

Fiber Optic System  
Digital Video with Bi-Directional Data  
Models S732DV and S7732DV

# installation instructions



**GENERAL**

This manual is a guide to the installation and operation of the S732DV and S7732DV series fiber optic video and data transmission system. Please read the entire manual before installing the equipment.

**NOTE:** The series numbers S732DVT and S732DVR are used to describe all models of transmitters and receivers unless noted otherwise.

The Series S732DV and S7732DV video and data transmission system offers simultaneous transmission of 8-bit video and bi-directional multiprotocol data (MPD). The S732DV system operates over one or two multimode fibers while the S7732DV uses one or two single-mode fibers.

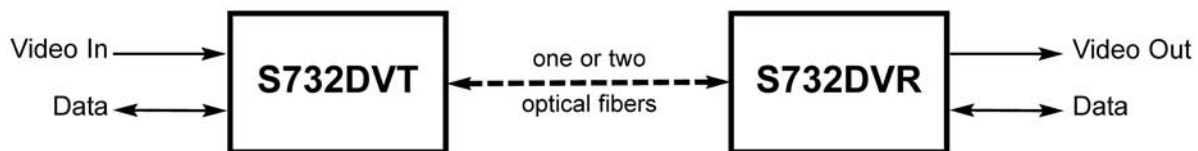
A complete system consists of an S732DVT transmitter and an S732DVR receiver. Units are designed for standalone operation or for installation in Fiber Options' 503H, 515R1, or 517R1 Card Cages.

**Unpacking the Unit**

In the event that anything is missing from the following list, contact your authorized Fiber Options dealer or representative.

S732DVT Transmitter or S732DVR Receiver  
(S7732DVT Transmitter or S7732DVR Receiver)  
Instruction manual

Save the original packing materials in case it becomes necessary to return the unit.

**SYSTEM DIAGRAM****INSTALLATION****Installation Considerations**

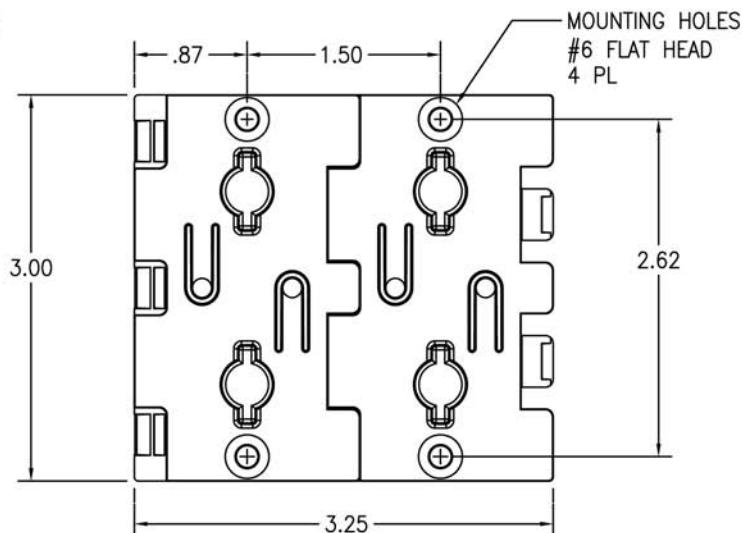
This fiber-optic link is supplied as a standalone module or as a rack card. Units should be installed in dry locations protected from extremes of temperature and humidity.

**Standalone Modules**

1. Determine where the module will be installed, and ensure that there is adequate space at both ends for making the various cable connections. See Figure 1.

**FIGURE 1: MOUNTING PLATE**

Mounting plate attaches to selected surface with four suitable screws. Standalone modules are mounted by sliding it onto the plate's hooks until firmly seated. The module can be easily removed and remounted.



### Rack Cards

Rack cards are designed to be installed in one of Fiber Options' 19-inch (483-mm) EIA standard card-cage racks, either the 515R1 or the 517R1. Follow these steps after performing MODULE SETUP procedures.

#### 515R1 and 517R1 Card Cage Racks

**CAUTION:** Although rack cards are hot-swappable and may be installed without turning off power to the rack, Fiber Options recommends that the power switch on the rack power supply be turned OFF and that the rack power supply is disconnected from any power source.

1. Make sure that the card is oriented right-side up, and slide it into the card guides in the rack until the edge connector at the back of the card seats in the corresponding slot in the rack's connector panel. Seating may require thumb pressure on the top and bottom of the card's front panel.

**CAUTION:** Take care not to press on any of the LEDs.

2. Tighten the two thumb screws on the card until the front panel of the card is seated against the front of the rack.

#### 503H Horizontal Card Cage

**CAUTION:** Although rack cards are hot-swappable and may be installed without turning off power to the rack, Fiber Options recommends that the power switch on the rack power supply be turned OFF and that the rack power supply is disconnected from any power source.

1. Make sure that the card is oriented right-side up, and slide it into the card guides in the rack until the edge connector at the back of the card seats in the corresponding slot in the rack's connector panel. Seating may require thumb pressure on the top and bottom of the card's front panel.

**CAUTION:** Take care not to press on any of the LEDs.

2. Tighten the two thumb screws on the card until the front panel of the card is seated against the front of the rack.

### MODULE SETUP

#### General

Determine the data formats required for input and output. The input and output formats may be the same or different, as described in the next section.

#### Data Selection

**NOTE:** The DATA SELECT switch on standalone units, or SW1 on rack cards, is shipped in the Disabled setting.

Using the rotary DATA SELECT switch, select a valid data format according to the DATA SELECT settings shown in Figure 3. See Figures 4 and 5 for the location of the DATA SELECT switch.

**NOTE:** If the link is going to support RS-485, refer to RS-485 APPLICATION NOTES on page 8.

FIGURE 3: DATA SELECT SWITCH SETTINGS

Setting	Mode	Setting	Mode
0	Disabled (factory preset)	8	RS-485 2-wire 2V
1	RS-232	9	RS-485 4-wire standard
2	RS-232 + handshake	A	RS-485 4-wire 1V
3	TTL	B	RS-485 4-wire 2V
4	RS-422 2-wire	C	Reserved
5	Manchester/Biphase	D	Audio/DTMF
6	RS-485 2-wire standard	E	Test Mode Rx
7	RS-485 2-wire 1V	F	Test Mode Tx

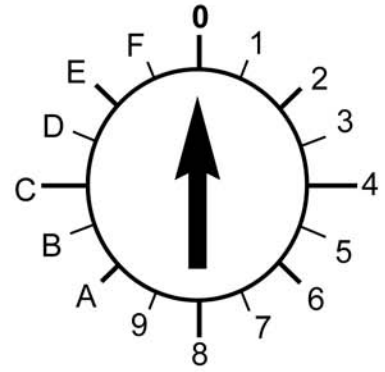


FIGURE 4: RACK-MOUNT MODULE - TWO-FIBER UNITS

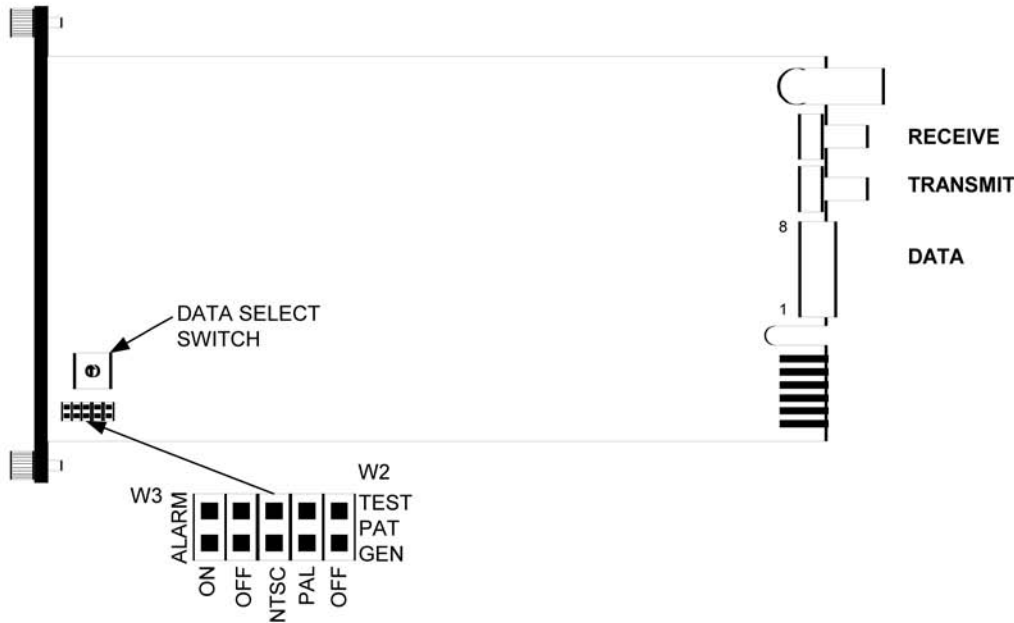
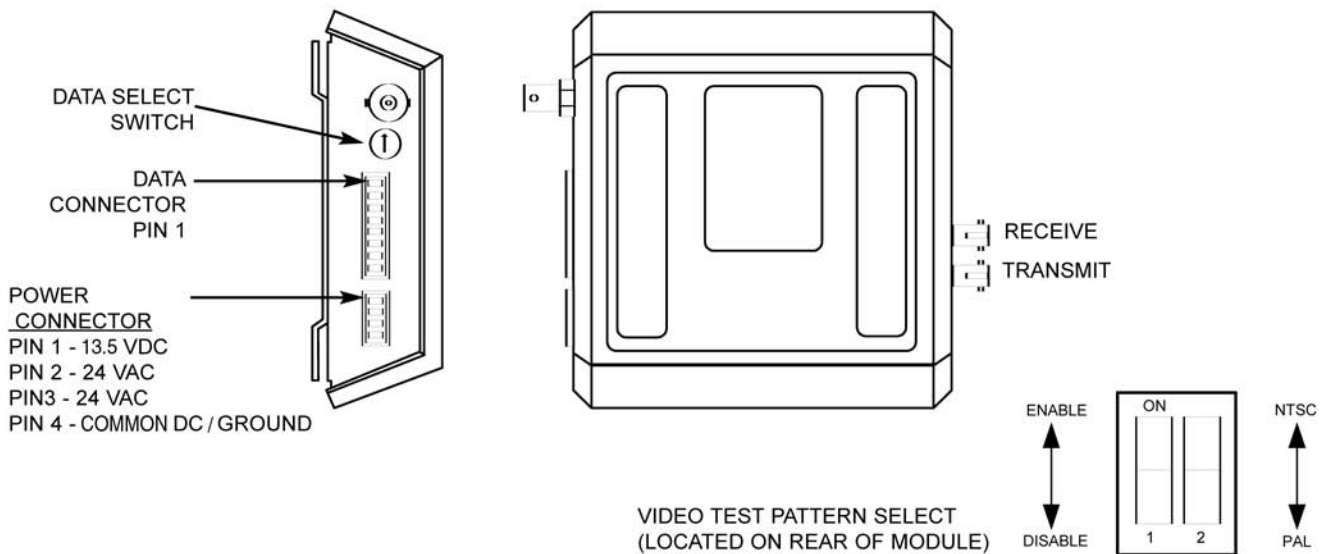


FIGURE 5: STANDALONE MODULE - TWO-FIBER UNITS



## Alarm Jumper

Rack cards are supplied with an alarm function that activates if the optical signal input to the receiver fails. The alarm is always indicated on the front panel of the card by a red LEVEL/LOSS™ LED. The alarm may also be output to the rack power supply, where a sonalert (audible alarm) and alarm output contact closure may be activated.

The alarm is set to ON (ACTIVE) at the factory. If the alarm output is not desired, move jumper W3 to “OFF” position. Refer to Figure 4.

**NOTE:** Setting alarm inactive does not affect the operation of the LEVEL/LOSS™ LED. Loss of optical signal will always be indicated by a red LEVEL/LOSS™ LED.

## Data Translation

The data translation capability of the S732DV series is unique in the industry. It allows translation from one format to another, thus eliminating the need for external translation devices. Data translation examples are shown in Table 1.

The translation is in the physical layer only; it cannot interpret specific protocols, nor translate commands. Due to the encoding schemes utilized in Manchester and Biphase, these formats are exempt from translation.

## DTMF/FSK Mode

The S732DV includes a special data mode to transport DTMF/FSK control signals. This configuration is bi-directional, full duplex. This feature is included in the S732DV as a control signal data path used on some PTZ control equipment. It can be utilized in two ways (refer to Table 9):

1. Single ended stereo: for stereo operation, left and right channels are referenced to ground.
2. Differential operation, single channel: in this configuration, most popular with DTMF systems, signal is input differentially to Diff In + and Diff In - pins. Likewise, signal is output on Diff Out + and Diff Out - pins.

In DTMF/FSK mode, DATA IN and DATA OUT LEDs will vary in intensity based on input levels. Levels less than 24 dBu will result in the corresponding LED being OFF. The LED will glow brighter green as level increases to 0 dBu.

When the input level exceeds the maximum input threshold (clipping), the LEDs will change color to yellow.

## Data Connections

Data connections are made to the 8-pin removable screw terminal on the S732DV according to the selected format. Refer to Tables 2 through 10 for transmitters and receivers. When connecting data cables, always wire the DATA OUT pins on the data equipment to the DATA IN pins on the fiber links, and the DATA IN pins on the data equipment to the DATA OUT pins on the fiber links. See Figures 4, 5, and 6.

## Built-In Termination

The S732DV features a built-in termination for RS-422, RS-485, Manchester and Biphase installations. Simply connect a jumper as described in Tables 5 through 8.

## Video Cable Connection

Both the S732DVT transmitter and the S732DVR receiver have one video connection.

Connect the video source cable to the input BNC jack on the S732DVT transmitter. Connect monitor equipment to the output BNC jack on the S732DVR receiver.

Fiber Options suggests that Belden number 9259 or equivalent coaxial cable should be used. Consult the cable manufacturer's specifications for the maximum distance between the video equipment and the fiber equipment.

## Fiber Optic Cable Connection

Most cable manufacturers identify the individual fibers in the cable. Select appropriately terminated fiber and mark both ends with unique identification label (e.g. for cable no. 03, fiber no. 08) to ensure that the fiber connected to the near end is the same one that is connected to the far end.

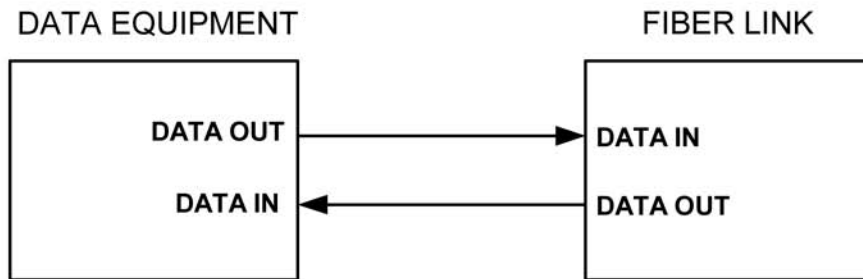
The proper optical connection will link the transmitter's TRANSMIT (OUT) port to the receiver's RECEIVE (IN) port. See Figures 4 and 5.

1. Wipe the inside of the port's sleeve with a lint-free pipe cleaner moistened with reagent-grade isopropyl alcohol. Blow dry with dry air.

TABLE 1: DATA TRANSLATIONS

Translation	TX Switch Setting	RX Switch Setting	Comment
TTL → RS-232, 3 wire	3	1	Signal level conversion.
RS-232, 3 wire → TTL	1	3	Signal level conversion.
TTL → RS-422	3	4	Single Ended to Differential Conversion.
RS-422 → TTL	4	3	Differential to Single Ended Conversion.
RS-232, 3 wire → RS-422	1	4	Single Ended to Differential Conversion.
RS-422 → RS-232, 3 wire	4	1	Differential to Single Ended Conversion.
RS-232, 5 wire → RS-485	2	7 - A	RS-232 Handshaking bit is used to indicate tri-state.
RS-485 → RS-232, 5 wire	7 - A	2	Tri-State detection circuitry activates handshaking bit

FIGURE 6: FIBER LINK DATA CONNECTIONS



2. Clean the connector using a 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.

3. Fasten the fiber optic cable to the port.

#### Power Connections

##### Standalone Modules

Standalone units may be powered either by 24 VAC or by 13.5 VDC. Connect input power according to the label on the module. See Figure 5.

##### Rack Modules

Power connections are made automatically when the card is installed. To supply power to the rack, connect the rack power supply to an AC outlet and set the power switch to ON.

#### SMARTS™ DIAGNOSTICS

The S732DV has built in Status Monitoring And Reliability Test System (*SMARTS™*) diagnostic capabilities. This includes LED indicators for monitoring data and optical status as well as video and data generators for verifying unit functionality. They are described in the following sections.

#### Video Test Patterns

The S732DV includes an internal video test pattern generator that can ease installation and troubleshooting. Refer to Table 11. The test patterns generated can notify the user of a fiber failure or a video source failure by outputting specific test patterns on the user's monitor. Also, a special "ramp" test pattern can be generated when the S732DVT is placed in test mode. This will verify proper functionality of the digital decoding process as well as troubleshooting fiber optic interconnections.

To enable the test pattern generator:

1. On rack modules, set jumper W2 per local video standard (the PC Board is labeled "NTSC, PAL, OFF"). See Figure 4.

NOTE: To provide earth ground reference, Stand Alone (Enclosure) modules need to be connected to a good earth ground. This can be accomplished by connecting a copper-based conductor from the modules *DC Common/Ground* pin to an approved earth ground.

**NOTE:** When making data connections to the transmitter as listed in Tables 2 through 10, always connect the pins labeled IN on the transmitter to the pins labeled OUT on the external equipment, and the pins labeled IN on the external equipment to the pins labeled OUT on the transmitter. When making data connections to the receiver, always connect the pins labeled IN on the receiver to the pins labeled OUT on the external equipment, and the pins labeled IN on the external equipment to the pins labeled OUT on the receiver.

**TABLE 2:  
RS-232 Interface**

Mode Switch SW1: Position 1

Pin No.	Function
8	Ground
7	nc
6	nc
5	RS-232 IN
4	nc
3	nc
2	RS-232 OUT
1	Ground/Shield

**TABLE 3:  
RS-232 with Handshaking Interface**

Mode Switch SW1: Position 2

Pin No.	Function
8	Ground
7	nc
6	RTS/CTS IN
5	RS-232 IN
4	nc
3	RTS/CTS OUT
2	RS-232 OUT
1	Ground/Shield

**TABLE 4:  
TTL Interface**

Mode Switch SW1: Position 3

Pin No.	Function
8	Ground
7	nc
6	TTL IN
5	tie to pin 1
4	nc
3	TTL OUT
2	nc
1	Ground/Shield

**TABLE 5:  
RS-422 Interface**

Mode Switch SW1: Position 4

Pin No.	Function
8	Ground
7	100 ohm Termination, tie to pin 5 if required
6	RS-422 IN +
5	RS-422 IN -
4	nc
3	RS-422 OUT +
2	RS-422 OUT -
1	Ground/Shield

**TABLE 6:  
Manchester/  
Biphase Interface**

Mode Switch SW1: Position 5

Pin No.	Function
8	Ground
7	100 ohm Termination, tie to pin 5 if required
6	Manchester/Biphase in +
5	Manchester/Biphase in -
4	nc
3	nc
2	Manchester/Biphase out +
1	Manchester/Biphase out -

**TABLE 7:  
RS-485 2-Wire Interface/Sensornet**

Mode Switch SW1:

Position 6 = standard offset

Position 7 = 1V offset

Position 8 = 2V offset

Pin No.	Function
8	Ground
7	100 ohm Termination, tie to pin 5 if required
6	RS-485+
5	RS-485 -
4	+5 VDC BIAS OUT
3	nc
2	nc
1	Ground/Shield

**TABLE 8:  
RS485 4-Wire Interface**

Mode Switch SW1:

Position 9 = standard offset

Position A = 1V offset

Position B = 2V offset

Pin No.	Function
8	Ground
7	100 ohm Termination, tie to pin 5 if required
6	RS485 in +
5	RS485 in -
4	+5 VDC BIAS OUT
3	RS485 out +
2	RS485 out -
1	Ground/Shield

**TABLE 9:  
DTMF/FSK Control Interface**

Mode Switch SW1: Position D

Pin No.	Function
8	Ground
7	nc
6	In right/Diff in +
5	In left/Diff in -
4	nc
3	Out right/Diff out +
2	Out left/Diff out -
1	Ground

nc = no connection

**TABLE 10:  
Test Mode Loopback Interface**

Mode Switch SW1: Position F

Pin No.	Function
8	Ground
7	nc
6	tie to pin 3
5	tie to pin 2
4	nc
3	tie to pin 6
2	tie to pin 5
1	nc

TABLE 11: ON SCREEN DIAGNOSTICS

Monitor Display	Meaning
Single white bar	No video input to transmitter
Double white bar	No optical input to receiver
Ramp test pattern	Testmode (Position E or F) selected at transmitter

2. On standalone units, switch S1, located through mounting hole on back of unit, configures the test pattern generator. Position 1 enables test patterns when in the ON position. S1 position 2 selects video standard; ON selects NTSC, while OFF selects PAL. See Figure 5.

Disabling the test pattern generator causes no signal output during the failure conditions or test mode described above.

### Test Mode

Test mode allows the user to verify the operation of the copper receiver/driver circuit in an S732DV, as well as the fiber connection from one S732DV to another. Placing the transmitter in test mode with test patterns enabled will cause a Fiber Options proprietary video ramp test signal to be generated and transmitted over the fiber to the receiver.

This allows the fiber optic video path to be tested without a video source. Using the test mode is simple:

1. On the S732DV to be tested, set the rotary DATA SELECT switch to position F (TX TEST MODE). At this end only, wire the data connector as shown in Table 10.

2. At the opposite end, set the S732DV rotary DATA SELECT switch to position E (RX TEST MODE)

3. In the test mode, the “Position F” transmitter unit should behave as follows:

a. The ENABLED LED is red, indicating that a valid data format has not been selected.

b. The DATA OUT LED is slowly flashing between amber, green, and off. This indicates that the test mode is generating an output pattern and sending it out on copper.

c. The DATA IN LED should mimic the DATA OUT LED. This indicates that the data transmit/receive circuitry is working properly.

d. The LEVEL/LOSS™ LED indicates received fiber signal strength.

4. The “Position E” receiving unit should behave as follows:

a. The ENABLED LED is red, indicating that a valid data format has not been selected.

b. The DATA OUT LED is slowly flashing between amber, green, and off. This indicates that the fiber path from the transmitting unit is set for TEST MODE is reliable.

c. The DATA IN LED should be off since there is no input copper connection made.

d. The LEVEL/LOSS™ LED is green indicating that sufficient optical power is being received.

When the test is completed, the test can be run again in the opposite direction by changing DATA SELECT switch positions and moving the loopback cable to the opposite end.

### LED Operation

Refer to the Table 12 for an explanation of how to diagnose system faults using the LEDs built into the Fiber Options units.

The S732DV has 4 LED indicators that are very useful in describing the current state of operation, as well as the current status of data flow and fiber optic signal strength. These indicators are LEVEL /LOSS™, VIDEO IN (or OUT), DATA IN (or OUT), and ENABLED. They function as follows:

#### LEVEL/LOSS™ Indicator

This LED is useful for indicating the relative optical signal strength at the fiber optic receiver. When sufficient optical power is being received, the LED is green. If no or insufficient optical power is received, the LED will be red. All data will default to it's failure state level to eliminate bus contention. If test patterns are enabled a grey screen with two white vertical bars will be output. If test patterns are disabled the screen will be black.



**VIDEO IN (or OUT) Indicator**

This LED indicates the presence of a video signal. VIDEO IN on the transmitter remains green as long as an adequate video signal is being input to the transmitter.

The LED will be red when no video signal is present. The VIDEO OUT LED on the receiver performs a similar function, except that it refers to the video that is output from the receiver. If test patterns are enabled a grey screen with a single white vertical bar pattern will be output when no video is present. If disabled, the screen will be black.

**NOTE:** The S732DV monitors the video sync signals to determine the presence of the signal. It does not monitor the picture brightness signal. Thus, if the scene in front of a camera is totally dark, producing a blank monitor screen, the VIDEO LEDs will still be green.

**DATA IN Indicator**

The DATA IN LED indicates the state of the data being input to the S732DV over copper. A green DATA IN LED indicates a logic HIGH is present on the copper inputs. A yellow DATA IN LED indicates a logic LOW is present on the copper. No color (OFF) indicates a tri-state or high impedance input.

Therefore, this can be used to determine the resting state of your equipment. Unique to the industry, the S732DV has special circuitry to capture data transitions and make them visible on the LEDs. High-speed bursts of activity, previously undetectable by standard LED circuits, can easily be seen by this special circuitry.

**DATA OUT Indicator**

The DATA OUT LED functions identically to the DATA IN LED except that the LED represents data that is being output from the unit. This LED has the same high-speed capture circuitry described in the DATA IN section.

**ENABLED Indicator**

This LED has three states; green indicates a valid mode has been selected, red indicates an invalid mode (spare or test mode) has been selected, or flashing red/green indicates that NO mode has been selected.

**RS-485 APPLICATION NOTES**

The S732DV is configurable for both full-duplex (4-wire) and half-duplex (2-wire) operation. It can be used for interfacing to systems adhering strictly to the RS-485 specification and for use with systems that use a modified, "fail-safe biased" RS-485 bus.

**Connection**

Use high quality twisted-pair wiring, and make sure all connection points are clean and tight. A loose connection on one of the wires can appear to function, yet cause intermittent errors: data LEDs may be flashing as signals pass through the system, but those signals will be corrupt.

**Configuration**

Fiber Options Universal Data units are designed to work with virtually any RS-485 system. Unfortunately, some systems operate on a "modified" version of RS-485; they use failsafe biasing to pull up/down their bus during a tri-state condition. In a standard RS-485 system, when a driver on a properly terminated bus goes into tri-state (inactive), the voltage between the differential outputs should be less than 200 millivolts. (This is considered "standard offset" in the product instruction manuals). A differential output tri-state voltage this small can cause some nonstandard systems to latch up, since they are designed for much larger, "fail-safe," offsets.

To be able to interface to such equipment, Fiber Options Universal Data products offer two more "offset" level modes. That is, the maximum differential input voltage that can be applied where it will be perceived to be in tri-state.

Of course, the equipment manufacturer does not disclose this information. In most cases, the Fiber Options unit should be configured for "standard offset" operation. When the system is operating properly, the DATA IN and DATA OUT LEDs will be off when there is no communication (tri-state) and they will flash when data is being sent or received. In the case where the link is not functioning properly, (LEDs will most likely not turn off), change the DATA SELECT switch on the unit to a higher offset mode. First try 1 V, then 2 V. If simply switching the mode switch does not prove effective, the offset level may have to be emulated at one end of the system by using pull-up/down resistors on the data connector. The S732DV has a +5 V bias pin and ground pins on the connector for this purpose. Contact equipment manufacturer's technical support for recommended resistor values and configuration.

**Termination**

RS-485 systems need to be properly terminated in order to work reliably. Exactly two terminating resistors are used on each RS-485 bus, at the furthest ends of the link. These resistors should be attached on the DATA IN/OUT connector if the Fiber Options link is at one end of the bus.

If the terminating resistors are left out, the tri-state condition will not be detected, and the bus may lock up. If there are too many terminations on the bus, signal levels may drop too low, or driver circuitry may fail. The standard value of terminating resistors for RS-485 is 120 ohms.

## OPERATION

S732DV links operate automatically once installed. Refer to Test Mode on page 7 for information on how to execute the test mode. Refer to Table 11 for a description of on-screen diagnostic indications. For an explanation of LED color codes, refer to LED Operation on page 7 and Table 12.

## MAINTENANCE

There is no operator maintenance other than keeping the units clean.

**TABLE 12: LED DIAGNOSTIC INDICATORS**

LED Name	Color	Indicates/ <i>Corrective Action</i>
LEVEL/ LOSS	Green	Sufficient optical power received. <i>No action required.</i>
	Red	Insufficient optical power received. <i>Verify fiber connected &amp; within optical budget, receiver power on.</i>
VIDEO IN/OUT	Green	Valid video signal at unit. <i>No action required.</i>
	Red	No video signal at unit. <i>Verify video connected, video source has power and is transmitting</i>
DATA IN	Green	Logic high into unit. <i>No action required.</i>
	Yellow	Logic low into unit. <i>No action required.</i>
	off	Tri-state or disabled condition. <i>Verify data connected, data source has power.</i>
DATA OUT	Green	Logic high received over fiber. <i>No action required.</i>
	Yellow	Logic low received over the fiber. <i>No action required.</i>
	Off	Tri-state received over fiber or disabled condition. <i>No action required.</i>
ENABLED	Green	DATA SELECT switch set to valid mode. <i>No action required</i>
	Flashing Red/Green	DATA SELECT switch in disabled position (position 0). <i>Select a valid data format.</i>
	Red	DATA SELECT switch set to Test Mode or invalid data format. <i>Check DATA SELECT switch conforms to desired configuration – may be valid.</i>

## Customer Support

For assistance in installing, operating, maintaining, and troubleshooting this product, refer to this document and any other documentation provided. If you still have questions, please contact technical support during normal business hours (Monday through Friday, excluding holidays, between 6 a.m. and 5 p.m. Pacific Time).

### GE Security

Call: 888 437-3287 (US, including Alaska and Hawaii; Puerto Rico; Canada)

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