

# User's Manual

## *D500 Series*



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**Fiber Optic Data Multiprotocol**

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**Installation and User Guide**

## **Revision 3.0 January 2006**

### **D500 Series Users and Installation Manual**

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## **1 SAFETY INSTRUCTIONS**

THE D500 SYSTEM MAY CONTAIN A CLASS IIIb LASER. PLEASE OBSERVE THE FOLLOWING SAFETY PRECAUTIONS THAT APPLY TO LASER EQUIPT UNITS.

**WARNING:** Do not disconnect the fiber optic external connector with the power turned on. Exposure to Class IIIb Laser radiation is possible when the external fiber connector is disconnected while the unit is still powered up. Ensure the rubber boot is in place whenever the fiber optic cable is disconnected.

**CAUTION:** Attempting to make adjustments or performing operations other than those specified may result in hazardous radiation exposure. Exposure for only seconds can cause permanent eye damage as well as other injuries.

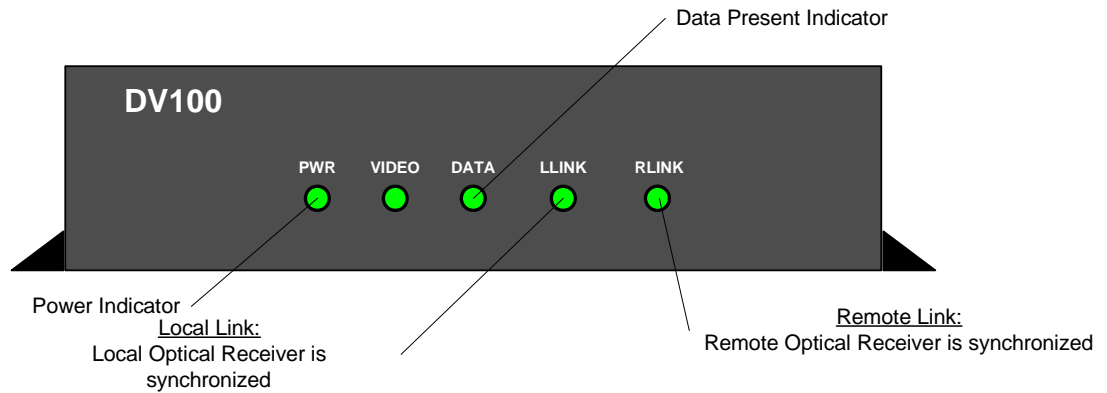
## 2 INTRODUCTION

This manual is a guide to the installation, operation, applications and maintenance of the D500 series fiber optic video optic transmission system.

### 2.1 System Configuration Overview

#### 2.1.1 Data Transmitter Front

The D500T and the D500R share the same indicator panel. The indicators provide information regarding the local optical link, the optical link at the remote end (relative to observer) and presence of video and data activity. The front and rear panels are shown below:



#### D500 FRONT VIEW

#### Optical Transmission Link Indicators:

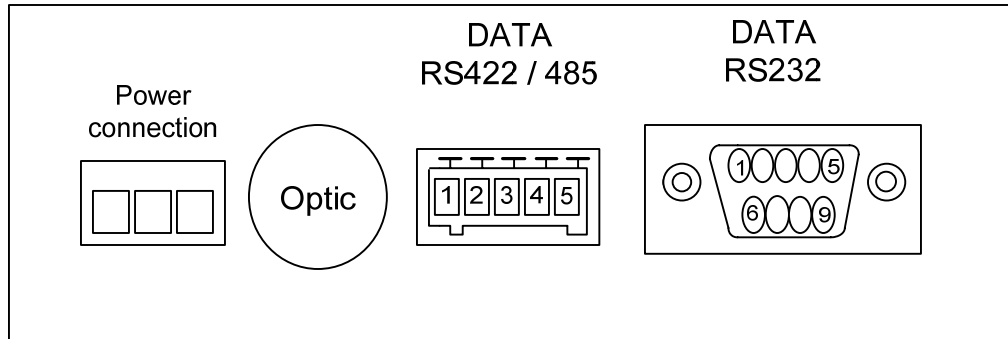
The presence of Local Link (LLINK) on the front panel indicates that the INCOMING optical digital signal is synchronized and being received without errors. In order for ANY OTHER INDICATORS to be valid, the LLINK LED must be illuminated GREEN.

The Remote Link Indicator (RLINK) indicates that the remote end's (relative to observer) optical digital signal is synchronized at the remote end and is being received without errors. This indicator allows the user to check the optical transmission status in both directions from one end of the system.

### 2.1.2 Data Rear View

The D500T and the D500R also have the same rear panel. The rear panel is depicted below:

REAR VIEW OF UNIT



## 2.2 Equipment Description

The system is capable of transmitting and receiving 3 types of standard data-RS232, RS422 or RS485 over 1 or 2 fibers.

Depending on the distance requirements between sites, the D500 Series may be equipped to operate over multi-mode fiber or equipped to operate over single mode fiber. Distances between the transmitter and receiver can be up to 10 Km for multi-mode operation and up to 80 Km for singlemode operation.

The D500 system employs uncompressed analog to digital modulation techniques, which provides for superior receiver output stability and is unaffected by changes in the fiber path attenuation caused by environmental factors, splicing or aging.

## 2.2.1 D500 SERIES BASE MODELS

The D500 Series:

<u><b>Tx Model</b></u>	<u><b>Rx Model</b></u>	<u><b>Description</b></u>
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**Two fiber Versions:**

D5XXM2-YZW

D5XXS2-YZW

Two fiber models are transceivers therefore do not use a T and R designation.

**Single Fiber Versions:**

D5XXM1-T-YZW    D5XXM1-R-YZW

D5XXS1-T-YZW    D5XXS1-R-YZW

Single fiber versions are designated as T and R to distinguish between operating wavelengths.

**Model Notes:**

D500	RS232 3-WIRE
D510	RS232 FULL HANDSHAKING
D515	RS422
D520	RS485
D550	RS232/RS422/RS485

XX	Model# /Data Type
Y	<b>M</b> -MODULAR <b>R</b> -RACK MOUNT <b>U</b> -1U CHASSIS
Z	<b>D</b> - ST, <b>B</b> -FC, <b>E</b> -SC/UPC <b>A</b> -SC/APC <b>S</b> -FCNAPC
W	Wavelength (Varies by Model) <b>1</b> -850 <b>2</b> -1300 <b>3</b> -1310 <b>5</b> -1550

### 3 Unpacking The Unit

Remove all materials from the packing box and confirm receipt of the following:

- D500-T Optical transmitter
- D500-R Optical Receiver
- A/C power cord(1U) or Power Supply (Modular)
- User's manual.

In the unlikely event that anything is missing, contact your authorized ACL dealer or representative. If it becomes necessary to return the unit (s), repackage the unit in its original box.

### 4 General Installation

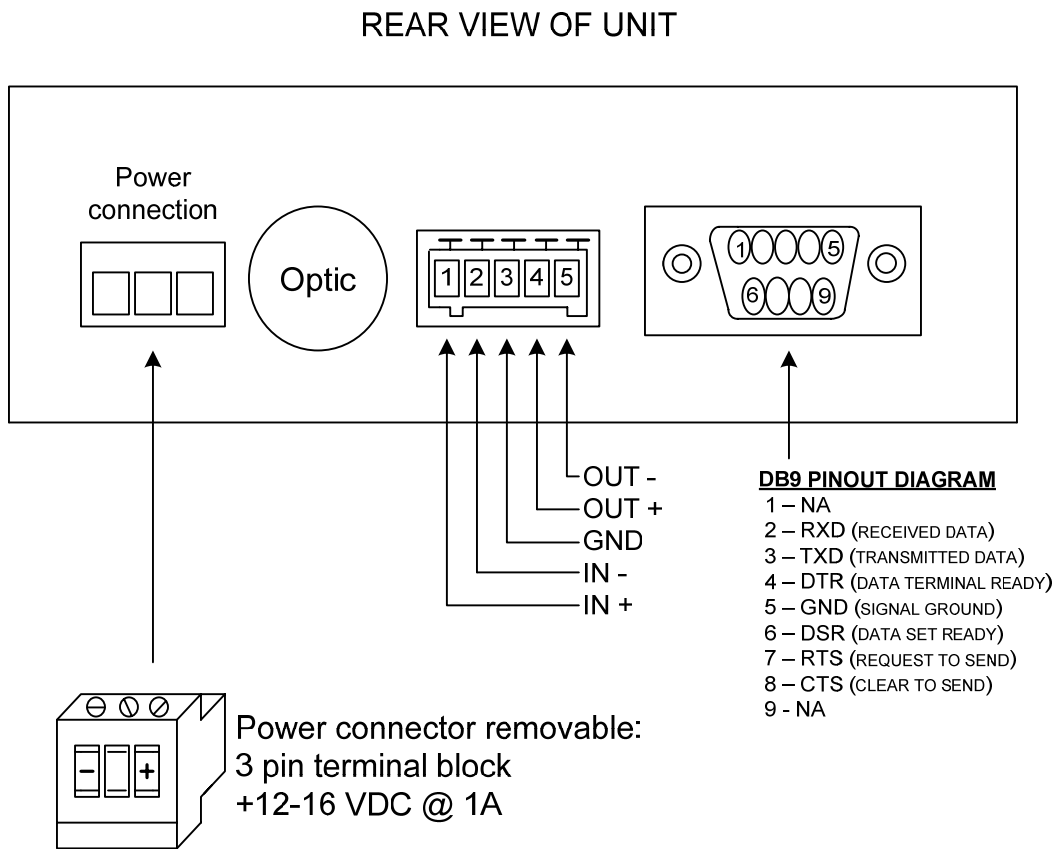
Install the D500 stand alone units such that the environmental specifications are not exceeded.

**NOTE:** Install the D500 such that ventilation is present as this will minimize the possibility of component failures and increase system reliability.

## 4.1 Power Connection

### 4.1.1 Stand Alone

DC Power connections are made by connecting the 12-14 volts DC @ 1A to the corresponding terminal block connections on the rear of the unit labeled " 14VDC + and - ", as shown below:



The Green LED indicator labeled "PWR" should now be on.

### 4.1.2 Rackmount Chassis

Slide the D500 Rackmount Card into an empty slot. Push firmly to ensure that the card is properly seated into the card slot.

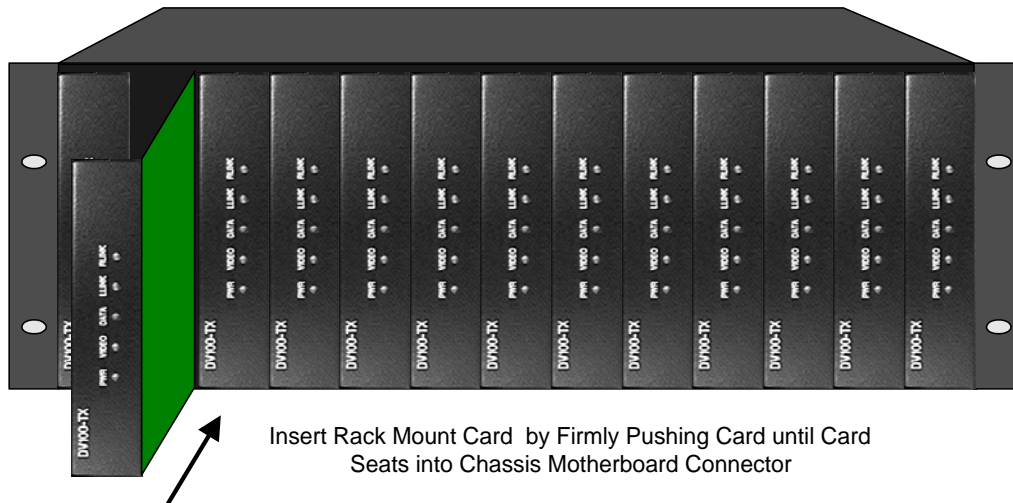
The D500 Rackmount Card is hot swappable and may be inserted or removed when power is applied to the chassis.

When power is applied to the chassis, the PWR LED indicator on the D500 Rackmount Card will illuminate indicating that the card is powered on.

The chassis power supply is designed for operation over an AC input range of 90 VAC to 240 VAC and input frequency from 47 Hz to 63 Hz and is equipped with a standard IEC three prong power plug which will only fit a grounding type AC outlet.

**Note:** Do not defeat the purpose of the AC chassis grounding plug or equipment damage may occur

#### D500 Series Installed in 19" EIA Chassis



## 4.2 Fiber optic cable connection

The D500 Series has the following optical connection options:

- a. ST
- b. FC
- c. SC
- d. SCAPC
- e. FCNAPC

In order to connect the D500 Series to the fiber optic cable plant, a compatible fiber optic jumper must be used.

**Note:** Clean fiber optic jumpers increase transmission distance and reduce reflections.

## 4.3 Fiber Optic Ports

The following describes the steps required to connect the D500 Series Transmitter and Receiver to the fiber optic cable plant.

- a. Proper optical fiber connection between the transmitter and the receiver is to label each individual cable for each channel.
- b. To make connections:
  - Clean the port: First remove and save the dust caps from the optical port of both the converter and the user device. Wipe the inside of the sleeve with a lint-free pipe cleaner moistened with reagent-grade isopropyl alcohol. Blow dry with dry air.
  - Clean the connector: Use lint-free cloth dampened with alcohol to thoroughly wipe the side and end of the ferrule. Blow the ferrule dry with dry air. Visually inspect the ferrule for lint.

. To insert connector:

ST-type: Hold the connector by the strain-relief boot and insert the connector ferrule into the port. Rotate the boot until the “key” engages in the slot of the coupling. Push the connector housing forward until it can be turned clockwise to latch to the port.

FC-type: Holding the connector by the strain-relief boot and insert the connector ferrule into the port. Rotate the boot until the “key” engages in the slot of the coupling. Push the connector housing forward and screw turned clockwise until it is tied.

SC Type: Align the SC fiber optic jumper's SC connector such that the SC Key is on top. Align the jumper's ferrule with the D500 Fiber Optic port and insert the ferrule. Firmly push the SC jumper's connector all the way into the D500 optical SC mating port until the connection clicks into place. Measure the optical output power with an optical power meter to ensure that a low loss connection has been made.

SCAPC Type: See Align the SCAPC fiber optic jumper's SCAPC connector such that the SC Key is on top. Align the jumper's ferrule with the D500 Fiber Optic port and insert the ferrule. Firmly push the SCAPC jumper's connector all the way into the D500 optical SCAPC (GREEN) mating port until the connection clicks into place. Measure the optical output power with an optical power meter to ensure that a low loss connection has been made. Note: Never mate angle jumpers(Green Boot) with unangled/Flat UPC jumpers(Blue Boot).

FCNAPC Type: Holding the connector by the strain-relief boot and insert the connector ferrule into the port. Rotate the boot until the “key” engages in the slot of the coupling. Push the connector housing forward and screw turned clockwise until it is tied. Note: Never mate angle jumpers(Green Boot) with untangled/Flat UPC jumpers(Blue Boot).

## 4.4 Data Connections

For D500 models, a data type [RS232 (3-wire), RS232 (Full Handshaking), RS422 or RS484] is chosen at time of order. By factory default, the D500 Series is capable of allowing either (2) channels of RS-232(3-wire) on the DB9 or RS422/RS485 on the terminal block. The user simply connects to the desired protocol on either data port. The D500 performs auto-sensing and auto-configuration to determine which protocol is present and automatically configures for the applicable data protocol. The user only has to connect to the appropriate pins on the DB9 and/or terminal block connector. Refer to the Data Port pin out below (See page 10 for Rear View diagram). If RS232 w/Full Handshaking is specified at the time of order, then 7 wires on the DB9 are active (DCD&RD are unavailable), but no other data type is enabled.

The D500 Series acts as a pass through device. It is characterized as neither DTE or DCE. As illustrated below, Tx/Rx on the Data Equipment will connect directly to the D500 Series units Tx/Rx, respectively.

### RS232 Pin-out DB9 Connector

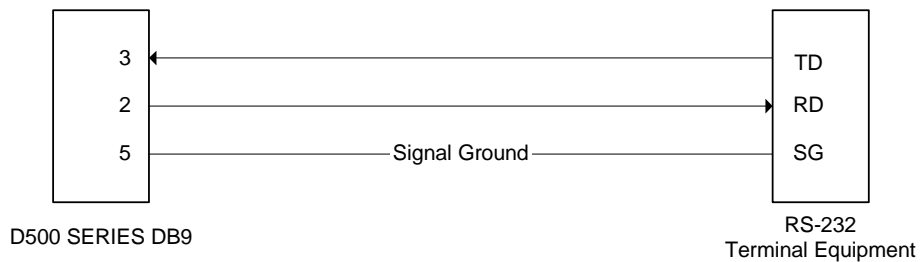
<u>PIN</u>	<u>DESCRIPTION</u>
1	NA
2	RXD (RECEIVED DATA)
3	TXD (TRANSMITTED DATA)
4	DTR (DATA TERMINAL DATA)
5	GND (SIGNAL GROUND)
6	DSR (DATA SET READY)
7	RTS (REQUEST TO SEND)
8	CTS (CLEAR TO SEND)
9	NA

### 4.4.1 RS-232 Data Cable Connection

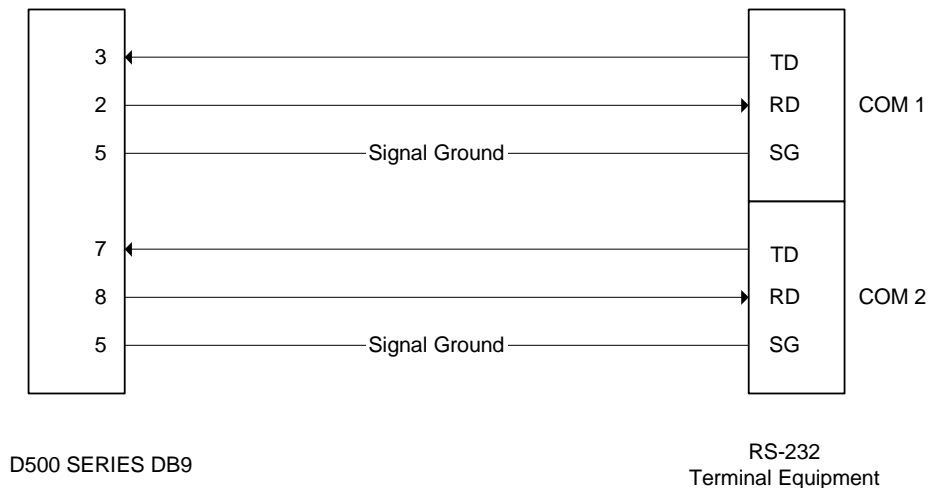
#### **NO HANDSHAKING:**

An RS-232 Data Connection can be made by connecting 3 wires to the DB9 Connector. An example cable is shown below:

One Data Channel Cable Connection Example:

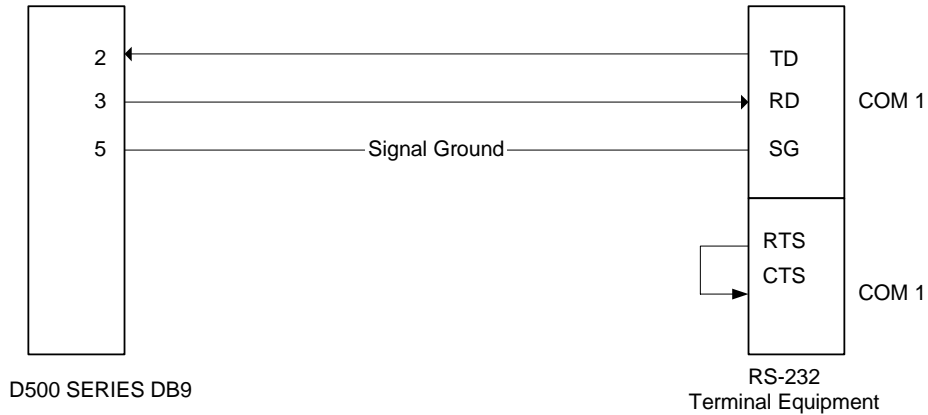


Two Data Channel Cable Connection Example:



**NULL MODEM (3-WIRE RS232):**

Repeat as above, except connect RTS to CTS in the cable. This will have the effect of enabling CTS whenever the terminal equipment asserts RTS. An example cable is shown below:

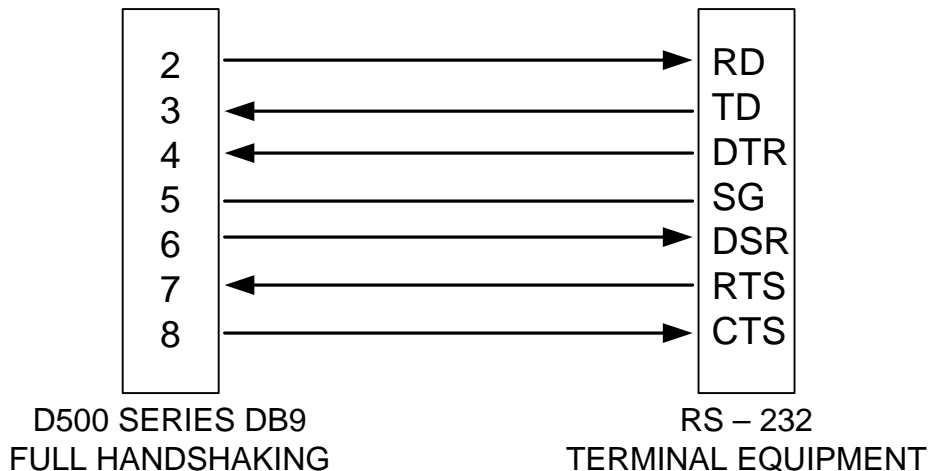


**RS232 FULL HANDSHAKING**

A D500 data cable with full RTS/CTS/DTR/DSR handshaking requires a data connection and a control line connection. First create RS-232 TD and RD connectivity by wiring the cable such that the terminal equipment's TD and RD to DATA IN and DATA OUT is connected to the D500's RS-232 Channel 1.

Next use the D500's 2<sup>nd</sup> data channel to provide connectivity for the CTS and RTS handshaking signals. An example cable is shown below:

**RS-232 Data Channel with Full Hand Shaking Cable Connection Example:**

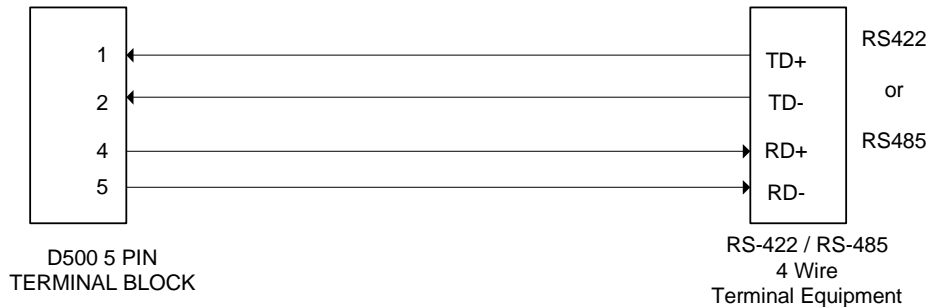


### 4.4.2 RS-422 / RS-485 4 Wire Data Connections

The D500 supports both RS-422 and RS-485 4 wire Configurations.

In order to connect the D500 as a RS-422 / RS-485 4 wire modem, construct the connection cable as shown below.

The D500 automatically senses data activity on the input of the RS-422 / RS-485 data connection. There are no configuration jumpers or switches.



**NOTE:** When using the RS-422 / RS-485 configuration, it is possible to also use RS-232 channel 2 provided that:

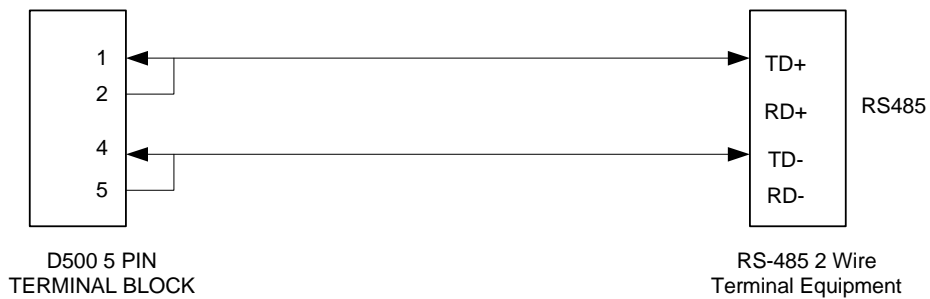
1. The RS-232 Device and the RS-422/RS-485 Devices do not transmit simultaneously.
2. The data link between head end and the remote units provides a pre-ample that allows the D500 enough time to switch between the RS-232 inputs and the RS-422/ RS-485 inputs.

The D500 transmits data outputs to both the RS-232 Channel 2 and the RS-422/RS-485 data outputs by broadcasting out of both channels simultaneously.

## RS-485 2 Wire Data Connections

In order to connect the D500 as an RS-485 2 wire modem, construct the connection cable as shown below.

The D500 automatically senses data activity on the input of the RS-485 data connection and RS-232 Channel 2. There are no configuration jumpers or switches.



## **5 Operation**

The D500 Series is designed such that once the unit is powered on and the I/O Connectors are attached, no periodic maintenance is required.

Refer to the following installation instructions for operating the D500 Series.

- 1.** Mount the D500T and install the power and data connections
- 2.** Measure the Optical Output power and verify that the power is the within specifications for the applicable D500 Series Model
- 3.** Attach the fiber optic cable plant to the D500T's optical port
- 4.** Repeat Steps 1 through 3 for the D500R
- 5.** Verify that the LLINK Indicators and the RLINK Indicators are illuminated GREEN
  
- 6.** Run a data test with an RS232/RS422 BER Test Box.  
Once the D500 System has passed the system check test, the system is available for application objectives.

## 5.1 Turn-On Procedure

To operate the transmission system, plug in the power supply, Rack Card or AC Cord, whichever is applicable. The green indicator "POWER" on the front panel shows that the unit is properly powered.

The green LINK lights of both units (local/remote) should be ON. This indicates an optical link between local and remote unit. Optical link of the remote unit can be determined by the Remote Link Status (RLINK) on the local unit.

The DATA led should be green.

This indicates that the receiver is receiving data from each channel. There are no adjustments to be made.

## **6 Maintenance and Troubleshooting**

### **6.1 MAINTENANCE**

There is no operator maintenance other than keeping the units clean and verifying that the units are operating in an environment that is within operating specifications for temperature, humidity and power.

### **6.2 TROUBLESHOOTING**

Troubleshooting is the systematic approach to solving a problem. Each step must be performed in sequence, or erroneous test results may be obtained.

The D500 Series has two optical transmission indicators: LLINK and RLINK. Both the D500T and the D500R have these indicators. The LLINK always refers to the Optical Transmission Status of the Local unit.

For example, if you are looking at the front panel of the D500R and the LLINK is illuminated GREEN, this indicates that the D500R is receiving a valid optical signal. If the RLINK LED is GREEN, this means that the remote end unit (e.g. D500T) has a valid optical signal. For troubleshooting purposes LOCAL END refers to the unit with the indicators you are observing and REMOTE END refers to the unit at the other end of the optical cable.

## TROUBLESHOOTING GUIDE

The following troubleshooting procedures are based on observing the visual indicators:

<b>TROUBLE</b>	<b>POSSIBLE CAUSE</b>	<b>CORRECTION</b>
POWER LED OFF	<ol style="list-style-type: none"> <li>1. No 12 VDC Input Power</li> </ol>	<ol style="list-style-type: none"> <li>1. Verify the AC Power is present</li> <li>2. Verify Input Power is 12 VDC</li> <li>3. Check / Replace Internal Fuse</li> <li>4. Faulty Power Circuit. Return Unit</li> </ol>
LLINK LED OFF	<ol style="list-style-type: none"> <li>1. No Optical Input</li> <li>2. Broken Fiber</li> <li>3. Remote End Off Line</li> </ol>	<ol style="list-style-type: none"> <li>1. Measure incoming Optical Power</li> <li>2. Measure REMOTE END Optical Output</li> <li>3. If no REMOTE END Optical Output Power, Return Unit - Faulty Laser</li> <li>4. Verify Optical Fiber Integrity (label, break)</li> </ol>
LLINK LED ON RLINK LED OFF	<ol style="list-style-type: none"> <li>1. No Laser Output at LOCAL END</li> <li>2. REMOTE END Rx defective</li> </ol>	<ol style="list-style-type: none"> <li>1. Measure the LOCAL END's Optical output</li> <li>2. Try a second unit LOCAL END UNIT</li> <li>3. Return REMOTE END UNIT</li> </ol>
LLINK ON RLLINK ON No Data	<ol style="list-style-type: none"> <li>1. Fault Cable Connections</li> <li>2. Data Protocol Mismatch</li> <li>3. RTS / CTS Problem</li> </ol>	<ol style="list-style-type: none"> <li>1. Verify that the cable is constructed correctly</li> <li>2. Verify that the RTS / CTS is handled correctly</li> <li>3. Call for Assistance</li> </ol>
Data LED Always ON, Data OK	<ol style="list-style-type: none"> <li>1. Faulty Cable Connections</li> <li>2. Faulty Indicator</li> </ol>	<ol style="list-style-type: none"> <li>1. Verify Cable Connections. If using RS-232, only connect 3 wires. Connecting RTS/CTS to RS422 I/O will cause DATA LED to be always ON</li> <li>2. Call for Assistance</li> </ol>

## 7 Specifications

### 7.1 Technical specification

#### Optical

Transmitter:	LASER
Receiver:	PIN TIA
Wavelength:	850nm/1300nm Multi-mode 1300nm/1550nm Single mode
Power Budget:	18dB w/9um SM Fiber 10dB w/62.5um MM fiber

Connectors (Optical): ST, FC, SC, SC/APC,FC/NAPC

**CONNECTORS** (Electrical): DB9F (RS232 Data)  
Header 5 pin 2.5MM (RS422/RS485 Data)  
Header 3 pin 5.08MM (Modular unit PWR)

#### SYSTEM

Indicators:	POWER, LLINK, RLINK, DATA
Power (19" Chassis):	90 to 240VAC/47-63Hz
Power (Modular):	12-16VDC @ 1A

#### TEMPERATURE

Operating:	0 <sup>0</sup> C to 50 <sup>0</sup> C
Storage:	-40 <sup>0</sup> C to 95 <sup>0</sup> C
Humidity:	95% non-condensing

#### PHYSICAL

Height:	1.3" (Modular/Rack) 1.75" (1U)
Width:	5.5" (Modular/Rack) 16" (1U)
Depth:	7.0" (Modular/Rack) 12" (1U)
Weight:	6.0 oz (Modular/Rack) 1.7LBS (1U)

## **8 Customer Support**

If you ever have any questions, on products or technology, need additional products or documentation, or need to return a unit, please contact your sales representative.

### **8.1 Return Policy**

If you have a problem with the fiber optic mode converter, check all your system connection and configuration. Also, review the troubleshooting section in this manual.

If you can't resolve the problem, contact your dealer/representative or Radiant Communications for customer service.

A Return Material Authorization (RMA) will be required before returning the unit for repair, including warranty repair. To obtain a RMA number, contact Radiant Communication's authorized service representative or distributor. To expedite return, please include the RMA.

## **8.2 WARRANTY**

### **Electronics**

Radiant Communications warrants to the buyer that all goods sold to the buyer will perform in accordance with the applicable data sheets, drawings or written specifications, and at the time of sale will be free of defects in material and workmanship. This warrant shall apply for a period of one year from the date of shipment, unless goods have been subject to lightning damage or other Acts of Nature, misuse, neglect, accident, damage, improper installation or maintenance, or alteration or repair by anyone other than Seller or its Authorized representative. Buyer should notify Radiant Communications promptly in writing of any claim based upon warranty, and Radiant Communications at its option may first inspect such goods at the premises of the Buyer, or may be given written authorization to Buyer to return the goods to Radiant Communications, transportation charges prepaid, for examination by Radiant Communications. Buyer should bear the risk of loss until all goods, authorized to be returned, are delivered to Radiant Communications. Radiant Communications should not be liable for any inspection, packing or labor costs in connection with the return of goods. Radiant Communications' obligations pursuant to this warranty, and sole remedies of the buyers shall be limited to the repair or replacement, or credit of the purchase price, in Radiant Communications' sole discretion.

### **Optical or Electrical Cables**

Carefully inspect the cable upon receipt, if the cable is defective, contact Radiant Communications Customer Service Department within ten (10) days of receipt to obtain a Return Material Authorization (RMA) number before reshipping to Radiant Communications. If defective, the cable will be repaired or replaced in accordance with the warranty of the cable manufacturer, which is the sole warranty. Unless the customer order specifies that Radiant Communications shall install or supervise installation of the cable. Radiant Communications assumes no responsibility for the installation. Radiant Communications should not be liable for defective cable, cost of removing defective cable, or cost of installing replacement cable.