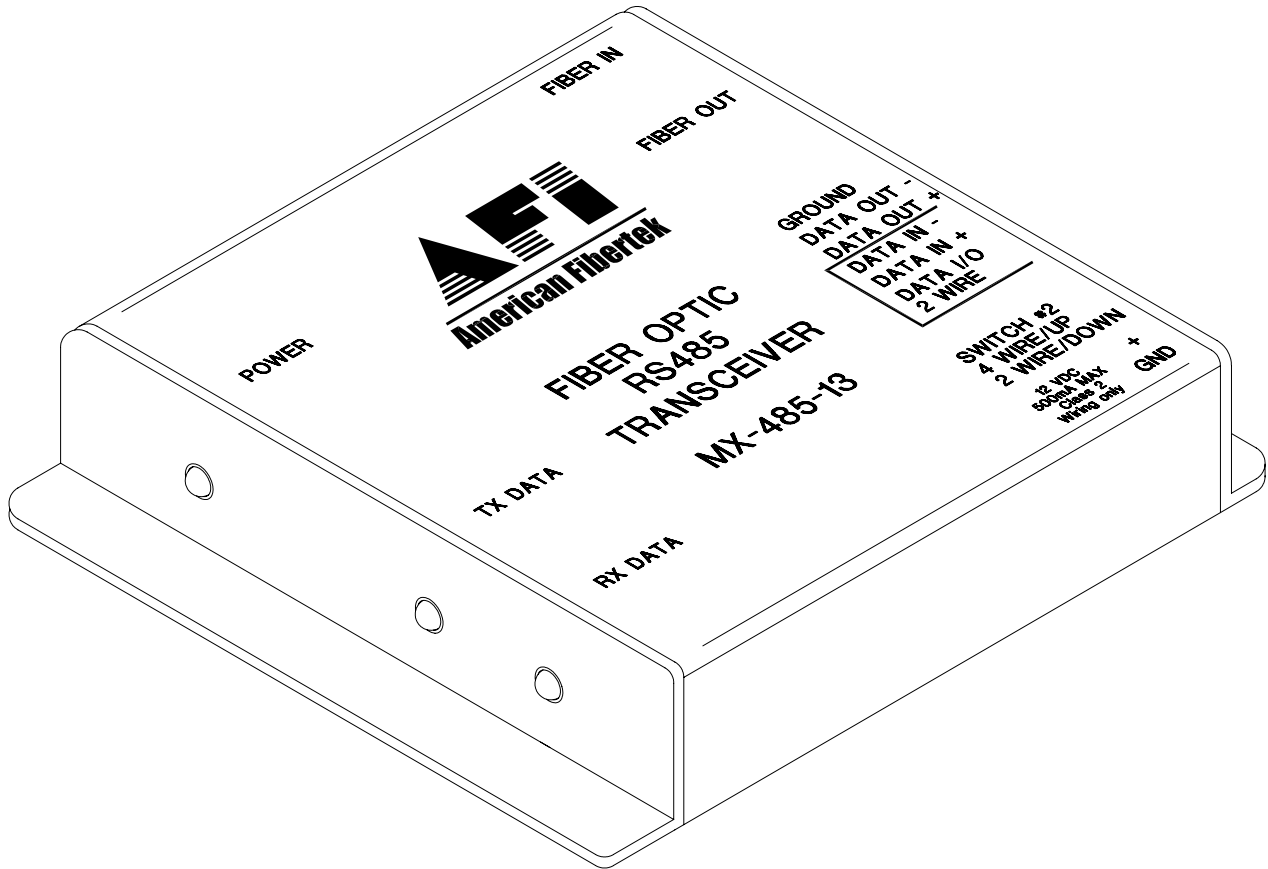




120 Belmont Drive
Somerset, NJ 08873-1204

American Fibertek

Phone: 732.302.0660 Fax: 732.302.0667



Instruction Manual

MX-485-13 Bi-directional RS485 Data Transceiver

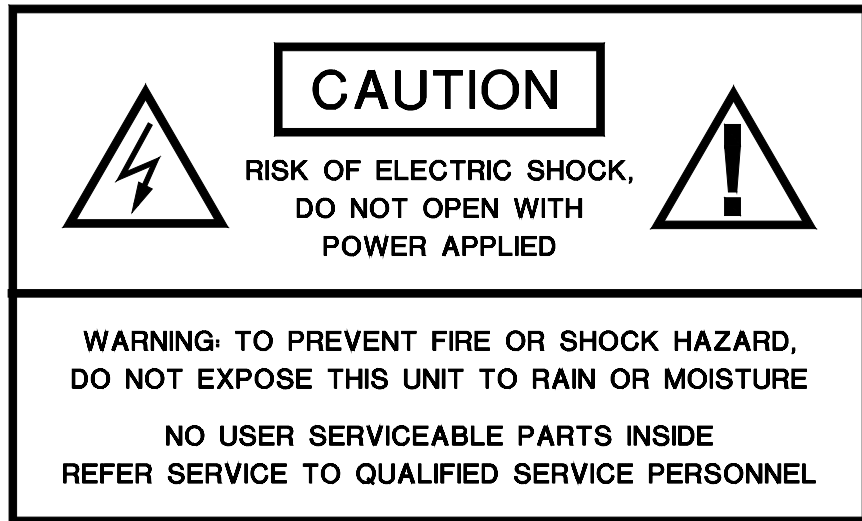


Table of Contents

Functional Description	3
Installation	3
Power Source	3
Power Connection.....	3
Fiber Input / Output Connections	4
Data Input / Output Connections.....	4
Data Configuration	4
Switch Settings	5
MX-485-13 Status LED Indicators.....	6
RS485 Termination and Offset Bias Requirements	7
Warranty	8
Service Information	8

INSTALLATION AND OPERATION INSTRUCTIONS

INTRODUCTION

Thank you for purchasing your American Fibertek MX-485-13 multimode RS485 data transceiver. Please take a few minutes to read these installation instructions in order to obtain the maximum performance from this product.

FUNCTIONAL DESCRIPTION

The MX-485-13 operates as half of a transceiver pair for the transmission of bi-directional RS485 data. It is designed to operate with another MX-485-13 or a RX-485-13 data transceiver over a dual multimode fiber optic cable. When configured in the 4-wire mode, this unit can also operate with a MX-485-4-13, a RX-485-4-13, or a MX-485-4T-13. When configured in the 2-wire mode, this unit can operate with a MX-485-2-13, a RX-485-2-13, or a MX-485-2T-13.

The MX-485-13 converts a single RS485 input into an optical fiber output using a 1300 nm wavelength source. The MX-485-13 also converts an optical RS485 signal returning on a separate fiber into an electronic RS485 output using a 1300 nm wavelength detector. This unit may be configured for two wire half duplex or four wire full duplex electrical interfaces. The 485 Series product is designed to operate over an optical loss budget range of 0 to 17 dB when used on 62.5 um multimode fiber. The MX-485-13 will also operate on 50 um multimode fiber at a reduced loss budget range. Refer to the data sheets for detailed performance specifications.

This unit is contained in a compact and rugged aluminum housing with internal dc voltage regulation. The detachable terminal block and LED indicators provide for easy installation and monitoring of data and dc power.

The MX-485-13 is designed for mounting as a modular stand alone unit. For a rack mounted version please see the RX-485-13.

INSTALLATION

THIS INSTALLATION SHOULD BE MADE BY A QUALIFIED SERVICE PERSON AND SHOULD CONFORM TO THE NATIONAL ELECTRICAL CODE, ANSI/NFPA 70 AND LOCAL CODES.

Mount the unit to a secure surface using #8 (3mm) hardware in four places. See the drawing on the next page for mounting dimensions. Be sure to allow sufficient room for the required minimum bend radius of the fiber cable used.

POWER SOURCE

This unit requires a +12VDC power source for proper operation. The DC input is diode protected. In the USA and in Canada an American Fibertek PS-12 is supplied with this unit. The negative side of the power input is directly connected to ground. ANSI/NFPA 70 Class 2 wiring is recommended.

POWER CONNECTION

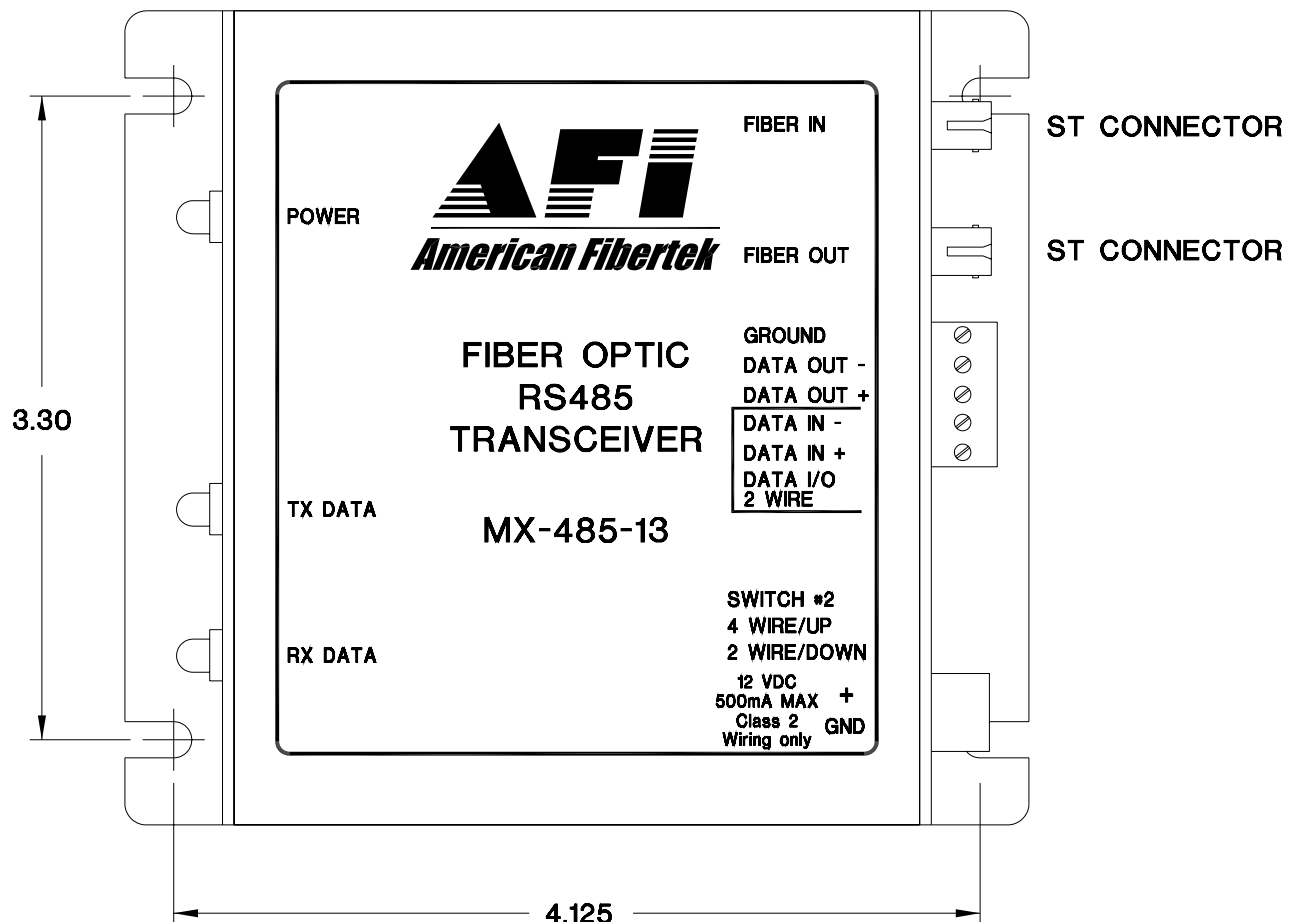
Power is supplied to the unit via a two pin terminal connector. Follow label on unit for proper orientation of +12 volt dc and ground.

FIBER INPUT / OUTPUT CONNECTIONS

The fiber optic connections are made via ST connectors located on the right side of the unit. The FIBER OUT port of this unit is connected to the FIBER IN port of the corresponding unit. The FIBER IN port of this unit is connected to the FIBER OUT port of the corresponding unit.

DATA INPUT / OUTPUT CONNECTIONS

Data input and output connections are made via a terminal block on the right side of the unit. Follow label on unit for proper orientation of RS485 data input and output. Please note that 2-wire applications utilize the 4-wire DATA IN + and DATA IN - terminals.



DATA CONFIGURATION

The MX-485-13 is shipped from the factory in the RS485 4-wire configuration. In order to configure the unit for RS485 2-wire operation switch settings need to be modified using the switch settings shown on the next page.

The MX-485-13 is shipped from the factory with the internal data input 120 ohm termination switched on and the output data 120 ohm termination switched off. In order to remove the input termination or add output termination, switch settings need to be modified using the switch settings shown on the next page.

See page 7 for an explanation of termination and offset bias requirements for RS485 data.

SWITCH SETTINGS

The MX-485-13 is factory shipped with the RS485 data channel configured in the 4-wire RS485 mode with the internal data input termination switched on, the internal data output termination switched off, and no offset bias applied.

In order to reconfigure the RS485 channel, the configuration switch bank on the right side of unit needs to be modified.

See the tables below for a summary of the switch settings. Please note that in all cases bias switches # 3 and # 4 must be either both on or both off. Likewise, bias switches # 6 and # 7 must be either both on or both off.

Switch settings for 4-Wire RS485 (Factory shipped settings in bold):

Switch Number	Function	On (Down)	Off (Up)
1	Must always be down	Down	
2	Must always be up		Up
3	Output Bias	Output Biased	No Bias
4	Output Bias	Output Biased	No Bias
5	Output Termination	Terminated	Non-terminated (HI Z)
6	Input Bias	Input Biased	No Bias
7	Input Bias	Input Biased	No Bias
8	Input Termination	Terminated	Non-terminated (HI Z)

Switch settings for 2-Wire RS485 (Factory shipped settings in bold):

Switch Number	Function	On (Down)	Off (Up)
1	Must always be down	Down	
2	Must always be down	Down	See Note Below*
3	Not Used		Up
4	Not Used		Up
5	Not Used		Up
6	Input/Output Bias	Input/Output Biased	No Bias
7	Input/Output Bias	Input/Output Biased	No Bias
8	Input/Output Termination	Terminated	Non-terminated (HI Z)

* Please note that when using this unit in a 2-Wire configuration, switch # 2 must be changed from its factory default setting of 'Up' to the proper setting of 'Down'.

MX-485-13 STATUS INDICATORS

The MX-485-13 transmitter provides the following LED status indicators to aid in installation and troubleshooting:

POWER

A green LED indicator monitors the DC power of the MX-485-13. DC power associated with this LED is summarized below.

Optical Level Indicator	DC Power Status
Green	On
Off	Off

TX DATA

A red LED indicator is provided to monitor the RS485 input data from the electrical interface, through the MX-485-13, and out onto the fiber. The intensity of this indicator will vary with input data patterns, however in typical applications it will cycle on and off as data is transmitted. RS485 status associated with this LED is summarized below.

DATA TX LED	RS485 Status
Red	Data Flow Present
Off	Data Flow Not Detected

DATA RX

A red LED indicator is provided to monitor the RS485 data coming in from the fiber, through the MX-485-13, and out onto the electrical interface. The intensity of this indicator will vary with input data patterns, however in typical applications it will cycle on and off as data is received. RS485 status associated with this LED is summarized below.

DATA RX LED	RS485 Status
Red	Data Flow Present
Off	Data Flow Not Detected

RS485 Data Signals

The RS485 protocol is an expanded version of the original RS422 protocol. RS485 differs from RS422 in the ability of the transmitter devices to go into a high impedance (Hi-Z) state. This allows multiple transmitter devices to reside on the same wire pair. The software must dictate a protocol that allows one device to transmit at any one time to prevent data crashes. Data wiring can use two wires or four wires. Using two wires the system works in half duplex. This means that data is exchanged between two points sequentially. When a four-wire system is used, the system may be full duplex. In many cases the system head end controller will continuously poll data from all remote devices. The remote devices all respond back to the head end (one at a time!) as they are addressed. This property of the network rests solely in the hands of the software or firmware.

The driver chips used in RS485 communications are capable of changing into their high impedance state very rapidly. On even short lengths of wire there can exist a residual voltage after a driver circuit turns off. This can interfere with circuits that are used to detect the Hi-Z state. It is very important that the copper communications lines be terminated with resistors across the data wire pair. The best place to locate such resistors is at the furthest electrical devices at the ends of the wire pair. For instance, if several RS485 devices are connected in a daisy chain fashion, the wire connection would loop across all devices in a chain. The furthest point in the chain would need to be terminated. A termination resistor for RS485 4-wire input data can be selected in the MX-485-13 using switch # 8. A termination resistor for RS485 4-wire output data can be selected in the MX-485-13 using switch # 5. A termination resistor for RS485 2-wire input/output data can also be selected in the MX-485-13 using switch # 5.

OFFSET BIAS – RS485

The RS485 specification requires receivers to detect input signals down to 200mVp-p of voltage level. In many cases this can cause systems to be sensitive to noise on the data wires. In an effort to eliminate the effects of low levels of noise, some manufacturers of equipment that communicate using RS485 have introduced a small voltage bias to the data lines. This is usually accomplished using a 470 Ohm resistance to +5V on the positive line and 470 Ohm resistance to ground on the negative line. When used in conjunction with the appropriate termination resistors referred to in the previous section, this introduces about a 300 mV offset, improving noise immunity.

Offset bias for RS485 4-wire output can be applied on the MX-485-13 by setting switch # 3 and switch # 4 on. Please note that these switches work as a set and must be either both on or both off. In a majority of cases, bias will not be required and these switches should remain in the off position. If using offset bias, it is important that termination resistor switch # 5 be in the on (applied) position. Using offset bias without a termination on the line will cause communications to fail.

Offset bias for RS485 4-wire input or RS485 2-wire input/output can be applied on the MX-485-13 by setting switch # 6 and switch # 7 on. Please note that these switches work as a set and must be either both on or both off. In a majority of cases, bias will not be required and these switches should remain in the off position. If using offset bias, it is important that termination resistor switch # 8 be in the on (applied) position. Using offset bias without a termination on the line will cause communications to fail.

LIFETIME WARRANTY INFORMATION

American Fibertek, Inc warrants that at the time of delivery the products delivered will be free of defects in materials and workmanship. Defective products will be repaired or replaced at the exclusive option of American Fibertek. A Return Material Authorization (RMA) number is required to send the products back in case of return. All returns must be shipped prepaid. This warranty is void if the products have been tampered with. This warranty shall be construed in accordance with New Jersey law and the courts of New Jersey shall have exclusive jurisdiction over this contract. **EXCEPT FOR THE FOREGOING WARRANTY, THERE IS NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR OTHERWISE, EXPRESSED OR IMPLIED, WHICH EXTENDS BEYOND THE WARRANTY SET FORTH IN THIS AGREEMENT.** In any event, American Fibertek will not be responsible or liable for contingent, consequential, or incidental damages. No agreement or understanding, expressed or implied, except as set forth in this warranty, will be binding upon American Fibertek unless in writing, signed by a duly authorized officer of American Fibertek.

SERVICE INFORMATION

There are no user serviceable parts inside the unit.

In the event that service is required to this unit, please direct all inquiries to:

American Fibertek, Inc.
120 Belmont Drive
Somerset, NJ 08873

Phone: (877) 234-7200
Phone: (732) 302-0660
FAX (732) 302-0667

E-mail: techinfo@americanfibertek.com