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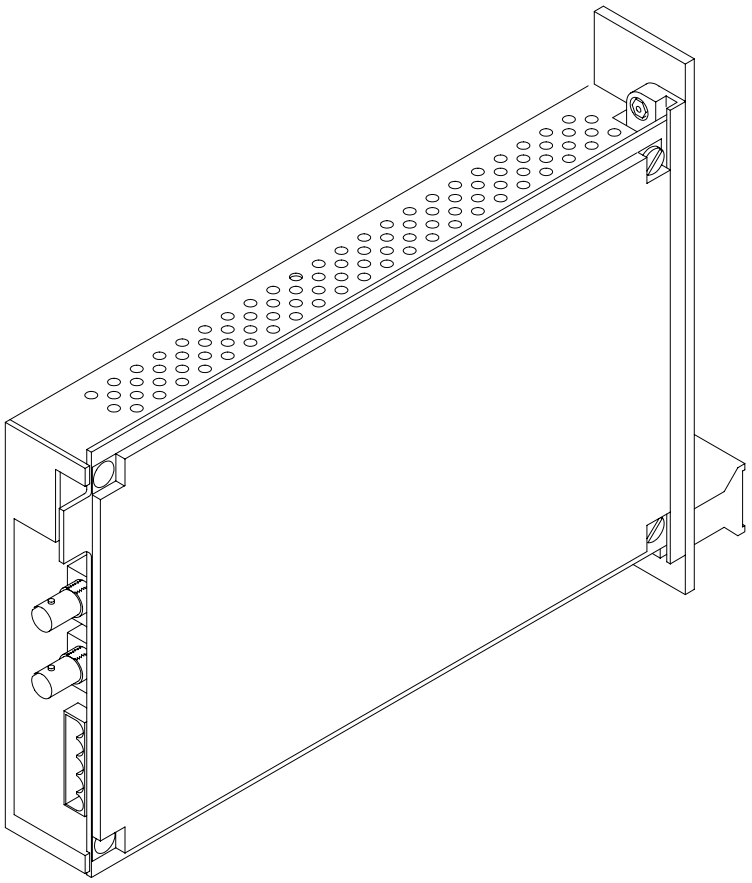

Instruction Manual

RX-485-S
Bi-directional RS485
Data Transceiver

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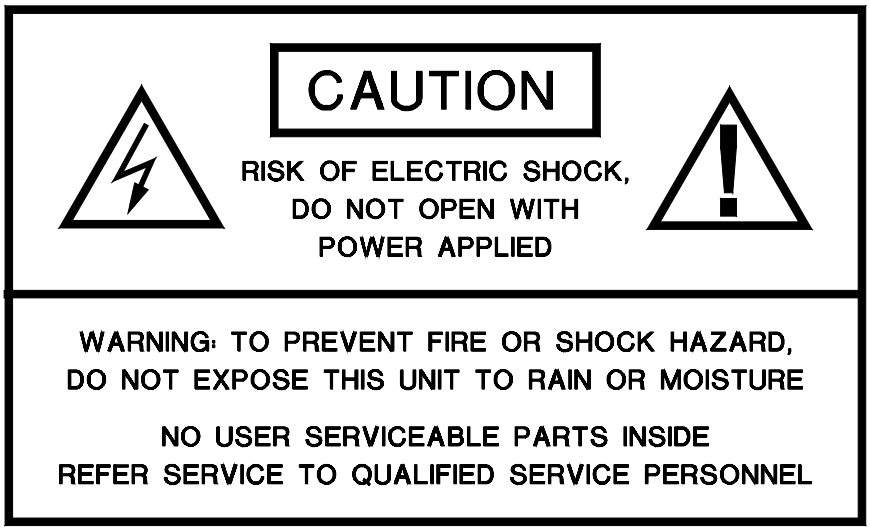

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INSTALLATION AND OPERATION INSTRUCTIONS

INTRODUCTION

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

The RX-485-S converts a single RS485 input into an optical fiber output using a 1300 nm wavelength source. The RX-485-S 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-S Series product is designed to operate over an optical loss budget range of 0 to 17 dB when used on 9um singlemode fiber. Refer to the data sheets for detailed performance specifications.

This unit is designed for rack mounting in any of the four American Fibertek subracks available. The subrack model numbers are SR-20/1, SR-20R/1, SR-20/2, and SR-20D/2. Slide in rack mounting and LED indicators provide for easy installation and monitoring of video and dc power.

The RX-485-S is designed for rack mounting only. For a modular stand alone version please see the MX-485-S.

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.

The unit slides into any open slot in the SR-20 subrack. Use a small screwdriver to push and lock the two ¼ turn fasteners into place.

POWER SOURCE

Power to the unit is supplied by the subrack. Please refer to the SR-20 and PSR instructions for further details.

POWER CONNECTION

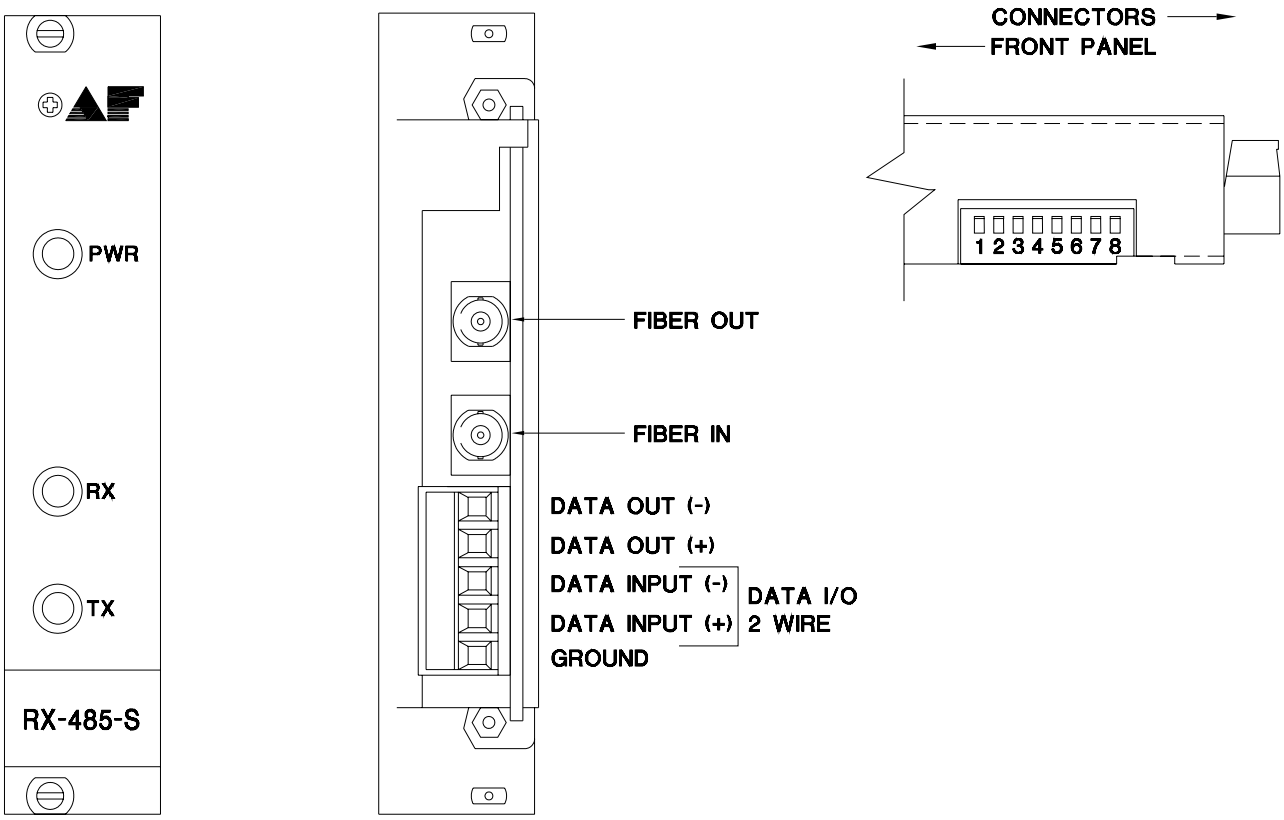
Power is supplied to the unit via a four finger backplane connector. The RX-485-S can be inserted into the subrack or removed from the subrack with power applied to the backplane.

FIBER INPUT / OUTPUT CONNECTIONS

The fiber optic connections are made via ST connectors located on the back of the unit. Be sure to allow sufficient room for the required minimum bend radius of the fiber cable used. 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 back of the unit. Follow the drawing below 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 RX-485-S 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 RX-485-S 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 RX-485-S 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 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’.

RX-485-S STATUS INDICATORS

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

POWER

A green LED indicator monitors the DC power of the RX-485-S. 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 RX-485-S, 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 RX-485-S, 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 RX-485-S using switch # 8. A termination resistor for RS485 4-wire output data can be selected in the RX-485-S using switch # 5. A termination resistor for RS485 2-wire input/output data can also be selected in the RX-485-S 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 RX-485-S 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 RX-485-S 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:

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