

# afi

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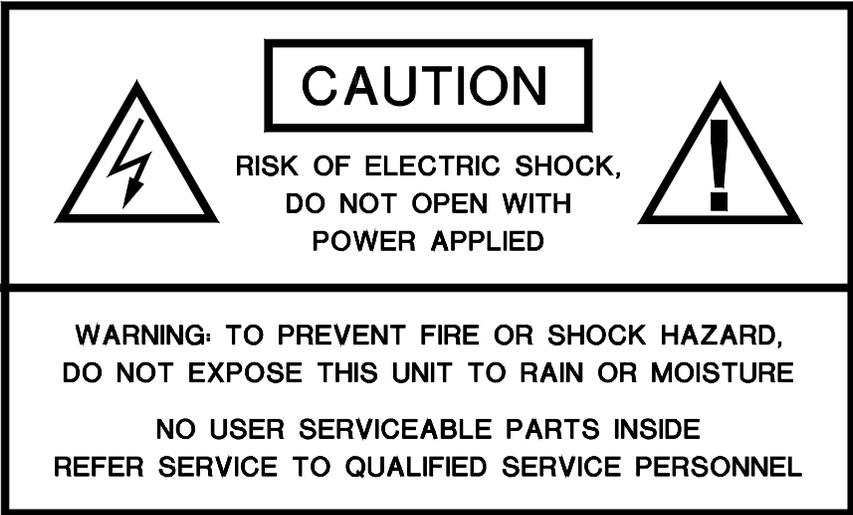
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## Instruction Manual

### MR-944C

Four Channel Video Receiver  
With One Bi-Directional  
Multi-Protocol Data Channel



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# INSTALLATION AND OPERATION INSTRUCTIONS

## INTRODUCTION

Thank you for purchasing your American Fibertek Series 944C multimode four channel video multiplexer with bi-directional multi-protocol data. Please take a few minutes to read these installation instructions in order to obtain the maximum performance from this product.

## FUNCTIONAL DESCRIPTION

The MR-944C operates as half of a transmitter / receiver pair for the digital transmission of four simultaneous NTSC or PAL video signals along with one channel of field configurable bi-directional data over one multimode fiber optic cable. The data channel may be configured as RS485 data, RS422 data, RS232 data, or Manchester data. The RS485 channel may be configured for 2-wire (half duplex) or 4-wire (full duplex) with or without biasing. Switch selectable internal 120 ohm terminations are available for RS422 or RS485 data.

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

**NOTE: This unit is shipped with data terminations off and data bias off. For other configurations, please refer to the DATA TERMINATION / BIAS section for changes to the default switch settings.**

The MR-944C receives a high speed data stream modulated onto a 1310 nm optical wavelength and then de-multiplexes this signal into four video input signals along with one multi-protocol data signal. The MR-944C also transmits a return multi-protocol data channel onto a 1550 nm optical wavelength.

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 video, data, and optical power.

The MR-944C is designed for mounting as a modular stand alone unit. For a rack mounted version please see the RR-944C.

## 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**

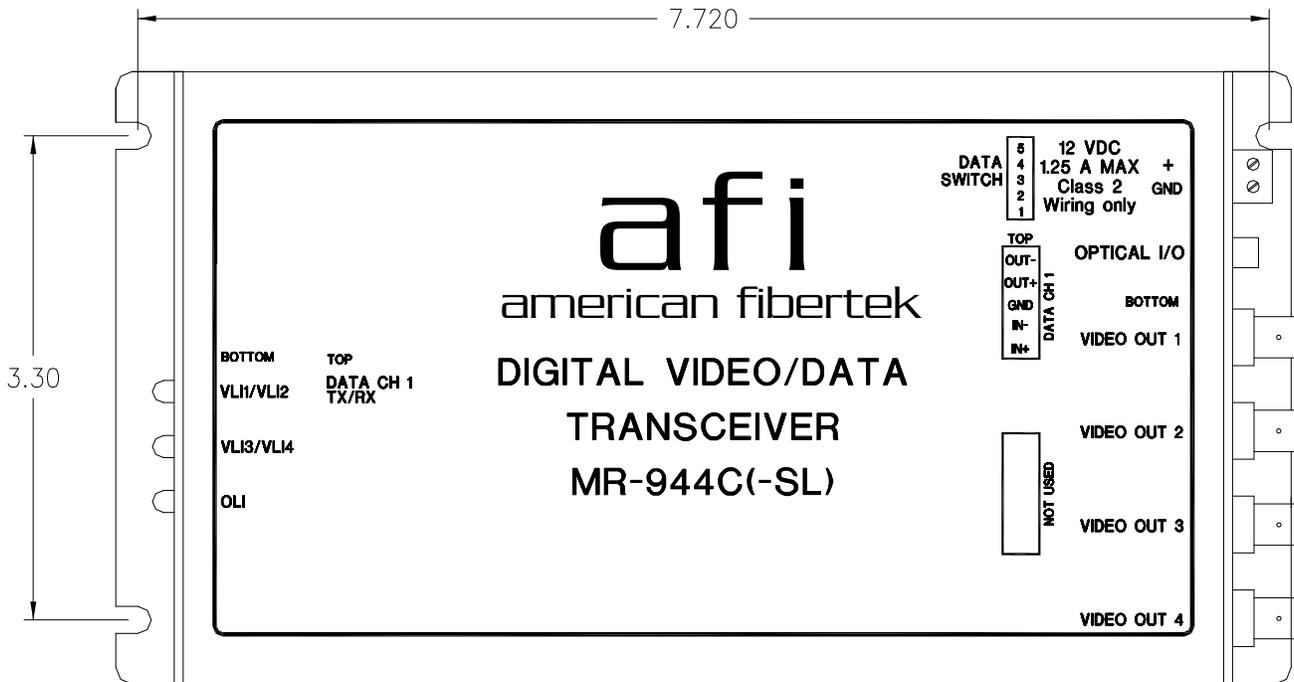
Power is supplied to the unit via a two pin terminal connector on the right side of the unit. Follow the label on unit for proper orientation of +12 volt dc and ground.

**FIBER CONNECTION**

The fiber optic connection is made via a ST connector located on the right side of the unit.

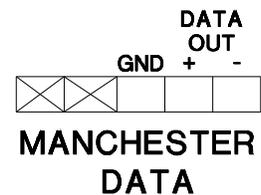
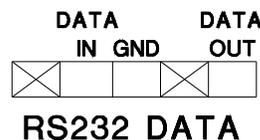
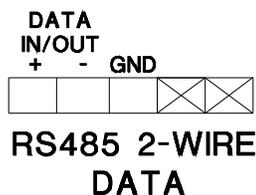
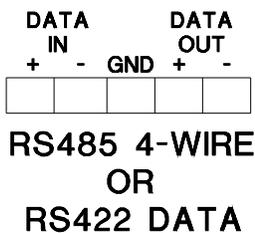
**VIDEO INPUT CONNECTIONS**

The video input connections are made via BNC connectors on the right side of the unit. The video inputs should be connected to an appropriate 75Ω baseband video source such as a camera or a video recorder output. For optimum performance the video cables should be the shortest length of coax practical.



**DATA INPUT / OUTPUT CONNECTIONS**

Data input and output connections are made via the terminal block labeled DATA CH 1 on the right side of the unit. See the drawings below for proper orientation of input and output connections.



## TYPICAL SYSTEM DATA CONNECTIONS

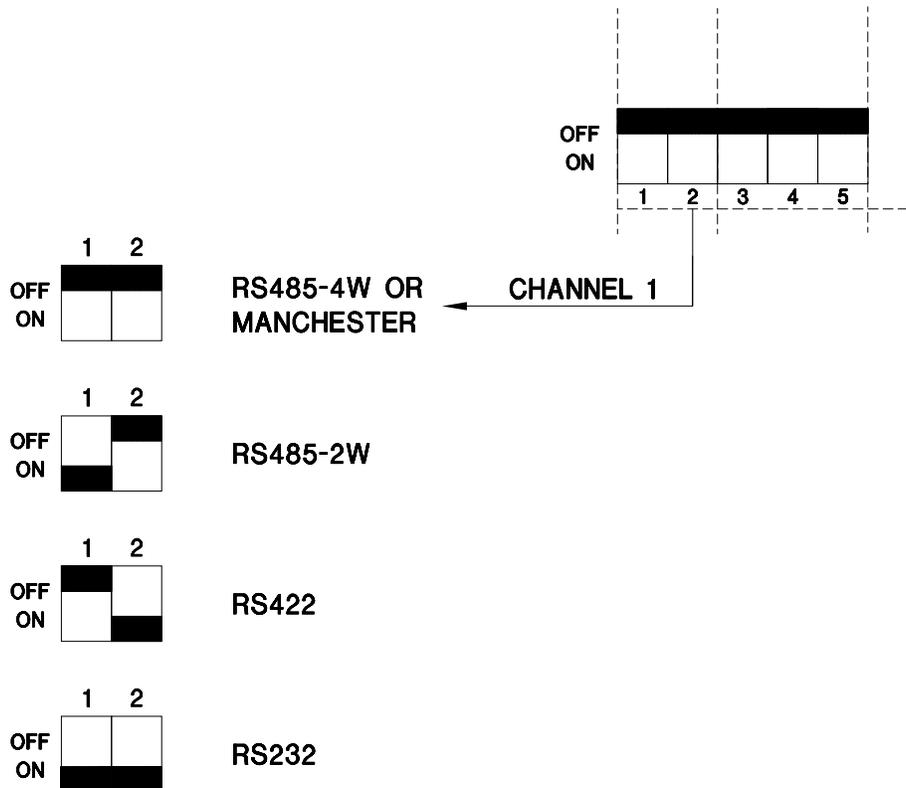
The RS422 or RS485 four-wire interconnection between the MR-944C and the copper device to which it is attached is based on industry standard EIA terminology for the transmission of electronic data signals. Using this terminology, the driver of an electronic signal is labeled TX or Data Out. Correspondingly, 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 MR-944C. The plus terminal of the copper device is connected to the plus terminal of the MR-944C and the minus is connected to the minus. The reverse flow of data from the MR-944C 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.

Please note that Data In on the MR-944C becomes Data Out on the MT-944C or the RT-944C after going across the fiber. The reverse flow follows the same orientation.

## DATA CONFIGURATION SWITCHES

**NOTE: This unit is shipped with Data Channel 1 in the RS485 4-wire configuration.**

For other configurations of data channel 1, please refer to the drawing below for changes to the default switch settings. These configuration switches are located on the right side of the unit and can be modified without opening the unit.

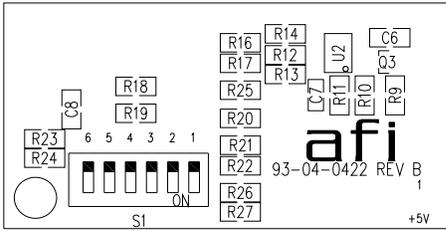


## DATA TERMINATION AND OFFSET BIAS SWITCHES

**NOTE: This unit is shipped with data terminations off and data bias off for the Data Channel. For other configurations, please refer to the chart below.**

Switches are available internally that allow offset bias and termination features to be activated when using RS485 data. These switches also allow termination features to be activated when using RS422 data. In order to reconfigure the RS485/422 channel, the module needs to be opened up. To open the MR-944C, remove the end panel on the terminal block side and remove the screw on the bottom of the module. Slide the PCB assembly out about half way. The configuration switch banks are located at the center of the PCB in line with the DATA 1 terminal block.

The MR-944C is shipped with these switches in the off (up) position. When transmitting contact closure, RS232, or Manchester data, the bias and termination switches must remain in the off (down) position. The top (S1) switches correspond to channel 1. The bottom switches correspond to channel 2. The chart below describes the layout of the top (S1) switch bank. The remaining switch bank follows the same layout.



|      | ON/CLOSED            | OFF/OPEN |
|------|----------------------|----------|
| S1-1 | 485/422 INPUT BIAS   | NO BIAS  |
| S1-2 | 485/422 INPUT TERM.  | NO TERM. |
| S1-3 | 485/422 INPUT BIAS   | NO BIAS  |
| S1-4 | 485/422 OUTPUT BIAS  | NO BIAS  |
| S1-5 | 485/422 OUTPUT TERM. | NO TERM. |
| S1-6 | 485/422 OUTPUT BIAS  | NO BIAS  |

Please remember when using offset bias switches that they must be used in pairs. If switch # 1 is up then switch # 3 must also be up. 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 (up) 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 AND OFFSET BIAS

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.

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.

## MR-944C STATUS INDICATORS

The MR-944C transmitter provides the following LED status indicators to aid in installation and troubleshooting:

### DATA TX / RX INDICATORS

DATA TX and DATA RX indicators are provided to monitor the data and contact closure channels. TX1 and RX1 correspond with the multi-protocol input/output of data channel.

#### DATA TX

A green LED indicator is provided to monitor the data coming in from the electrical interface, through the MR-944C, and out onto the fiber. The intensity of this indicator will vary with input data patterns, however in typical data applications it will cycle on and off as data is transmitted. Data transmit status associated with this LED is summarized below.

| DATA TX LED | Data Status            |
|-------------|------------------------|
| Green       | Data Flow Present      |
| Off         | Data Flow Not Detected |

#### DATA RX

A green LED indicator is provided to monitor the data/contact closure coming in from the fiber, through the MR-944C, and out onto the electrical interface. The intensity of this indicator will vary with input data patterns, however in typical data applications it will cycle on and off as data is received. Data receive status associated with this LED is summarized below.

| DATA RX LED | Data Status            |
|-------------|------------------------|
| Green       | Data Flow Present      |
| Off         | Data Flow Not Detected |

#### VLI 1 THROUGH VLI 4

A bi-color LED indicator is provided for each of the four video inputs to the MR-944C. DC power and video status associated with each of these LED's are summarized below.

| Video Presence LED | DC Power Status | Video Status               |
|--------------------|-----------------|----------------------------|
| Green              | On              | Proper Input Video Present |
| Red                | On              | Input Video Not Detected   |
| Off                | Off             | Check Power Supply         |

#### OLI

A bi-color LED indicator monitors the optical input power of the data signal that is being received at the MR-944C from the MR-944C or the RR-944C. 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                 |

**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  
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