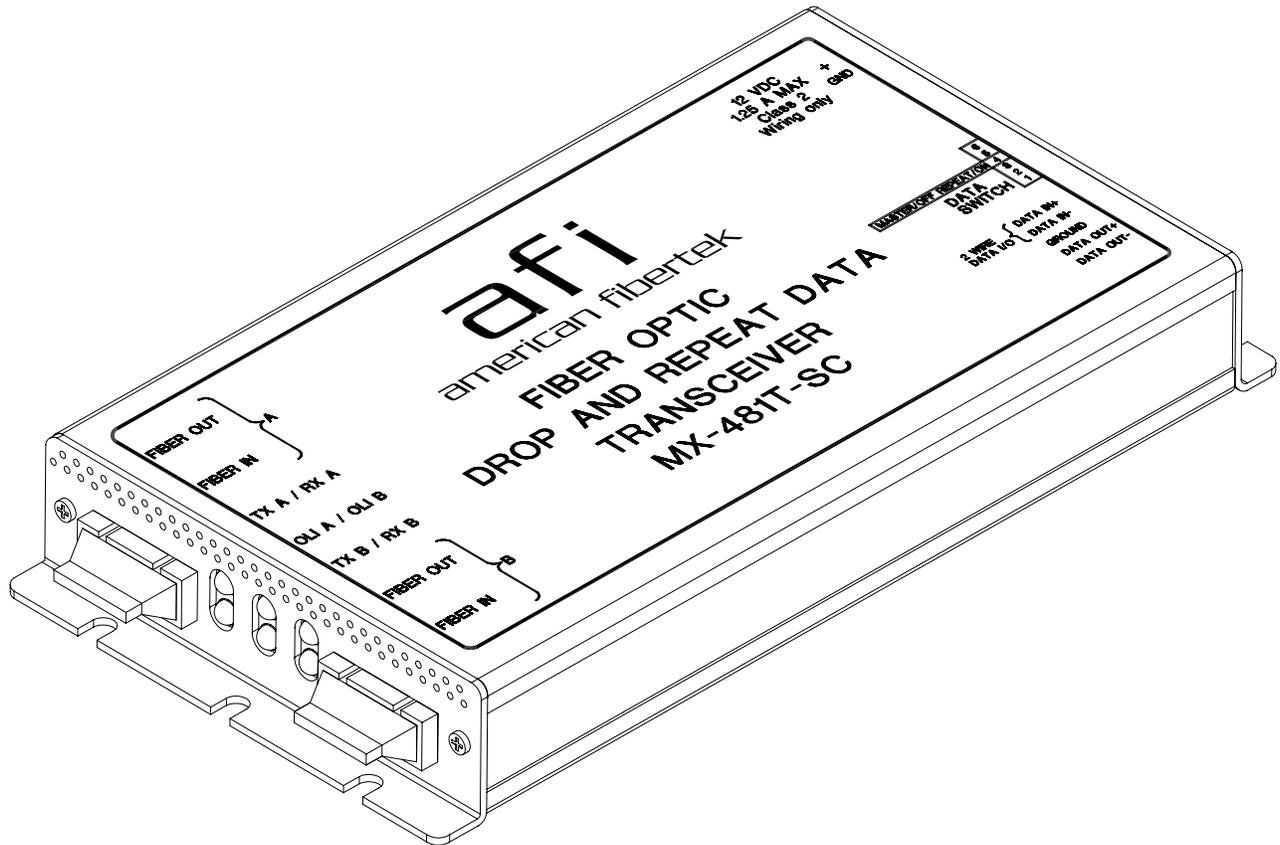


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Instruction Manual

MX-481T-SC

Bi-directional Drop and Repeat RS485 Data Transceiver

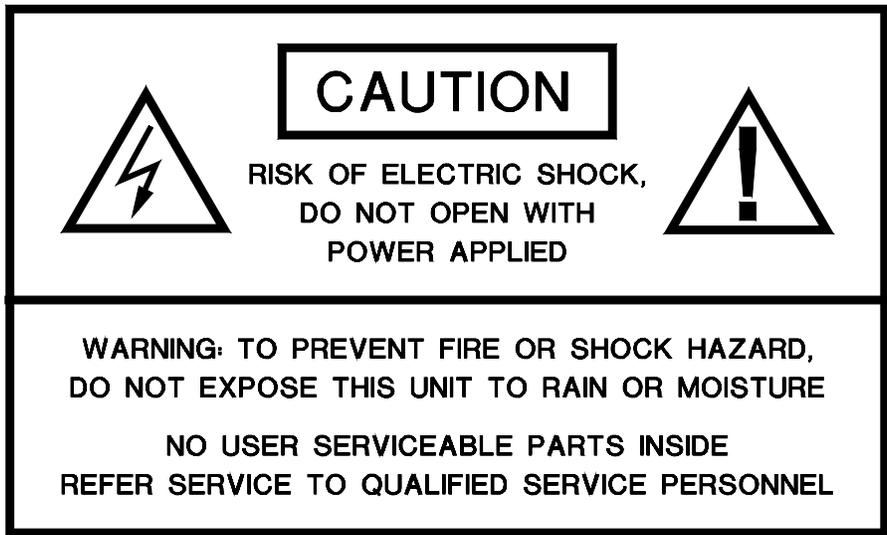


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INSTALLATION AND OPERATION INSTRUCTIONS

INTRODUCTION

Thank you for purchasing your American Fibertek MX-481T-SC multimode bi-directional drop and repeat 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-481T-SC operates as one of a group of drop and repeat transceivers for the transmission of one bi-directional RS485 data channel. This data channel can be configured for 2 wire RS485 or 4 wire RS485 data.

NOTE: This unit is shipped with the data channel in the RS485 2-wire configuration. For RS485 4-wire configurations, please refer to the DATA CONFIGURATION section for changes to the default switch settings.

The MX-481T-SC is designed to operate with multiple MX-481T-SC transceivers with bi-directional RS485 data over two multimode fiber optic cables.

The MX-481T-SC converts a single data signal into a high speed serial data stream. This serial data stream modulates a laser at 1310 nm wavelength. The MX-481T-SC also detects a serial data stream signal returning on a separate optical fiber using a 1310 nm wavelength detector. The 481T-SC Series product is designed to operate over an optical loss budget range of 0 to 10 dB on 62.5 um multimode fiber. The MX-481T-SC will also operate on 50 um multimode fiber at a reduced loss budget range. Refer to the product specification sheet for additional performance data.

The RS485 channel may be configured for 2-wire (half duplex) or 4-wire (full duplex) with or without biasing. Switch selectable 120 ohm terminations are available for RS485 data.

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

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 PRODUCT SHALL BE POWERED BY A LISTED CLASS 2 POWER SUPPLY ONLY.

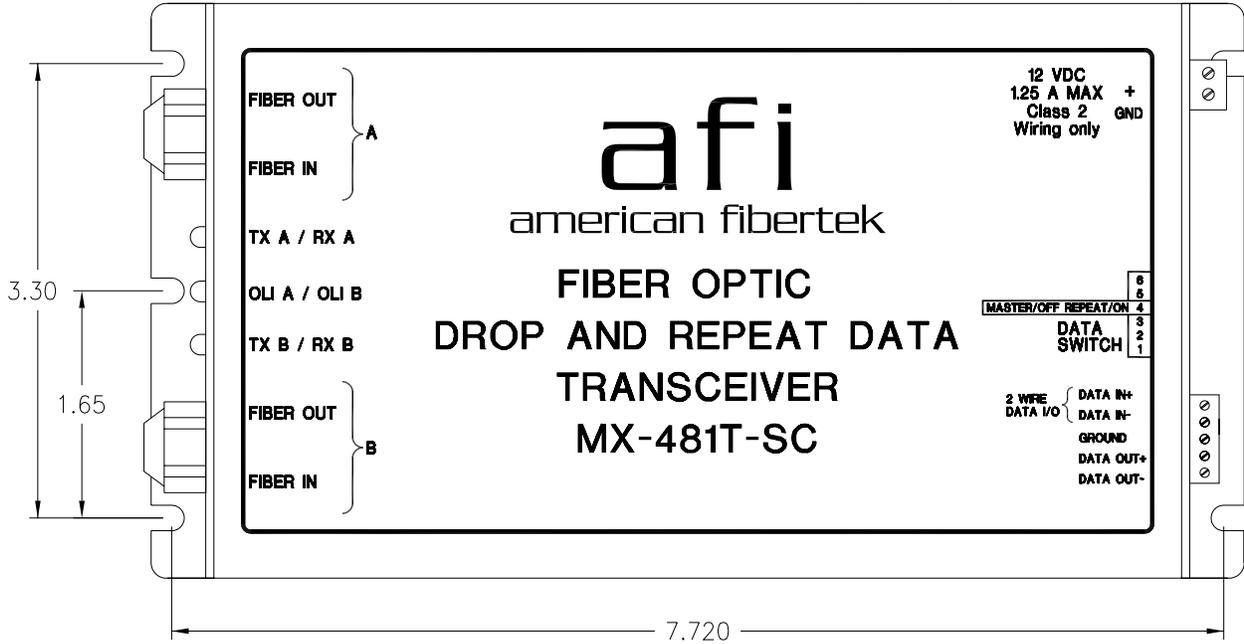
This unit requires a +12VDC power source with a current rating of 1.25 amps for proper operation. The DC input is diode protected. In the USA and in Canada an American Fibertek PS-12D is supplied with this unit. The negative side of the power input is directly connected to ground. ANSI/NFPA 70 Class 2 wiring is recommended.

POWER CONNECTION

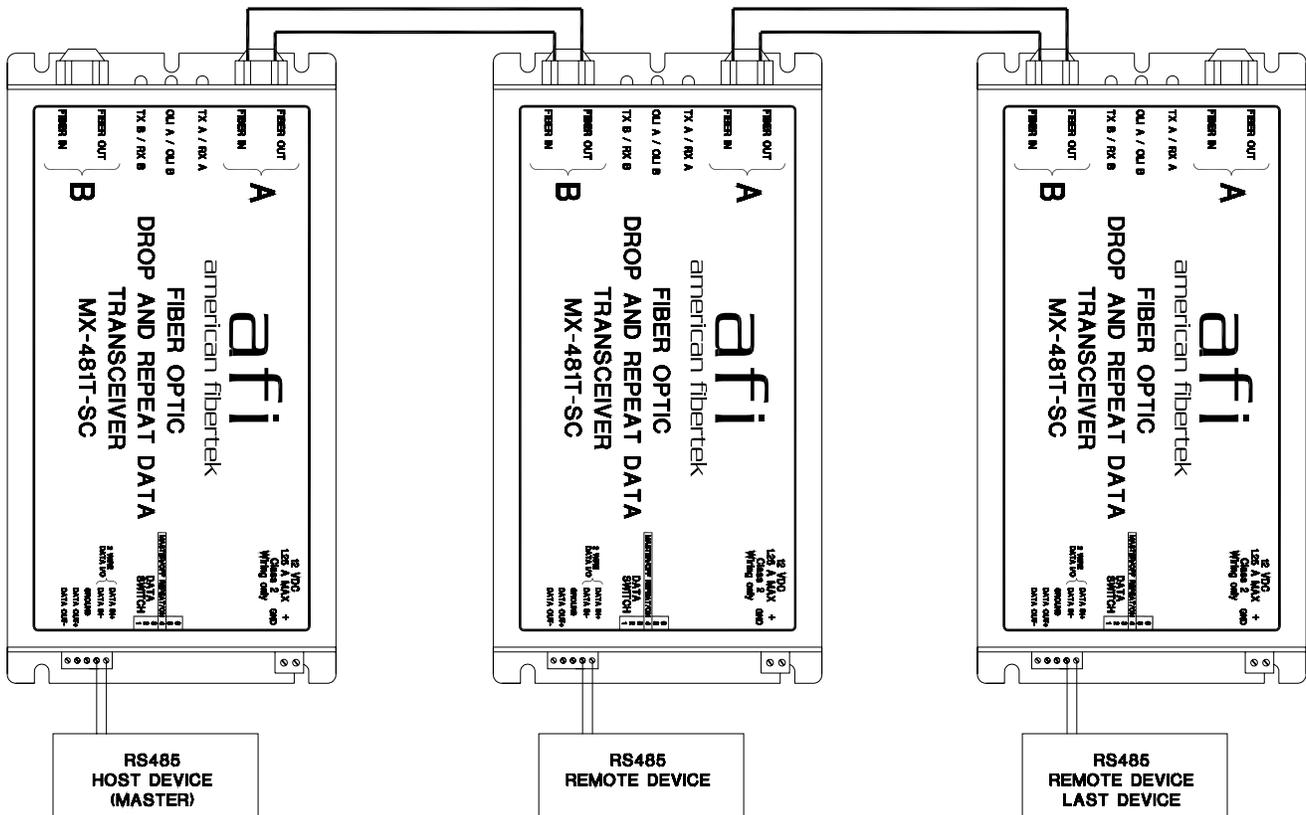
Power is supplied to the unit via a two pin terminal connector on the right side of the unit. Follow the label on unit for proper orientation of +12 volt dc and ground.

FIBER INPUT / OUTPUT CONNECTIONS

The fiber optic connections are made via SC connectors located on the left side of the unit. Follow the label on unit for proper orientation of the fiber input and output cables. The optical port labeled 'B' is connected to the fibers coming from the host/master end of the link. The optical port labeled 'A' is connected to the fibers leading to the repeaters further downstream. Therefore, if this unit is the end fiber unit, only the 'B' fiber port will be used. If this unit is connected via copper data wires to the host/master device for this application, only the 'A' fiber port will be used. Also, please note that for each port FIBER OUT of this unit will become FIBER IN at the corresponding unit.



The drawing below illustrates the fiber connections for a typical application connecting a RS485 host device with two remote RS485 devices.



DATA INPUT / OUTPUT CONNECTIONS

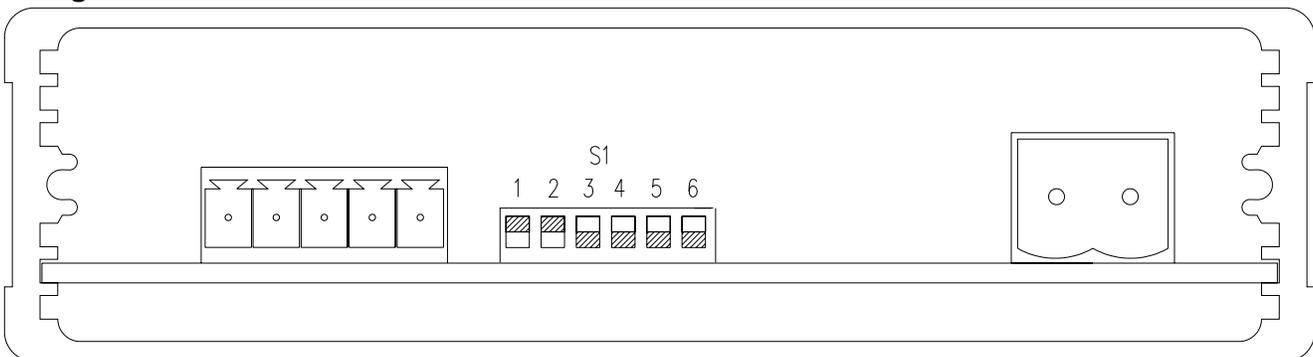
Data input and output connections are made via a terminal block on the right side of the unit. Please follow the label on the unit for proper orientation of the data connections. Please note RS485 2-wire data uses the two terminals labeled DATA IN. For RS485 4-wire, DATA IN on the MX-481T-SC becomes DATA OUT on the remaining MX-481T-SC or RX-481T-SC units after going across the fiber. The reverse flow follows the same orientation. For 2-wire RS485 format data flows through DATA IN on both ends.

TYPICAL FOUR WIRE SYSTEM DATA CONNECTIONS

The RS485 four wire interconnection between the MX-481T-SC and the copper device to which it is attached is based on industry standard EIA terminology for the transmission of electronic data signals. Using this terminology, the driver of an electronic signal is labeled TX or Data Out. Correspondingly, the receiver of an electronic signal is labeled RX or Data In. Following this standard, the Data Out of the copper device is connected to the Data In of the MX-481T-SC. The plus terminal of the copper device is connected to the plus terminal of the MX-481T-SC and the minus is connected to the minus. The reverse flow of data from the MX-481T-SC to the copper device follows the same pattern. Not all manufactures follow standard EIA terminology. Consult the installation instructions for your copper device if you are unsure which two wires are the drive (data out) wires and which two wires are the receive (data in) wires.

DATA CONFIGURATION

NOTE: This unit is shipped as a 'non-master' repeater with the data channel in the RS485 2-wire configuration. Input termination is set to ON, output termination is set to OFF, and all offset biasing is set to OFF. The drawing below depicts the configuration switches in their default settings.



If this unit is connected directly to the host device in this application, or for RS485 4-wire configurations please refer to the drawing below for changes to the default switch settings of switch bank S1. These configuration switches are located on the right side of the unit and can be modified without opening the unit. Switch S1-4 determines the master / 'non-master' status of the unit.

SWITCH S1 LEGEND						
1	2	3	4	5	6	ON=DOWN / OFF=UP
OFF	OFF	ON	ON	ON	ON	RS485-2W, NON-MASTER (FACTORY SHIPPED)
OFF	OFF	ON	OFF	ON	ON	RS485-2W, MASTER
OFF	OFF	OFF	ON	OFF	OFF	RS485-4W, NON-MASTER
OFF	OFF	OFF	OFF	OFF	OFF	RS485-4W, MASTER

DATA BIAS / TERMINATION SWITCHES

NOTE: This unit is shipped input termination set to ON with offset biasing turned OFF.

Switches are available externally that allow offset bias and termination features to be activated when using RS485 data. These bias / termination switches, labeled S2, are located on the right side of the S1 switches and can be modified after removing the end panel cover. Please refer to the drawing below for changes to the default switch settings of switch bank S2.

SWITCH S2 LEGEND			
	ON-DOWN	OFF-UP	FACTORY SHIPPED
1	INPUT BIAS ON	INPUT BIAS OFF	OFF
2	INPUT TERM. ON	INPUT TERM. OFF	ON
3	INPUT BIAS ON	INPUT BIAS OFF	OFF
4	OUTPUT BIAS ON	OUTPUT BIAS OFF	OFF
5	OUTPUT TERM. ON	OUTPUT TERM. OFF	OFF
6	OUTPUT BIAS ON	OUTPUT BIAS OFF	OFF

DATA BIAS / TERMINATION SWITCHES (Cont.)

Please remember when using offset bias switches that they must be used in pairs. If switch # 1 is down then switch # 3 must also be down. The same situation applies for switch # 4 and switch # 6. Also, if using offset bias, it is important that the corresponding termination resistor switch be in the on (down) position. Using offset bias without a termination on the line will cause communications to fail. An explanation follows on general bias and termination guidelines.

RS485 DATA TERMINATION

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 only one device to transmit at any one time to prevent data crashes. 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. The driver chips that are 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 two points in the chain would need to be terminated.

OFFSET BIAS – RS485 DATA

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.

MX-481T-SC STATUS INDICATORS

The MX-481T-SC transmitter provides the following LED status indicators to aid in installation and troubleshooting:

TX A

A green LED indicator is provided to monitor the data coming in from the electrical interface or the 'B' receive port, through the 'A' optical port of the MX-481T-SC, 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. Data transmitted status associated with this LED is summarized below.

TX A LED	Data Status
Green	Data Flow Present
Off	Data Flow Not Detected

RX A

A green LED indicator is provided to monitor the data coming in from the fiber, through the 'A' optical port of the MX-481T-SC, and on to the 'B' optical transmit port. If this is the master unit, this data will also be sent out on 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. Data received status associated with this LED is summarized below.

RX A LED	Data Status
Green	Data Flow Present
Off	Data Flow Not Detected

OLI A

A bi-color LED indicator monitors the optical input power of the data signal that is being received at the 'A' optical port of the MX-481T-SC from the corresponding MX-481T-SC or the RX-481T-SC. DC power and optical input status associated with this LED are summarized below.

Optical Level Indicator	DC Power Status	Optical Status
Green	On	Proper Optical Input Power Present
Red	On	Optical Input Not Detected
Off	Off	Check Power Supply

OLI B

A bi-color LED indicator monitors the optical input power of the data signal that is being received at the 'B' optical port of the MX-481T-SC from the corresponding MX-481T-SC or the RX-481T-SC. DC power and optical input status associated with this LED are summarized below.

Optical Level Indicator	DC Power Status	Optical Status
Green	On	Proper Optical Input Power Present
Red	On	Optical Input Not Detected
Off	Off	Check Power Supply

TX B

A green LED indicator is provided to monitor the data coming in from the electrical interface or the 'A' receive port, through the 'B' optical port of the MX-481T-SC, 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. Data transmitted status associated with this LED is summarized below.

TX B LED	Data Status
Green	Data Flow Present
Off	Data Flow Not Detected

RX B

A green LED indicator is provided to monitor the data coming in from the fiber, through the 'B' optical port of the MX-481T-SC, and out onto the 'A' transmit port and 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. Data received status associated with this LED is summarized below.

RX B LED	Data Status
Green	Data Flow Present
Off	Data Flow Not Detected

**This unit complies with 21 CFR
1040.10 and 1040.11**

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