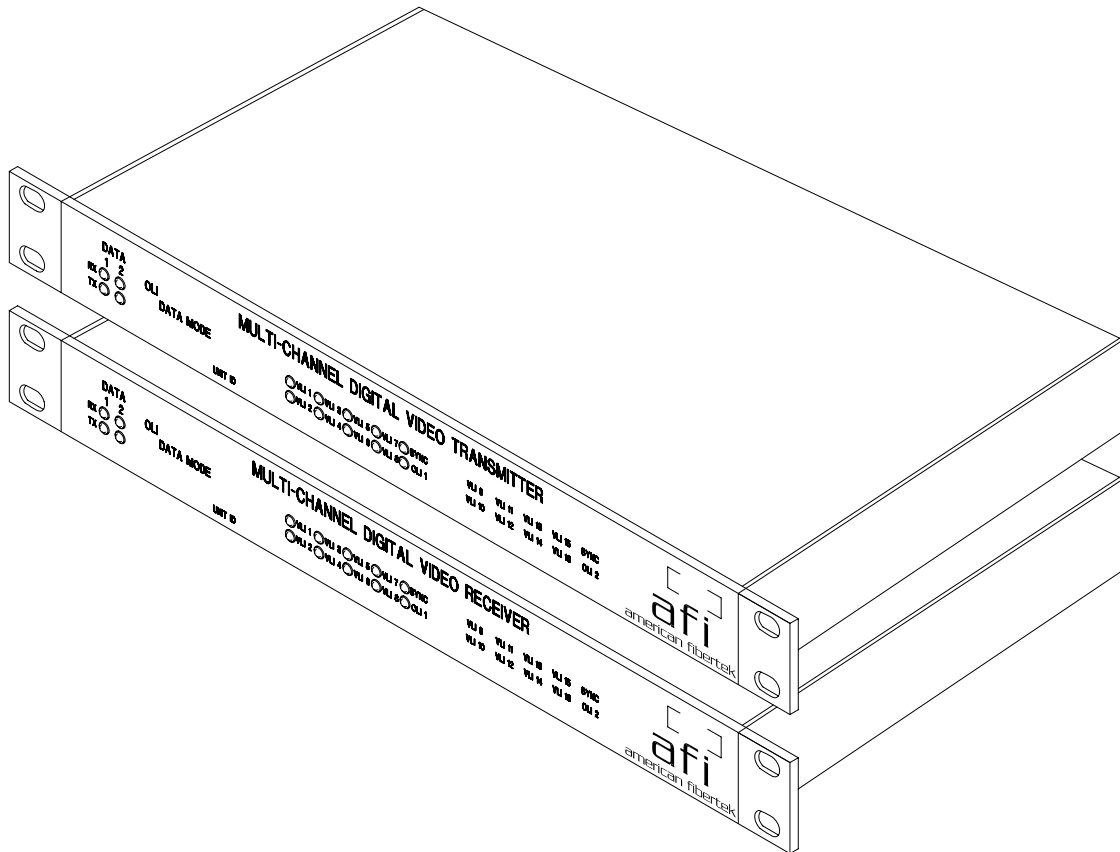


# afi

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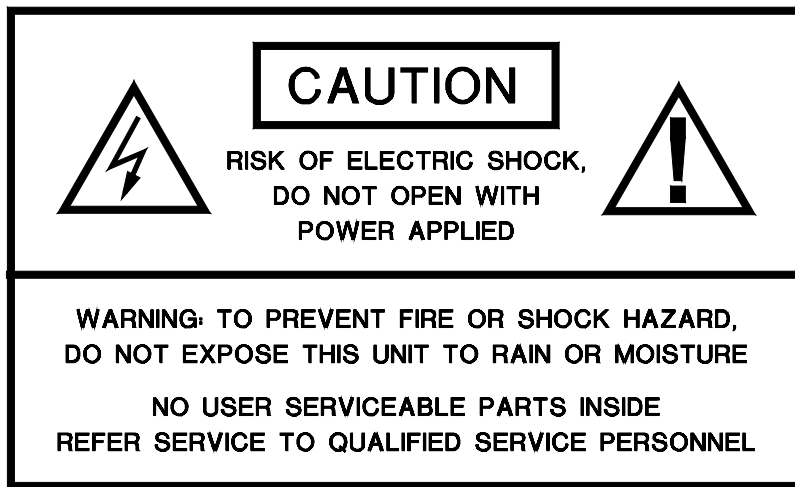


## Instruction Manual

MTX-986-UTP

MRX-986-UTP

Eight Channel Video Multiplexer  
With One Bi-directional Multi-Protocol  
Data Channel and One Bi-directional  
Contact Channel



## Table of Contents

Functional Description .....	3
Installation .....	4
Power Source / Connection .....	4
Fiber Connection.....	4
Video, Data, and Contact Input / Output Connections .....	5
Data Mode Switches .....	6
Data Termination / Bias Switches .....	6
Data Termination Requirements .....	7
Offset Bias - RS485 Data Signals .....	7
MTX-986-UTP Video Input Adjustments .....	8
MRX-986-UTP Video Output Adjustments.....	8
MTX-986-UTP Status LED Indicators .....	9
MRX-986-UTP Status LED Indicators.....	10
Warranty / Service Information .....	12

# INSTALLATION AND OPERATION INSTRUCTIONS

## INTRODUCTION

Thank you for purchasing your American Fibertek Series 986-UTP multimode eight channel video multiplexer with bi-directional multi-protocol data and contact closure. Please take a few minutes to read these installation instructions in order to obtain the maximum performance from this product.

## FUNCTIONAL DESCRIPTION

The 986-UTP Series units operate as a transmitter / receiver pair for the digital transmission of eight simultaneous NTSC or PAL video signals along with one channel of field configurable bi-directional data and one channel of bi-directional contact closure 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 and RS485 biasing.

**NOTE: This unit is shipped with Data Channel 1 in the RS422 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 Data Channel 1. For other configurations, please refer to the DATA TERMINATION / BIAS section for changes to the default switch settings.**

The MTX-986-UTP transmitter accepts up to eight video inputs and multiplexes these inputs into a high speed serial data stream. This serial data stream, along with the forward data and contact closure channels, modulates a laser at 1310nm wavelength. A Wave Division Multiplexer combines this wavelength, along with the return data wavelength of 1550nm, onto a single optical output port for connection to the fiber transmission system. Correspondingly, the MRX-986-UTP receiver converts the optical signal to eight independent video output signals with the forward data and contact closure channels while transmitting the return data and contact closure channels. The 986-UTP Series product is designed to operate over an optical loss budget range of 0dB to 12dB on 62.5um multimode fiber with a maximum transmission distance of 1 Km. Refer to the product specification sheet for additional performance data.

The 986-UTP Series units are designed to be used with a UTP video interface connector. Output video level adjustments are available to properly match a range of UTP camera devices with this unit.

The individual units may be configured for rack mounting or wall mounting depending upon the position of the included mounting hardware. Nominal dimensions of the MTX-986-UTP and MRX-986-UTP are 1 ¾ inches high by 17 inches wide by 12 inches deep. When mounting hardware is included, overall width increases to 19 inches wide.

## 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.

To install the MTX-986-UTP or MRX-986-UTP it is first necessary to mount the rack flanges to the unit.

For rack mounting the ears are installed on the sides of the unit with the surfaces that have oval holes flush with the front of the unit as in Figure 1. Mount the ears with the #10 flathead screws provided. To mount in the rack cabinet, use mounting screws that are appropriate for the rack cabinet being used. When mounting the MTX-986-UTP or MRX-986-UTP in a rack configuration, it is recommended that sufficient airflow is available through the unit. This can be achieved by leaving a 1RU slot above the unit open for air movement and by leaving open space along the sides of the unit.

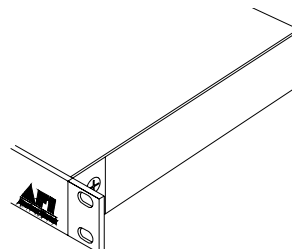


Figure 1. Rack Mount Configuration

For mounting the unit flush to a wall or other rigid surface, the ears may be installed on the sides with the oval holes flush with the bottom of the unit as in Figure 2. Mount the ears with the #10 flathead screws provided. Mount the unit to a rigid surface using #10 (5mm) screws.

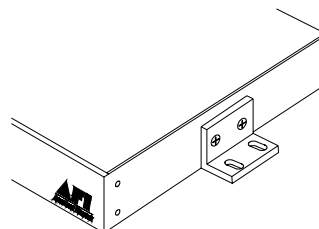


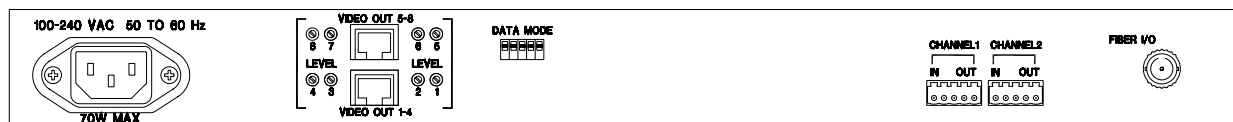
Figure 2. Wall Mount Configuration

## POWER SOURCE

The internal power supply accepts universal line voltage. Any mains supply from 100 to 240 VAC, 50 to 60 Hz, may be used without modification or adjustment. A universal power connector is provided on the rear of the unit to facilitate connection to the power mains.

## POWER CONNECTION

The unit is supplied (in the US and UK only) with a three conductor power cord. The “ground” conductor is directly connected to the chassis.



## FIBER CONNECTION

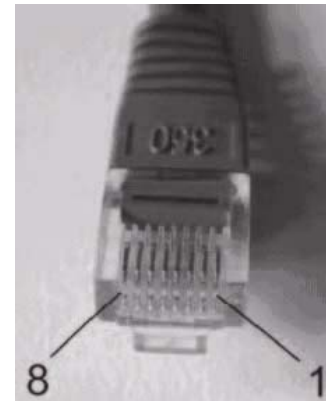
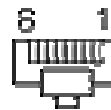
The fiber optic connection is made via a ST connector located at the back of the unit. Be sure to allow sufficient room for the required minimum bend radius of the fiber cable used.

## VIDEO INPUT / OUTPUT CONNECTIONS

Video input and output connections are located on the rear of the unit. Video input connections on the MTX-986-UTP are connected to an appropriate baseband video source such as a camera or a video recorder output. The video outputs on the MRX-986-UTP can be looped through typical baseband video inputs of switchers, recorders and other equipment as required. For optimum performance the video cables should be the shortest length of unshielded twisted pair cable practical. Use the chart and the drawing below to determine the proper configuration of the UTP connector wires for insertion into the MTX-986-UTP unit. The bottom UTP port on the MTX-986-UTP corresponds to video channels 1 through 4, the top corresponds to channels 5 through 8. The video output connectors of the MRX-986-UTP follow the same orientation and configuration.

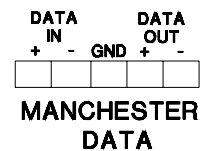
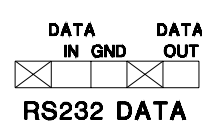
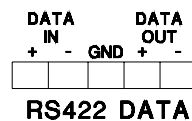
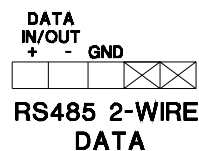
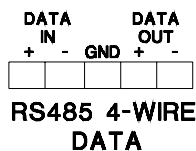
Pin	Function
1	Video In Channel 4 (+)
2	Video In Channel 4 (-)
3	Video In Channel 2 (+)
4	Video In Channel 1 (-)
5	Video In Channel 1 (+)
6	Video In Channel 2 (-)
7	Video In Channel 3 (+)
8	Video In Channel 3 (-)

Front  
View



## DATA INPUT / OUTPUT CONNECTIONS (DATA 1)

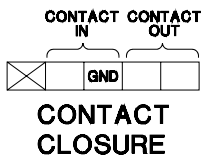
Data input and output connections are made via terminal blocks on the back of the unit. See the drawings below for proper orientation of the input and output connections. Please note that the far right pin on each connection drawing corresponds with the far right terminal block pin on the unit.



Please note that Data In on the MTX-986-UTP becomes Data Out on the MRX-986-UTP after going across the fiber. The reverse flow follows the same orientation.

## CONTACT INPUT / OUTPUT CONNECTIONS (DATA 2)

Data input and output connections are made via terminal blocks on the back of the unit. See the drawing below for proper orientation of input and output connections. Please note that the far right pin on the connection drawing corresponds with the far right terminal block pin on the unit.

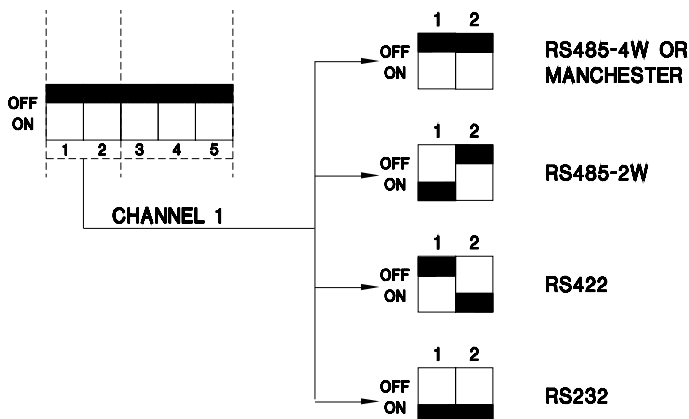


Please note that Contact In on the MTX-986-UTP becomes Contact Out on the MRX-986-UTP after going across the fiber. The reverse flow follows the same orientation.

## DATA MODE SWITCHES

**NOTE: This unit is shipped with Data Channel 1 in the RS422 configuration and Data Channel 2 in a Contact Closure configuration.**

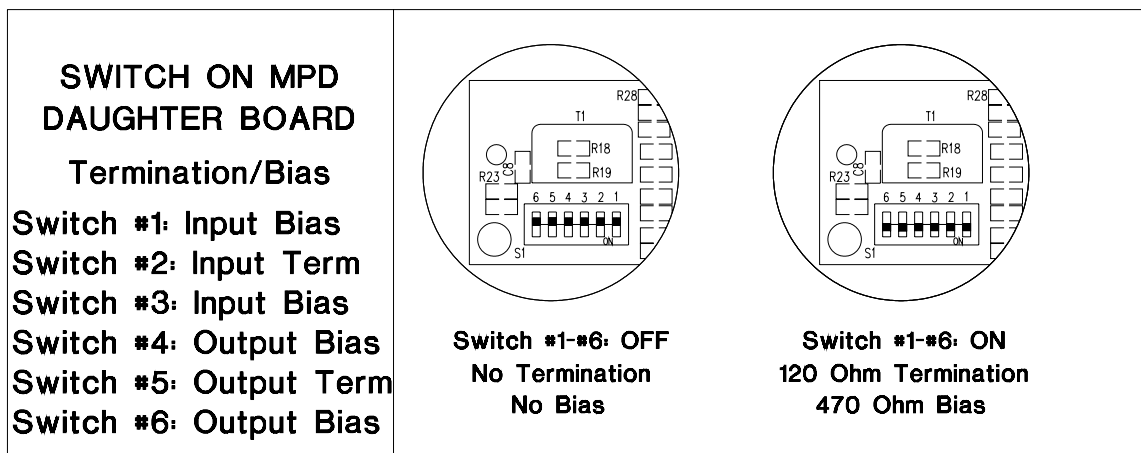
For other configurations of data channel 1 please refer to the drawing at the right for changes to the default switch settings. The configuration switch is located on the rear of the unit and can be modified without opening the unit. Please note that switch # 3, 4, and 5 are not used and should remain in the off (up) position.



## DATA TERMINATION / BIAS SWITCHES

**NOTE: This unit is shipped with Data Termination and Bias switches in the off position.**

Switches are available inside the unit that allow termination and offset bias features to be activated. The drawing below illustrates the function of each of these switches. To gain access to these switches remove the top cover of the MTX-986-UTP and the MRX-986-UTP by removing the fourteen screws joining the cover to the main housing. The switch bank can be found by following the UTP port connector back toward the circuit board located in the center of the unit. For an explanation of termination functions when using RS422 or RS485, please refer to the **DATA TERMINATION REQUIREMENTS** section. For an explanation of RS485 biasing please refer to the **OFFSET BIAS – RS485** section. In the majority of cases, bias will not be required and these switches should remain in the off (up) position. If biasing is required, the corresponding termination switch must be turned on for the biasing switches to be functional. Also, biasing switches must be set in pairs, for example, switch # 1 and 3 must be both on or both off. If using the bias switches with 2-Wire RS485, only the Input switches are used, all Output switches must remain in the off position. **When transmitting RS232 or Manchester data, the bias and termination switches must remain in the off (up) position.**



## DATA TERMINATION REQUIREMENTS

### RS232 Data Signals

The RS232 interface standard is a point to point transmission protocol for digital signals. It allows for a single transmitter device communicating to a single receiving device. This configuration is mirrored in the opposite direction to create one bi-directional data path. Devices using this protocol have terminating resistors built into their data path. This eliminates the need for any switch selection for termination resistors in the RS232 mode.

### RS422 Data Signals

The electrical interface described in RS422 is a data transmission standard for balanced digital signals. It allows for a single transmitter device communicating to as many as 32 receiving devices. This type of data signal is well suited to systems that require data to be distributed to several points without a return data path. Several companies offer camera telemetry controllers using this data interface. Because there is only one transmitting device on the network, this one may remain active at all times. There is no need for the driver to go into a high impedance state to allow others to "talk." In most cases termination resistors are not required to be applied to RS422 data outputs. In long copper runs (over 500 feet) termination resistors may be required on data inputs to eliminate data reflections.

### RS485 Data Signals

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 (firmware).

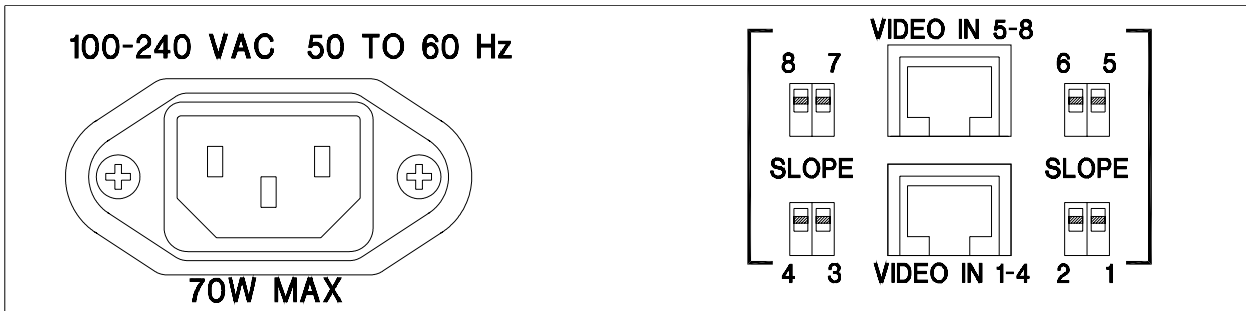
The driver chips used in RS485 communications are capable of changing into their high impedance state very rapidly. On even short lengths of wire there can exist a residual voltage after a driver circuit turns off. This can interfere with circuits that are used to detect the Hi-Z state. It is very important 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 two points in the chain would need to be terminated.

### OFFSET BIAS – RS485

The RS485 specification requires receivers to detect input signals down to 200mVp-p of voltage level. In some 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.

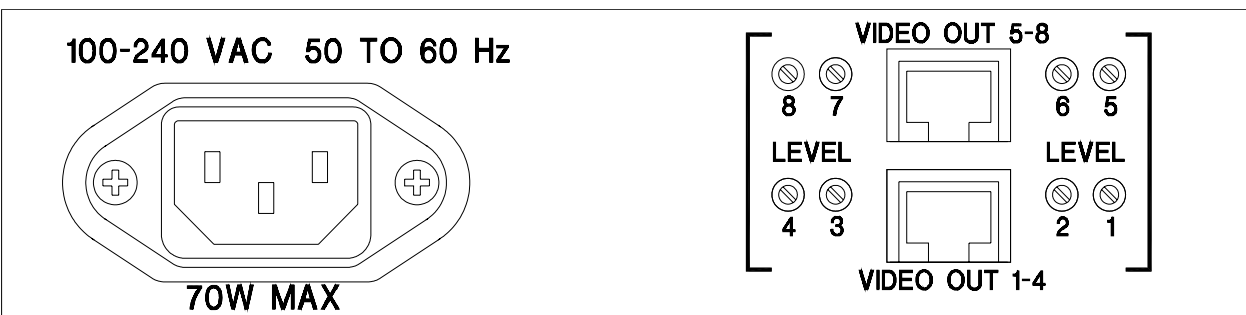
## MTX-986-UTP VIDEO INPUT ADJUSTMENTS

The MTX-986-UTP has the ability to individually boost the high frequencies of each of the eight video inputs of the UTP ports. This boost is available to compensate for the high frequency roll off at 3.58 MHz associated with CAT 5 UTP cables. Typically, CAT 5 UTP cables have a slope roll off of 4dB for every 100 meters of cable. See the drawing below for the location of the SLOPE switch associated with each video channel. The MTX-986-UTP is shipped with these switches in the up (off) position. To increase the video input levels into this unit at 3.58 MHz by 4dB (20 IRE), move the desired channel switch to the down (on) position.



## MRX-986-UTP VIDEO OUTPUT ADJUSTMENTS

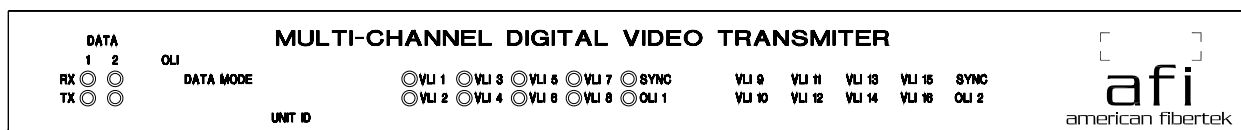
The MRX-986-UTP has the ability to individually increase or decrease each of the eight video outputs of the UTP ports. See the drawing below for the location of the LEVEL potentiometers associated with each video channel. The MRX-986-UTP is shipped with these potentiometers in the midrange position. To increase the video output of this unit to a maximum of 2 volts p-p turn the desired potentiometer counter clockwise. To decrease the video output of this unit to a minimum of 0 volts p-p turn the desired potentiometer clockwise.





## MTX-986-UTP STATUS INDICATORS

The MTX-986-UTP transmitter provides the following front panel LED status indicators to aid in installation and troubleshooting:



### DATA RX/TX INDICATORS

DATA RX and DATA TX indicators are provided to monitor each of the two available data channels. DATA 1 RX and TX correspond with the multi-protocol output/input of DATA CH 1. DATA 2 RX and TX correspond with the status of the Contact (open/closed).

### DATA RX/CONTACT STATUS

A green LED indicator is provided to monitor the data coming in from the fiber, through the MTX-986-UTP, 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. Data received status associated with this LED is summarized below.

DATA RX LED	Data 1 Status	Data 2 (Contact) Status
Green	Data Flow Present	Contact Closed
Off	Data Flow Not Detected	Contact Open

### DATA TX/CONTACT STATUS

A green LED indicator is provided to monitor the data coming in from the electrical interface, through the MTX-986-UTP, 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.

DATA TX LED	Data 1 Status	Data 2 (Contact) Status
Green	Data Flow Present	Contact Closed
Off	Data Flow Not Detected	Contact Open

### VLI 1 THROUGH VLI 8

A green LED indicator is provided for the each of the eight video inputs to the MTX-986-UTP. Video status associated with each of these LED's is summarized below.

VIDEO LEVEL LED	Video Status
Green	Proper Input Video Present
Off	Input Video Not Detected

### SYNC

A green LED indicator is provided to monitor the AC power status of the unit. AC power status associated with this LED is summarized below.

SYNC LED	AC Power Status
Green	On
Off	Check Power Supply Input

## MTX-986-UTP STATUS INDICATORS (cont)

### OLI 1

A bi-color LED indicator monitors the optical input power of the data signal that is being received at the MTX-986-UTP from the MRX-986-UTP. Optical input status associated with this LED is summarized below.

OPTICAL LEVEL LED	AC Power Status	Optical Status
Green	On	Proper Optical Input Power Present
Red	On	Optical Input Not Detected

## MRX-986-UTP STATUS INDICATORS

The MRX-986-UTP receiver provides the following front panel LED status indicators to aid in installation and troubleshooting:



### DATA RX/TX INDICATORS

DATA RX and DATA TX indicators are provided to monitor each of the two available data channels. DATA 1 RX and TX correspond with the multi-protocol output/input of DATA CH 1. DATA 2 RX and TX correspond with the status of the Contact (open/closed).

### DATA RX/CONTACT STATUS

A green LED indicator is provided to monitor the data coming in from the fiber, through the MRX-986-UTP, 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. Data received status associated with this LED is summarized below.

DATA RX LED	Data 1 Status	Data 2 (Contact) Status
Green	Data Flow Present	Contact Closed
Off	Data Flow Not Detected	Contact Open

### DATA TX/CONTACT STATUS

A green LED indicator is provided to monitor the data coming in from the electrical interface, through the MRX-986-UTP, 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.

DATA TX LED	Data 1 Status	Data 2 (Contact) Status
Green	Data Flow Present	Contact Closed
Off	Data Flow Not Detected	Contact Open

## MRX-986-UTP STATUS INDICATORS (cont)

### VLI 1 THROUGH VLI 8

A green LED indicator is provided for the each of the eight video outputs of the MRX-986-UTP. Video status associated with each of these LED's is summarized below.

Video Presence LED	Video Status
Green	Proper Output Video Present
Off	Output Video Not Detected

### SYNC

A green LED indicator is provided to monitor the AC power status of the unit. AC power status associated with this LED is summarized below.

SYNC LED	AC Power Status
Green	On
Off	Check Power Supply Input

### OLI 1

A bi-color LED indicator monitors the power of the optical input signal that is being received at the MRX-986-UTP from video channels one through eight of the MTX-986-UTP. Optical input status associated with this LED is summarized below. Please note that data is also sent to the MRX-986-UTP with this optical input signal.

OPTICAL LEVEL LED	AC Power Status	Optical Status
Green	On	Proper Optical Input Power Present
Red	On	Optical Input 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](mailto:techinfo@americanfibertek.com)