 Module Connections

Figure 21: Mating Connections
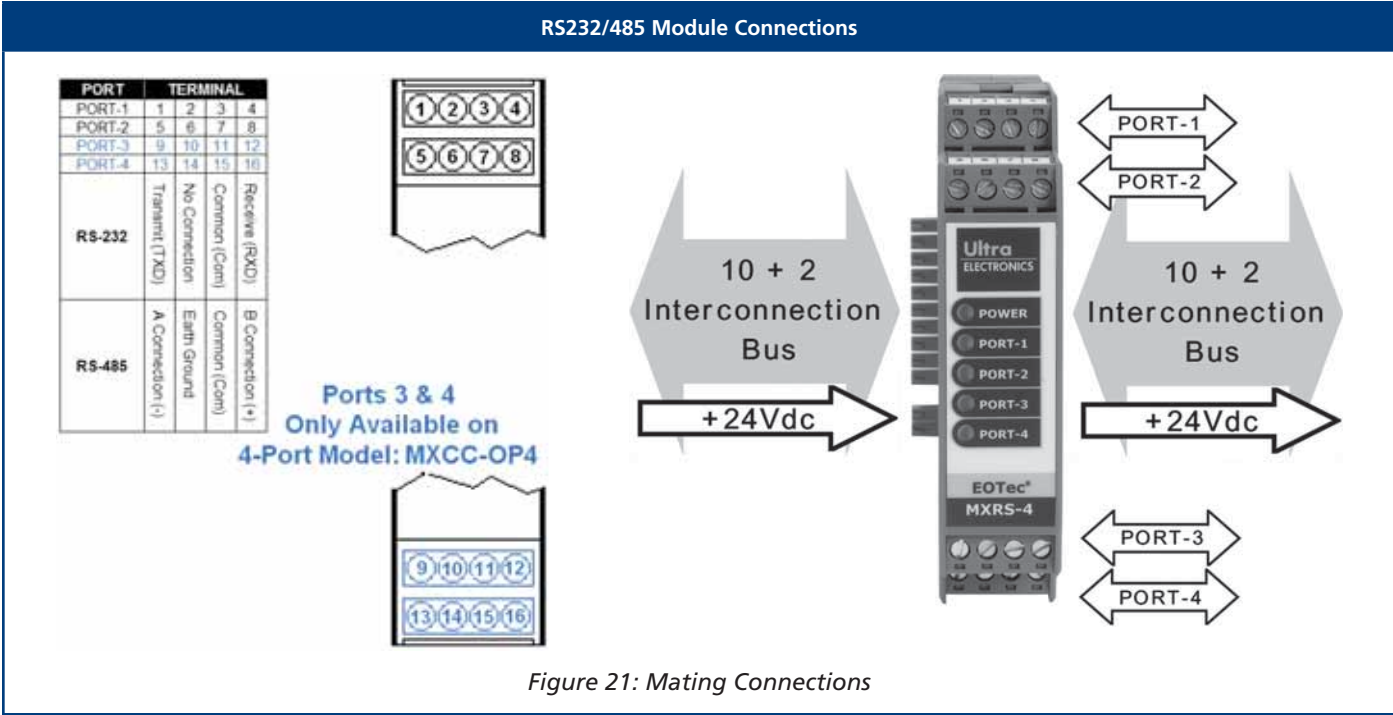
RS232/485 Module Connections
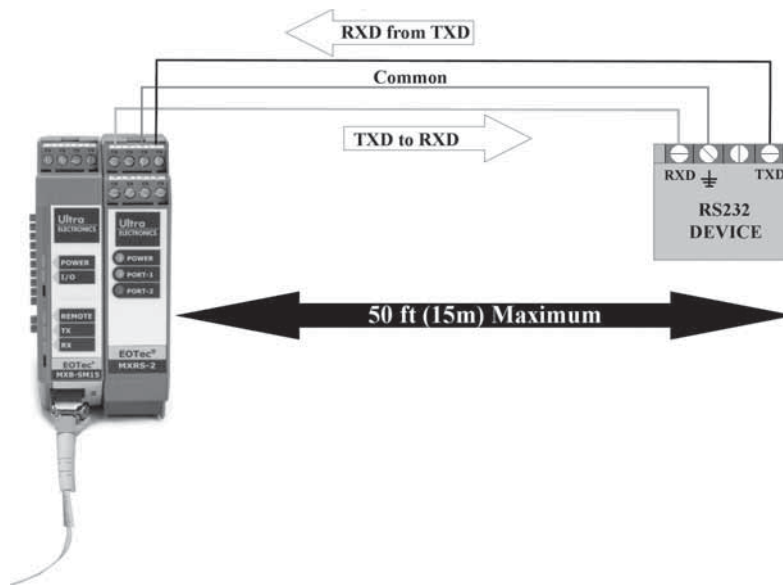
Figure 22: RS232 Network – Maximum Devices and Length
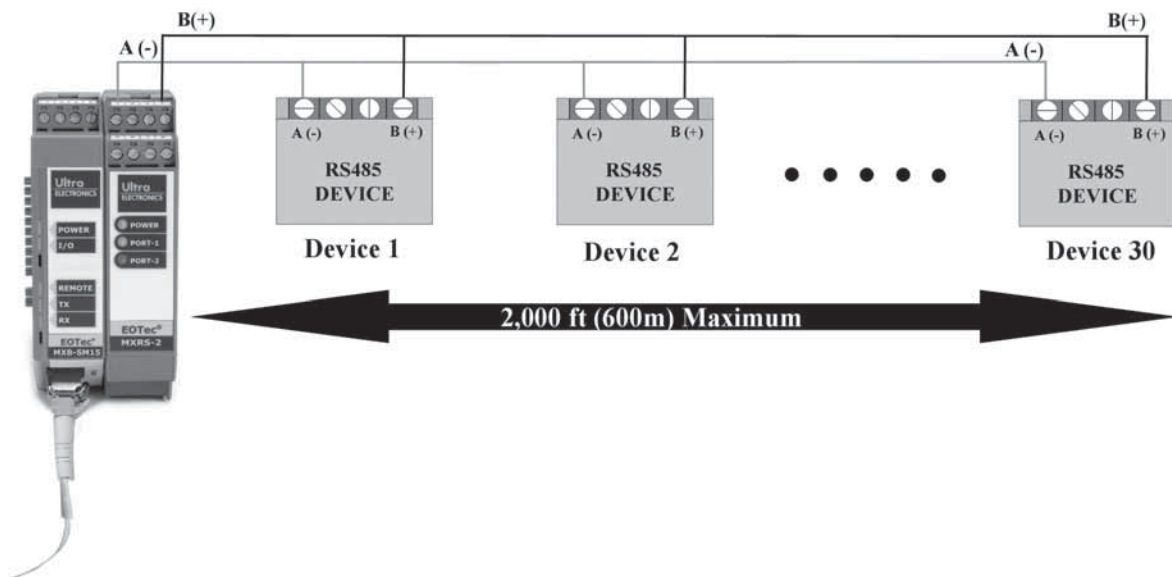
Figure 23: RS485 Network – Maximum Devices and Length

When using the RS232 mode of Ultra's MXRS modules, remember the Transmit from your device is wired to the Receive connection on the MXRS module and visa-versa (see Figure 22). RS232 is limited to supporting only one device of up to 50ft (15.24m) away. However, the RS485 mode uses a differential signal so it can support as many as 30 devices at up to 2,000ft (609.6m). See Figure 23 for an RS485 network wiring diagram. The RS232 transceivers are in full compliance with RS232 specification. The RS485 transceiver supports both RS485 and RS422 standards, whereas the RS232 transceivers support both RS232 and EIA562 standards.

RS232/485 Regulatory Markings
INDUSTRIAL CONTROL EQUIP. FOR HAZ. LOC.

CLASS I, DIVISION 2, GROUPS A,B,C, & D, T4

Do not disconnect equipment unless area is known to be non-hazardous. Certified components for use in a suitable enclosure. Substitution of components or other equipment modification may impair suitability.

Ambient Temperature: -40 .. 85C Max

Electrical Rating: 24Vdc, 100mA

FM11ATEX0067X

II 3 G Ex nA IIC T4 Ta = -40 °C to 85 °C

The EOTec® MX Multiplexer modular RS232/485 communication products, MXRS-2 and MXRS-4 comply with the essential requirements of the following applicable European Directives, and carry the CE marking accordingly: EMC Directive (EN 61326-1:2006).

For Safety requirements these products comply with Canada: CSA C22.2 No. 142, Process Control Equipment.

These products have been assessed against, and found to be in conformity with, approvals for hazardous locations and explosive atmospheres for USA and Canada. Also, the Essential Health and Safety Requirements (EHSR's) of the ATEX Directive 94/9/EC for use in potentially explosive atmospheres and display the adjacent markings as shown to the left in RS232/485 Regulatory Markings.

2.4.2.   RS232/485 Link Operational Setting

Address & Communications Settings for RS232/485 Link

Use a small screwdriver to press on the latches (indentations) at the top and bottom of the front housing cover. Slide housing forward to open.
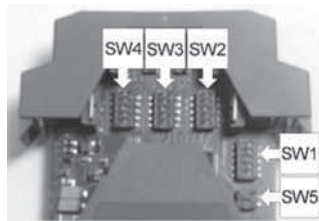

Figure 24: Latches   *Figure 25: Switch*

MODULE ADDRESS SETTING: A two position DIP switch, SW5, is used to set the address of the module and it must match the address of its mating module at the opposite end of the fiber link. Do not set two modules at the same end of the fiber link in one stack to the same address setting. Each module in a stack must have a different address to function properly. All possible address settings are shown in Table 3:

CHANNEL SETTINGS: There are five position DIP switches which determine each channel's communications parameters, independently. Use SW1 thru SW4 for channels Port-1 thru Port-4 respectively. The settings for these switches are as follows in Table 4:

SW5		
Address	Position 1	Position 2
00	OFF	OFF
01	OFF	ON
10	ON	OFF
11	ON	ON

Table 3: Address Settings

SW1 – SW4		
Position 1	Use parity bit	No parity bit
	ON	OFF
Position 2	RS-485	RS-232
	ON	OFF

Positions 3, 4, 5			
3	4	5	Baud Rate
ON	OFF	ON	9.6K
ON	OFF	OFF	19.2K
OFF	ON	ON	38.4K
OFF	ON	OFF	56.6K
OFF	OFF	ON	115.2K
OFF	OFF	OFF	230.4K

Table 4: Communication Settings

The address for an RS232/485 Communications Link can easily be set by first opening the module as shown in Figure 24 using a small screw driver to release the front cover latches at both the top and bottom of the module. Slide the housing front cover forward to reveal a small 2-position DIP switch marked SW5 (see Figure 25). Set address DIP switch according to Table 3.

Using Table 3 set the address switches for both the I/O module remaining in the local area and the I/O module to be placed in the remote location (See Figure 26) to the same address. This creates a communication link between the two I/O modules which is known as a matched pair. When all I/O devices on each end of the fiber are matched in pairs, the I/O LED on the front of the MX Base (MXB) module will be light solid green.

To communicate properly, use Table 4 to select a communications type (RS-232 or RS-485), a parity bit (if required), and baud rate that you wish to transfer data. Set DIP switches according to Table 4, SW1 = Port-1; SW2 = Port-2; SW3 = Port-3; SW4 = Port-4.
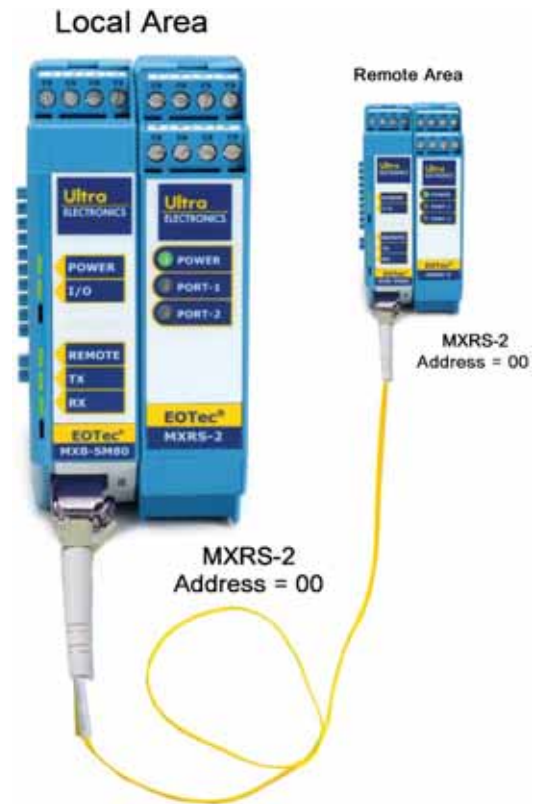

Figure 26: MXRS Matched Pair

3. Installation and Removal of Multiplexer Equipment

The MX Multiplexer product line was designed with installation in mind. Diagnostic LEDs have been provided to aid in the installation of the product. To learn more about this subject, refer to Installation: Section 3.1. Removal of this equipment is very simple as well (see Removal: Section 3.2). For more information about regulatory compliance please see the Standards & Safety section.

3.1. Installation

For installation of this equipment in a hazardous location always remember that the power line must be de-energized before connecting or disconnecting the terminal plugs on these devices. Once this is done, place the top lip of the MX Base (MXB) module's mounting channel onto the DIN rail as shown in Figure 27. Push the lower portion of the module towards the mounting surface until it "clicks" and locks the spring-loaded clip into place.

When the Base modules are mounted correctly in both the local and remote areas, power the units on.
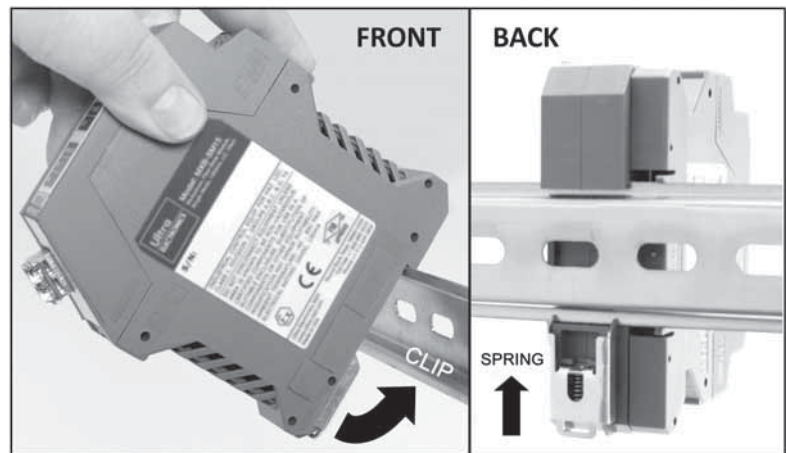

Figure 27: Install

When the DIN rail is strapped to earth ground, the metal clip inside of the upper lip of the mounting channel of each module connects earth ground to the circuit board inside each module.

Each MXB module with no fiber connected between them will display the diagnostic indicators identified in Table 5 and shown in Figure 28. The power light will be solid green as power has been connected and turned on. The I/O and Remote LEDs are not applicable in this situation so they are turned off. The TX light will turn solid green whenever the Small Form-factor Pluggable (SFP) transceiver is installed; otherwise this LED is solid red. The RX LED will remain solid red until an optical fiber is connected and it can receive light transmissions from the transmitter in the remote location.

Label	Diagnostic Indicators
Power	Green = On
I/O	Off = N/A
Remote	Off = N/A
TX	Green = Transceiver In
RX	Red = No Light Received

Table 5: MXB No Fiber

Figure 28: MXB

Once the fiber optic cable has been correctly installed between the two MXB modules all the diagnostic indicators referenced in Table 6 and displayed in Figure 29. The power is still good so the Power LED is still solid green. The fiber cable is now connected and the two MXBs are communicating data properly; there are no I/O modules connected yet so there are no I/O mismatches so the I/O LED is lit solid green. The Remote LED is solid green to indicate that the transceiver in the remote location is receiving proper data. If any of the LEDs fail to turn green, turn to Section 4: Troubleshooting.

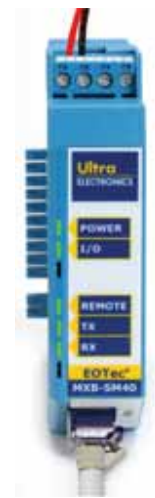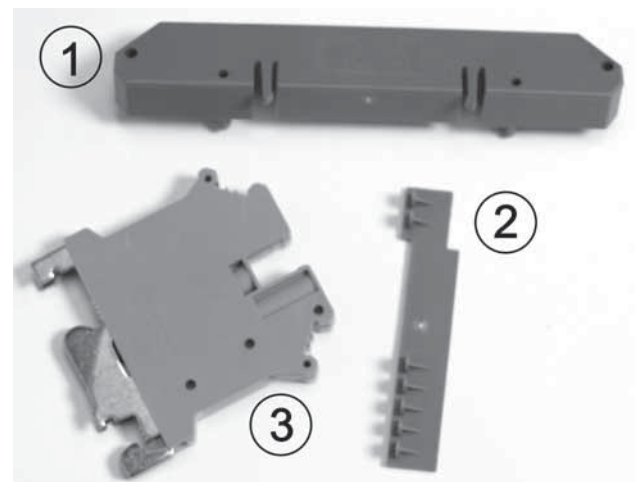| Label	Diagnostic Indicators
Power	Green = On
I/O	Green = No Mismatch
Remote	Green = Remote Receiver OK
TX	Green = Transceiver In
RX	Green = Transmit Light Received

Table 6: Fiber Correct

Figure 29: Fiber OK

Now that the two MX Bases (MXBs) have been connected by a fiber cable and verified to be operational, I/O Modules can now be added to both the local and remote locations. When adding the I/O modules to either the MXB in the local or remote location the local Input/Output Module must be matched with the corresponding remote Output/Input Module on either end of the fiber. To match these modules the address switches in both modules must be set to the same address (for more information see the Operational Settings in the appropriate Hardware section for each I/O device).

When adding the first I/O module to either end, there will be no matching module on the other side of the fiber so both MXB modules will display a solid red I/O LED. Once the second matching I/O module has been connected to the MXB on the other end, both MXB modules will display a solid green I/O LED. This will repeat as each I/O module is added to either end. **If the I/O LED fails to turn green, either the addresses are not the same for I/O matched pair or the module types do not match, e.g., an Analog Data Link mismatched with an RS Communications Link.** For more information on Diagnostic Indicators refer to Section 4: Troubleshooting.

To complete the installation, use the bus covers and end clamps shown to the right which are provided with each MX Base (MXB) module. Once the last I/O module is mounted and operational, the parts in Table 7 are used to finish the installation of both MX Multiplexer stacks residing on either end of the fiber cable.

Item	Qty	Description	Part No.
1	1	Left BUS Cover	2BCL
2	1	Right BUS Cover	2BCR
3	2	End Clamp	2A09

Table 7: Seal Stacks

Figure 30: BUS Covers

Take the four parts listed in Table 7 and mount the two BUS covers over either side of each MX Multiplexer stack. As shown in Figure 30, the left cover will mount over the left (male) side of the BUS and the right cover will mount inside the right (female) side of the BUS.

The two End Clamps mount on either side of the MX Multiplexer stack by ensuring the two end hooks catch the top and bottom of the DIN rail. Then clamp the hooks down onto the rail by tightening the middle screw as shown in Figure 31.
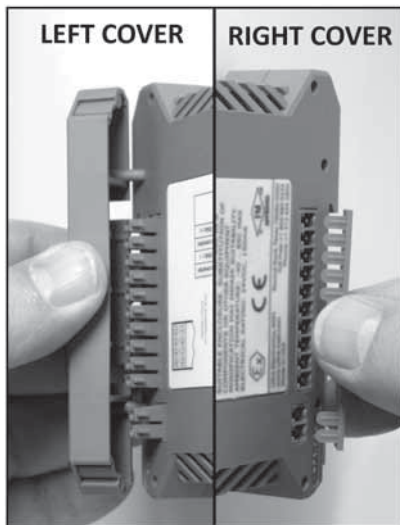
End clamps have two cage clamp screw terminal blocks connections, one on the top and the other on the bottom as you see it mounted on the rail in Figure 31. Wires of 12 to 24 AWG can be captured in one of two cage clamps with a direct connection to the DIN rail. The end clamps can be used to connect earth ground to the DIN Rail or to connect to an EOTec module cage clamp screw terminal block as may be required.

Figure 31: End Clamp

ATEX Special Conditions of Safe Use

Modules shall be installed in an enclosure which maintains an ingress protection rating of IP54 and meets the enclosure requirements of EN60079-0 and EN60079-15. The EOTec modules shall be installed on DIN rail with DIN end clamps mounted on both sides of the module set. The DIN rail must be connected to Protective Earth in order to provide modules with a Protective Earth connection. Do not disconnect equipment connections or modules when energized.
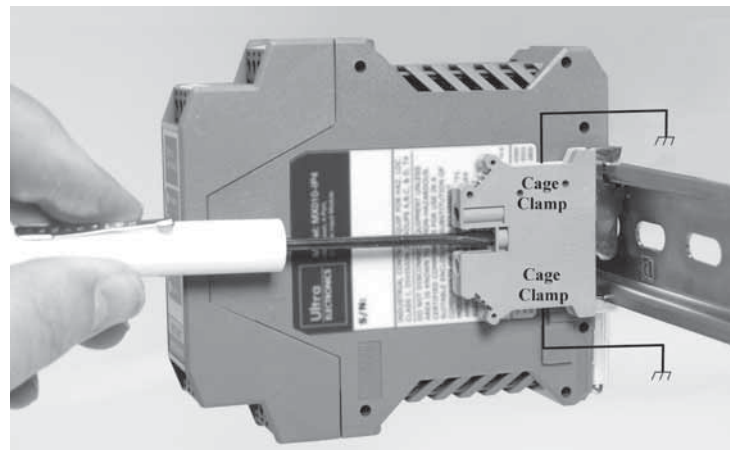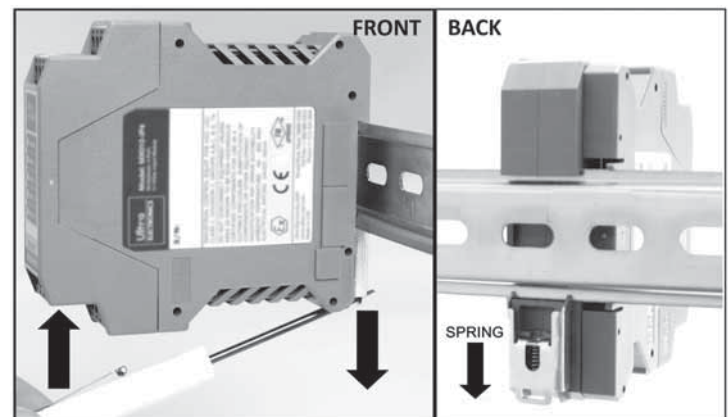

Figure 32: Uninstall

3.2.   Removal

When working with this equipment in a hazardous location, always remember that the power line must be de-energized before connecting or disconnecting the terminal plugs on these devices.

Once this done, work the installation process backwards by first uninstalling all wiring to each I/O module and disconnecting the fiber from the MXB. Next, remove the two end clamps as shown in Figure 31.

Now any module can easily be separated along the BUS connector from the others in the stack. To remove each module from the DIN rail, place a screwdriver in the slot at the bottom of the spring clip as shown in Figure 32 and pry downward. This compresses the spring and the module comes right off.

4.   Troubleshooting

Ultra provides several solutions to help you diagnose trouble that may occur in an MX Multiplexer network. Understanding the information in this section will greatly help you to find the root cause of the problem and resolve it quickly.

4.1.   Diagnosing Failure

All MX Multiplexer modules have LED indicators to help you diagnose a functional failure when trouble occurs. Understanding the indicators will help you identify the problem locally at the Multiplexer Stack. Ultra also provides some remote features to help diagnose failures when you're not in that particular location; features such as contacts to alert you when a failure has occurred in the network or the I/O LED indicator which tells the user there is a communication problem with the multiplexer stack on the other side of the fiber in the other location.

Figure 33: Advanced   Figure 34: Intermediate   Figure 35: Simple

The MX Multiplexer modules fall into 3 basic classifications of diagnostic features. The MX Multiplexer Fiber Optic Base or MXB is considered to have Advanced LED Diagnostics which the highest level diagnostics available with the MX multiplexer product line. The MXB shown in Figure 33, not only tells the user it has a good transmit and receive connection, but can also notify the user of an I/O mismatch or whether there is a receive problem in the remote area away from the user.

The Analog Data Links shown in Figure 34 have more of an intermediate type of diagnostic. They can inform the user when data is flowing between input and output ports, but can also identify possible senor failures by providing an over-range and under-range indicators. The lowest level of diagnostics is used in the Digital Data Links and the RS232/485 Communication Links. These modules are very simple devices so are only a simple form of diagnostic is needed for these devices.

Take care when connecting an MX Multiplexer stack that each module has a unique address and the baud rate is set properly. The LED diagnostics on these modules indicate that data is moving through a port and not that it is being routed correctly. Only the address and baud rate jumpers insure data routes correctly through the MX Multiplexer stack.

The following troubleshooting suggestions have been provided to assist you should you have trouble with your EOTec MX Multiplexer Modules.

4.2.   Interrupting LED Diagnostics

MX Fiber Optic Base (MXB) Modules – Advanced Diagnostics		
Model No.	MXB-MM2, MXB-SM15, MXB-SM40, MXB-SM80	
Function	**Indication**	**Action**
POWER	Solid Green	Power is good.
	Off	Power has not been supplied. 1. Check power input to terminal block (+15-30Vdc). 2. Check fuse. Replace if blown. 3. If both power and fuse are good, replace MXB.
I/O	Solid Green	All modules have been matched correctly.
	Solid Red	Mismatched modules found in network. 1. Check for matching module types. 2. Check matching modules for same address. 3. If both modules and addresses are correct, swap out input and output modules one at a time.
	Off	No mismatch has occurred.
REMOTE	Solid Green	Receiver in remote area is good.
	Solid Red	Receiver in remote area has a problem. 1. Swap transceiver with known good one. 2. Check fiber cable for break on transmitter output. 3. If both transceiver and fiber are good, replace MXB on the opposite side of fiber from red LED.
	Off	No problem with remote receiver has occurred.
TX	Solid Green	Transceiver is good and plugged in.
	Solid Red	Transceiver is not acknowledging to be plugged in. 1. Swap transceiver with known good one. 2. If swapping transceiver doesn't work, replace MXB.
RX	Solid Green	Local receiver communication is good.
	Solid Red	Transceiver not receiving data. 1. Swap transceiver with known good one. 2. Check fiber cable for break on receiver input. 3. If both transceiver and fiber are good, replace the MXB with the red LED.

MX Analog Data Links – Intermediate Diagnostics

| Model No. | MX010 | MX010-IP2, MX010-IP4, MX010-OP2, MX010-OP4 |
| | MX420 | MX420-IP2, MX420-IP4, MX420-OP2, MX420-OP4 |

Function	Indication	Action
POWER	Solid Green	Power is good.
	Off	Power has not been supplied. 1. Check power light on MXB. If off, go to MXB diagnostics. 2. Check power output from MXB on interconnection BUS (see Figure 7). 3. If both power input and fuse are good, but output bad then replace MXB. 4. If both power input and fuse are good, but output bad then replace MXB. 5. Check I/O module fuse. Replace if blown. 6. If both power input and fuse are good, but I/O module not energized then replace I/O module.
PORT 1 - 4	Solid Green	Input or Output is within normal operation. See Figure 15.
	Solid Red	Over Range: Input or Output is above normal operation. 1. Check input sensor or output device for proper functionality. 2. If external devices are functioning properly then swap input or output module with known good module.
	Flashing Red	Under Range: Input or Output is below normal operation. 1. Check input sensor or output device for proper functionality. 2. If external devices are functioning properly then swap input or output module with known good module.
	Off	Normal operation with no connection. See Figure 15.

MX Digital Data and Communication Data Links – Simple Diagnostics

| Model No. | MXCC | MXCC-IP2, MXCC-IP4, MXCC-OP2, MXCC-OP4 |
| | MXRS | MXRS-2, MXRS-4 |

Function	Indication	Action
POWER	Solid Green	Power is good.
	Off	Power has not been supplied. 1. Check power light on MXB. If off, go to MXB diagnostics. 2. Check power output from MXB on interconnection BUS (see Figure 7). 3. If both power input and fuse are good, but output bad then replace MXB. 4. Check I/O module fuse. Replace if blown. 5. If both power input and fuse are good, but I/O module not energized then replace I/O module.
PORT 1 - 4	Solid Green	Input or Output has data flowing.
	Solid Red	Input or Output has no data flowing. 1. Check input or output device for proper functionality. 2. If external devices are functioning properly then swap input or output module with known good module.

4.3. Interrupting Remote Relay Diagnostics

The Fiber Optic Base provides a relay that can be connected to a remote alarm. There 5 fault conditions that can set off an alarm as shown in the following table. Also see section 2.1.1 for more information on remote alarms.

MX Base Module – Remote Alarm	
Model No.	MXB-MM2, MXB-SM15, MXB-SM40, MXB-SM80
Function	Failure: Action
No Power	Unit with alarm has no power: All LEDs are turned off. Refer to MXB Diagnostics in section 4.2 for further troubleshooting advice.
Fiber Break	Unit with alarm is not receiving transmissions: RX LED is solid red. Refer to MXB Diagnostics in section 4.2 for further troubleshooting advice.
I/O Mismatch	There is a mismatch between two I/O models: I/O LED is solid red on both MXB modules. Refer to MXB Diagnostics in section 4.2 for further troubleshooting advice.
Remote	Receiver in the remote area away from this local fault indicator has a problem. Local MXB has solid red Remote LED; Remote MXB has solid red RX LED. Refer to MXB Diagnostics in section 4.2 for further troubleshooting advice.

5. Default Settings

This chapter lists the factory default settings for all EOTec MX Multiplexer modules when they come out of the box. Use this information to find out what changes may be necessary for tailoring the switch to your exact needs. For reconfiguring switches and jumpers, consult the Hardware Chapter for Operational Settings for each device.
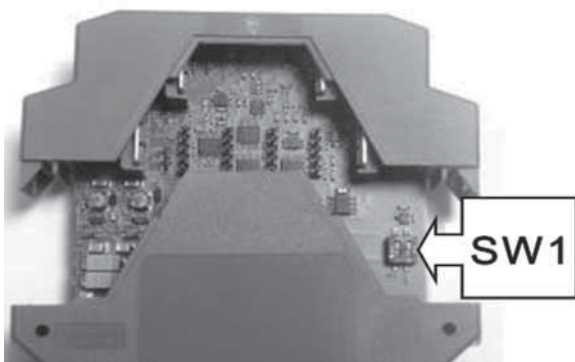
MX Base Modules	
Module Type	Model Numbers
MXB	MXB-MM2, MXB-SM15, MXB-SM40, MXB-SM80
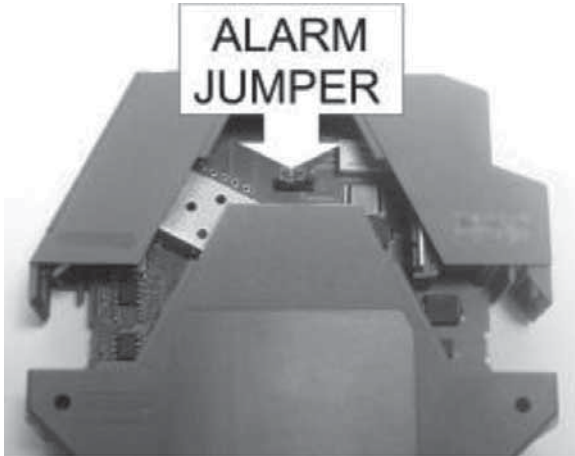
J4 = O – Open Relay on Alarm

MX Analog and Digital Modules	
Module Type	Model Numbers
MX010	MX010-IP2, MX010-IP4, MX010-OP2, MX010-OP4
MX420	MX420-IP2, MX420-IP4, MX420-OP2, MX420-OP4

SW1 = 0, 0

Address	SW1-1	SW1-2
00	OFF	OFF

MX Contact Closure Modules

Module Type	Model Numbers
MXCC	MXCC-IP2, MXCC-IP4, MXCC-OP2, MXCC-OP4
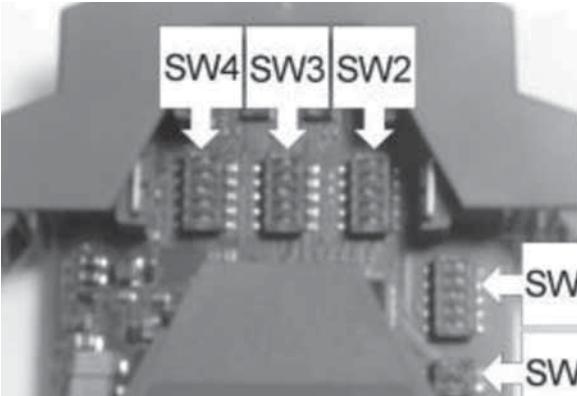
SW1 = 1, 1

Address	SW1-1	SW1-2
11	ON	ON

MX I/O Modules

Module Type	Model Numbers
MXRS	MXRS-2, MXRS-4

SW1 – 4 = No Parity, RS485, 19.2K Baud

SW1 – 4				
1	2	3	4	5
OFF	ON	ON	OFF	OFF

SW5 = 0, 0

Address	SW5-1	SW5-2
00	OFF	OFF

6.   Product Dimension

MX Base Modules	
Module Type	Model Numbers
MXB	MXB-MM2, MXB-SM15, MXB-SM40, MXB-SM80
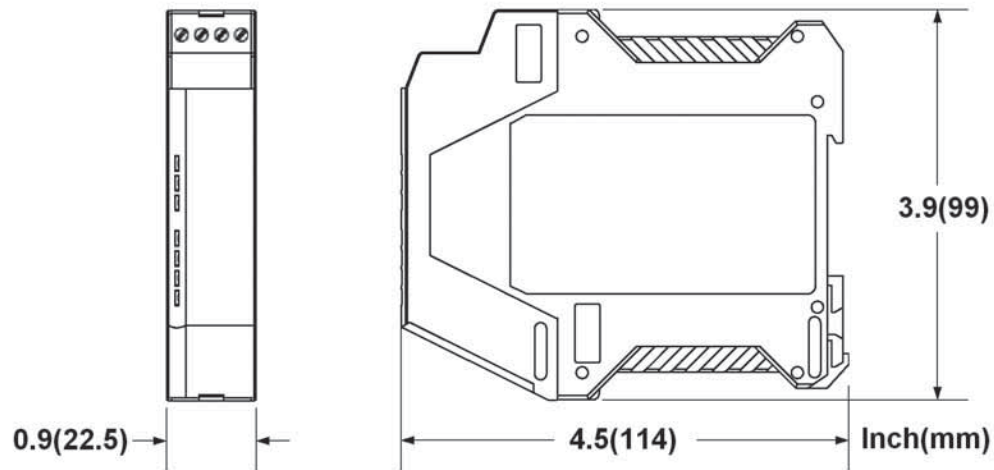
MX I/O Modules	
Module Type	Model Numbers
MX010	MX010-IP2, MX010-IP4, MX010-OP2, MX010-OP4
MX420	MX420-IP2, MX420-IP4, MX420-OP2, MX420-OP4
MXCC	MXCC-IP2, MXCC-IP4, MXCC-OP2, MXCC-OP4
MXRS	MXRS-2, MXRS-4
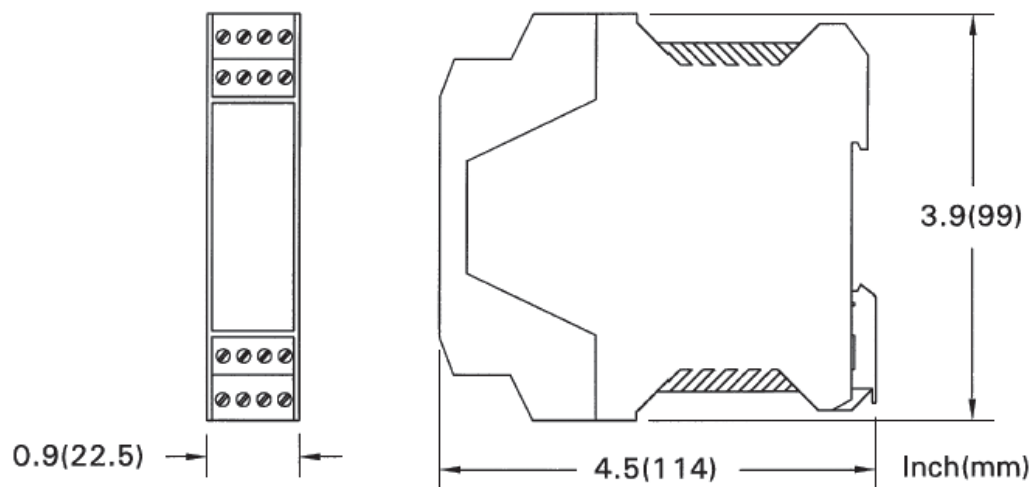
7.   Service

Installation and Operation

Our professionals guide you through the installation of your new product so that it is operational in the minimum amount of time.

www.ultra-nspi.com/contact-us/tech-support/installation-operation/

Troubleshooting

Should you have a question regarding the operation of your instrument or its perceived malfunction, the technical support experts will help you determine the issue and offer you the best possible solution. Before contacting us, please go to our website to determine if any of the troubleshooting tips solve your problem.

www.ultra-nspi.com/contact-us/tech-support/troubleshooting/

Service and Repair

If you need service or repair, please visit our website and follow the directions provided at this link.

www.ultra-nspi.com/contact-us/tech-support/rma-request/

For any other questions, please call (512) 434-2850.

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