



# USER'S MANUAL

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# GENERAL INFORMATION

The Pure Digital, One Fiber® optical transmission system is a fully configurable, adjustment-free transmitter, receiver or transceiver that employs digital processing and transmission techniques to convey video, multi-channel-audio, data and dry contact closures in one or in both directions over a single fiber optic cable.

The use of digital encoding assures high-quality noise-free transmissions that retain all of their initial parameters regardless of fiber optic cable attenuation. In addition, an integral indicator LED is provided on each unit to continuously signify the presence of an optical signal and thus, the proper operation of each side of the system.

## Technical Specifications

### **Video**

Bandwidth (+0, -3 dB).....	20 Hz to 8 MHz
(+/- 0.2dB).....	50 Hz to 5 MHz
Input/output Impedance.....	75 Ohms
Input/output Voltage.....	1 V p-p nom., 1.3Vp-p max.
Differential Phase .....	2° typical
Differential Gain .....	2.5% typical
Signal to Noise Ratio .....	63 dB CCIR weighted
Signal Connectors.....	BNC

### **Audio**

Bandwidth (+0, -3 dB).....	20 Hz to 20 KHz
Input/output Impedance.....	600 Ohms or 10Kohms (Balanced or Unbalanced)
Input/output Voltage.....	0dBm nominal +10dBm max.
THD.....	0.1% typical
Signal to Noise Ratio.....	85 dB
Signal Connectors.....	Removable terminal block

### **Data/PTZ**

Protocols Supported.....	RS-232, RS-422, RS-485 2-wire, RS-485 4-wire
Data Rate.....	DC to 100 Kb/s
Signal Connectors.....	Removable terminal block

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## Contact Closures

Input.....Dry contact or TTL level  
referenced to GND  
Output.....Isolated reed relay contacts,  
115VAC 50/60 Hz @ 0.2A or 24VDC @ 1A  
Signal Connectors.....Removable terminal block

## Optical

Operating Wavelength.....850nm, 1310nm, 1550nm MM/SM  
Optical Fiber.....62.5/125microns MM or 8-10/  
125 microns SM  
Optical Connectors.....ST or FCPC

<u>Wavelength</u>	<u>Mode</u>	<u>Loss/Budget (dB)</u>	<u>Transmission Distance (km)</u>
850nm MM	2 way	0 - 11	0 - 2
850nm MM	1 way	0 - 18	0 - 3
1310nm MM	2 way	0 - 6	0 - 10
1310nm MM	1 way	0 - 13	0 - 15
1310nm SM			
- Normal Range	2 way	0 - 14	0 - 50
- Extended Range	2 way	N/A	N/A
1310nm SM			
- Normal Range	1 way	0 - 17	0-50
- Extended Range	1 way	8 -25	15-65
1550nm SM			
- Normal Range	2 way	0-14	0-60
- Extended Range	2 way	N/A	N/A
1550nm SM			
- Normal Range	1 way	0 - 19	0 - 95
- Extended Range	1 way	12 - 30	50 - 130

## Misc.

Operating Temperature Range .....-35 to +75 degrees C  
Operating Power..... 9 to 24 Volts AC or DC @ 8 watts.(max)

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**CAUTION!** *The transmitting element in some versions of the Pure Digital, One Fiber™ Transmitter and transceiver units is a solid-state Laser Diode located in the optical connector on the unit. This device emits invisible infrared electro-magnetic radiation which can be harmful to human eyes. The radiation from this optical connector, if viewed at close range without a fiber optic cable connected to the optical connector, may be of sufficient intensity to cause instantaneous damage to the retina of the eye. As a result, direct viewing of this radiation should be avoided at all times.*

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# **INSTALLATION INSTRUCTIONS**

## **Installation Procedure**

The Pure Digital, One Fiber® Fiber Optic Transmission System units are normally preset for immediate use as ordered. There are several indicator LEDs on the units for monitoring purposes and various user selectable options for the various signals accommodated. The following instructions describe the typical installation procedure, the function of the LED indicators and a description of how to change the configuration of the various signals.

1. The various options, as already mentioned, have been preset. When or if changes are required, please consult the next section.
2. Connect the fiber optic cable between two Pure Digital units.
3. Apply power to both Pure Digital units.
4. When power is applied, the green POWER LED will light, indicating the presence of operating power. The green LINK LED should also light, indicating the presence of a received optical signal. Note that the card-cage version will have a third red LED for indicating the presence of an alarm condition.
5. Connect the various input signals to the proper positions on the removable terminal blocks. Be certain to check all connections and assure that inputs and outputs are not intermixed. Refer to the next section for the various connections.
6. The system should now be operational.

## **Note to users of BI-DIRECTIONAL SYSTEMS**

Pure Digital One Fiber transceivers configured to support bi-directional video, audio, data and/or contact closure are designed with a coupler that allows the same fiber to both transmit and receive information. If the connector on the PURE DIGITAL ONE FIBER unit does not properly match up with the tip of fiber within the transmitting fiber optic cable, there is a possibility that light intended for transmission will be reflected back into the coupler and be interpreted by the transceiver as part of a received signal. When this happens, the LINK light on a transceiver unit will become lit, even though the unit is not really receiving any transmitted signal. In order to fix this problem, simply apply a small amount of coupling gel to the tip of fiber before inserting it into the connector. This should work to create a better match between connector and fiber and eliminate any reflected light.

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## **System Jumper Configurations**

Some of the plug-in interface boards used in the product have on-board jumpers that are used to configure the various signal options. These are pre-set at the time of shipment based on the customer order information. If changes are required, the positions of these jumpers will have to be changed in accordance with the following procedure:

1. Turn off all operating power and remove all external connectors and terminal blocks.
2. Remove the two screws holding the rear panel (terminal block side).
3. Slowly and carefully slide open the bottom cover plate until the internal circuit boards are visible. Be very careful not to disturb the coiled fiber optic cables in the unit.
4. Unplug the interface board to be changed.
5. Determine the function desired and set the jumper positions accordingly. All jumper positions are clearly numbered directly on the interface boards.
6. Return the interface board to the proper position.
7. Slide the bottom cover back onto the unit again, being certain not to disturb or crimp the coiled fiber optic cable.
8. Finally, replace the rear panel screws and reapply power.

Settings and functions are as follows:

### **Video Transmitter Plug-in**

There are no jumpers used on this plug-in

### **Video Receiver Plug-in**

There are no jumpers used on this plug-in

### **Audio Input Two Channel Plug-in**

#### **Jumper 1**

When installed, the input impedance of Channel A will be 600 Ohms

When not installed, the input impedance of Channel A will be 10K Ohms

#### **Jumper 2**

When installed, Channel A will have an unbalanced input

When not installed, Channel A will have a balanced input

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### Jumper 3

When installed, the input impedance of Channel B will be 600 Ohms

When not installed, the input impedance of Channel B will be 10K Ohms

### Jumper 4

When installed, Channel B will have an unbalanced input

When not installed, Channel B will have a balanced input

### Jumpers 5, 6, 7 and 8

These are storage positions for unused jumpers

## Audio Output Two Channel Plug-in

### Jumper 1

When installed, Channel A will have an unbalanced output

When not installed, Channel A will have a balanced output

### Jumper 2

When installed Channel B will have an unbalanced output

When not installed Channel B will have a balanced output

## Data Input/Output Plug-in

Jumpers 1, 2, 3, 7, 8, 9 and 10 are used to select the desired protocol. Connections for these are as follows:

<b>Protocol</b>	<b>J1-1</b>	<b>J1-2</b>	<b>J1-3</b>	<b>J1-7</b>	<b>J1-8</b>	<b>J1-9</b>	<b>J1-10</b>
RS-232	ON	OFF	OFF	OFF	OFF	OFF	OFF
RS-422/RS-485 4-wire point-to-point	OFF	ON	OFF	OFF	OFF	ON	ON
RS-485 4-wire	OFF	ON	ON	OFF	OFF	ON	ON
RS-485 2-wire Auto xmit/receive	OFF	ON	ON	ON	ON	ON	OFF
RS-485 2-wire Ext xmit/receive	ON	ON	ON	ON	ON	ON	OFF
RS-485 2-wire Zero xmit/receive	ON	ON	OFF	ON	ON	ON	OFF

Jumpers 4, 5 and 6 are only used in the RS-485 two-wire configuration to select the time interval that the unit will wait before switching back to the receive mode (tri-state).

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<b>Baud Rate</b>	<b>Time</b>	<b>J1-4</b>	<b>J1-5</b>	<b>J1-6</b>
2400	4.73ms	ON	OFF	OFF
4800	2.20ms	ON	ON	OFF
9600	1.10ms	ON	ON	ON
19.2K	620usec	OFF	ON	OFF
38.4K	300usec	OFF	ON	ON
57.6K	180usec	OFF	OFF	ON
76.8K	150usec	OFF	OFF	OFF

Positions 11, 12 and 13 are provided as positions for storing unused jumpers.

### **Contact Closure Input/Output Plug-in**

There are no jumpers used on this plug-in

### **System Terminal Block Connections**

The various input and output connections for the Pure Digital, One Fiber™ Transmission system are as follows:

**Video Input and/or Output**      BNC connectors

**Audio Connector**    Audio terminal block positions can be used as audio inputs or outputs depending on which Two-Channel Audio plug-in interface board is used.

With a Two channel Audio Input board in J7 (Audio 3+4) on the base board:

<b>Position 3-</b>	<b>Audio Channel 3 Input (-)</b>
<b>Position 3+</b>	<b>Audio Channel 3 Input (+)</b>
<b>Position G</b>	<b>Audio Ground</b>
<b>Position 4-</b>	<b>Audio Channel 4 Input (-)</b>
<b>Position 4+-</b>	<b>Audio Channel 4 Input (+)</b>

With a Two Channel Audio Input board in J5 (Audio 1+2) on the base board:

<b>Position 1-</b>	<b>Audio Channel 1 Input (-)</b>
<b>Position 1+</b>	<b>Audio Channel 1 Input (+)</b>
<b>Position G</b>	<b>Audio Ground</b>
<b>Position 2-</b>	<b>Audio Channel 2 Input (-)</b>
<b>Position 2+</b>	<b>Audio Channel 2 Input (+)</b>

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With a Two Channel Audio Output board in J7 (Audio 3+4) on the base board:

<b>Position 3-</b>	<b>Audio Channel 3 Output (-)</b>
<b>Position 3+</b>	<b>Audio Channel 3 Output (+)</b>
<b>Position G</b>	<b>Audio Ground</b>
<b>Position 4-</b>	<b>Audio Channel 4 Output (-)</b>
<b>Position 4+</b>	<b>Audio Channel 4 Output (+)</b>

With a Two Channel Audio Output board in J5 (Audio 1+2) on the base board:

<b>Position 1-</b>	<b>Audio Channel 1 Output (-)</b>
<b>Position 1+</b>	<b>Audio Channel 1 Output (+)</b>
<b>Position G</b>	<b>Audio Ground</b>
<b>Position 2-</b>	<b>Audio Channel 2 Output (-)</b>
<b>Position 2+</b>	<b>Audio Channel 2 Output (+)</b>

### **Data Input/Output Connector**

Data terminal block positions 1 through 6 can be used as data inputs or outputs, depending on the protocol selected.

#### RS-232

Position 2	Signal to be transmitted out over fiber
Position 4	Signal being received in from fiber
Position 1	Signal Common

#### RS-422

Position 2	Signal to be transmitted (+) out over fiber
Position 3	Signal to be transmitted (-) out over fiber
Position 4	Signal being received (+) in from fiber
Position 5	Signal being received (-) in from fiber
Position 1	Shield Ground

#### RS-485 4-Wire

Position 2	Signal to be transmitted (+) out over fiber
Position 3	Signal to be transmitted (-) out over fiber
Position 4	Signal being received (+) in from fiber
Position 5	Signal being received (-) in from fiber
Position 1	Shield Ground

#### RS-485 2-Wire

Position 2	Signal being transmitted or received (+) over fiber
Position 3	Signal being transmitted or received (-) over fiber
Position 6	Enable RTS signal (when used)
Position 1	Shield Ground

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## Contact Closure Input/Output Connector

Contact terminal block positions 7 through 10 are used as contact inputs and outputs.

Position 7	Contact output (floating)
Position 8	Contact output (floating)
Position 9	Contact or TTL input
Position 10	Contact or TTL input (common to case and power supply)

## Indicator LEDs and Alarm Circuitry

The stand-alone box versions of the Pure Digital, One Fiber™ transmission units have two integral indicator LEDs that are used to monitor the state of the unit. The status of these LEDs are as follows:

**POWER:** (Green) Indicates that correct power has been applied.

**LINK:** (Green) Indicates that an optical signal has been received. If this LED remains unlit, it usually signifies a break in the fiber between the two transmission units or excessive optical path loss.

The card-cage version of the Pure Digital, One Fiber™ transmission unit has an additional red indicator LED that lights when an alarm condition exists. The card-cage unit also provides an output to drive a model 6020 Alarm Sensing Module which provides an audible tone and activates a set of contacts for external signaling purposes.

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# OPERATING POINTERS AND TROUBLESHOOTING

## OPTICAL FIBER:

Versions of the Pure Digital Transmission System are available to operate with most multimode (MM) and single-mode (SM) optical fibers. Be certain that the correct size fiber is being used for the particular transmitter/receiver combination.

Also be certain that the attenuation and bandwidth of the fiber optic cable being used is within the range of the system's loss budget specifications.

## GENERAL:

The status of any of the LINK indicator LED should provide the first clue as to the origin of any operation failure. If this LED is off it usually means that the fiber is broken or has too much attenuation.

Next, be certain that the input and output signal connections are proper. Due to the number of positions, it is possible that there may be wrong connections.

Finally, although multimode and single mode devices may look the same, they will not operate properly together. Using the wrong device or fiber can easily add more attenuation than specified, resulting in poor overall performance.

## DATA CIRCUIT:

Even when installed exactly as directed, it is possible that the data function may fail to operate properly when using the Pure Digital One Fiber units in the RS-485 2-wire auto xmit / receive mode. If this problem occurs, it may be that your units are attempting to interface with other manufacturers' products that have resting states opposite to the way in which your Pure Digital One Fiber units are programmed. (No standard exists.) You can compensate for this condition by simply switching

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the polarities of the (+) and (-) pins. To do this, first swap the Tx (+) and Tx (-) pins with one another and then do the same for the Rx (+) and Rx (-) pins. Make sure to do this on both the transmitter and receiver units.

If, after reviewing the above possibilities, the system is still not operating, please contact the Customer Service Department for further assistance

### **Note to users of BI-DIRECTIONAL SYSTEMS**

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## **MAINTENANCE**

The Pure Digital, One Fiber™ transmission units have been manufactured using the latest semiconductor devices and techniques that electronic technology has to offer. They have been designed for long, reliable, and trouble free service and are not normally field repairable. Should difficulty be encountered, Communications Specialties maintains a complete service facility to render accurate, timely and reliable service of all products.

The only maintenance that can be provided by the user is to ascertain that optical connectors are free of dust or dirt that could interfere with light transmission and that electrical connections are secure and accurate.

All other questions or comments should be directed to our Customer Service Department. It should be noted that many “problems” can easily be solved by a simple telephone call.

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# **WARRANTY**

Communications Specialties, Inc. (CSI) warrants that for a period of three years after purchase by the Buyer, all PURE DIGITAL ONE FIBER transmission systems will be free from defects in material and workmanship under normal use and service. A Return Material Authorization (RMA) number must be obtained from CSI before any equipment is returned by the Buyer. All material must be shipped to CSI at the expense and risk of the Buyer. CSI's obligation under this warranty will be limited, at its option, to either the repair or replacement of defective units, including free materials and labor. In no event shall CSI be responsible for any incidental or consequential damages or loss of profits or goodwill. CSI shall not be obligated to replace or repair equipment that has been damaged by fire, war, acts of God, or similar causes, or equipment that has been serviced by unauthorized personnel, altered, improperly installed or abused.

RMA numbers and repairs can be obtained from:

**Communications Specialties, Inc.  
55 Cabot Court  
Hauppauge, NY 11788  
Tel: (631) 273-0404  
FAX: (631) 273-1638**

Or in the Asia Pacific Region:

**Communications Specialties Pte Ltd  
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TEL: +65 6837 8790 FAX: +65 6333 0501**

Please have your serial number (located on the top label of the unit) available when contacting us.