

Fiber Optic System
Digital Video with Return Data and Contact Closure
Models S731DV and S7731DV

installation instructions



GENERAL

This manual is a guide to the installation and operation of the S731DV and S7731DV series fiber optic video and data transmission system. Please read the entire manual before installing the equipment.

NOTE: The series numbers S731DVT and S731DVR are used to describe all models of transmitters and receivers unless noted otherwise.

The Series S731DV and S7731DV data transmission system offers simultaneous digital transmission of 8-bit video, return multiprotocol data (MPD), and contact closure. The S731DV system operates over one or two multimode fibers while the S7731DV uses one or two single-mode fibers.

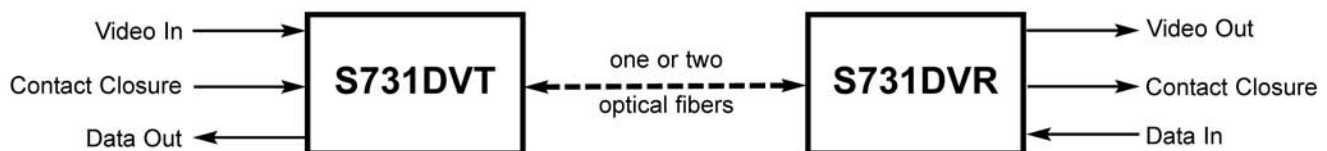
A complete system consists of an S731DVT transmitter and an S731DVR receiver. Units are designed for standalone operation or for installation in Fiber Options' 503H, 515R1 or 517R1 Card Cages.

Unpacking the Unit

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

S731DVT Transmitter or S731DVR Receiver
(S7731DVT Transmitter or S7731DVR Receiver)
Instruction manual

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

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

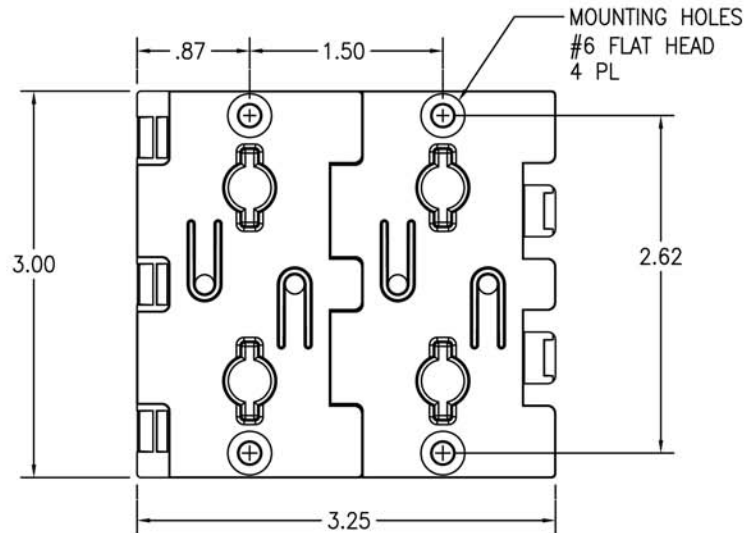
This fiber-optic link is supplied as a standalone module or as a rack card. Units should be installed in dry locations protected from extremes of temperature and humidity.

Standalone Modules

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

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 503H, 515R1 or the 517R1. Follow these guidelines to install rack cards after performing the 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: The rack card module can only be powered by 13.5 - 16 VDC. AC power must not be used.

CAUTION: Fiber Options recommends that the card cage is not connected to any power source during installation.

1. Look inside the card cage to determine the location of the socket for the edge connector on the card. Orient the card so that it will seat in the socket, and slide it into the card guides in the card cage until the edge connector at the back of the card seats in the socket. 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 card cage.

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 9.

FIGURE 3: DATA SELECT SWITCH SETTINGS

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

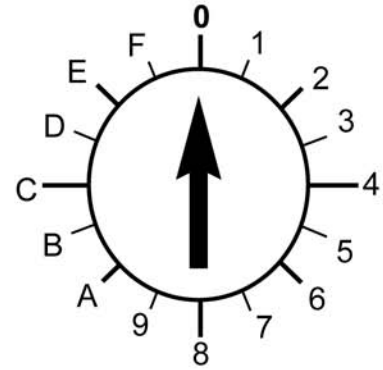


FIGURE 4: RACK-MOUNT MODULE

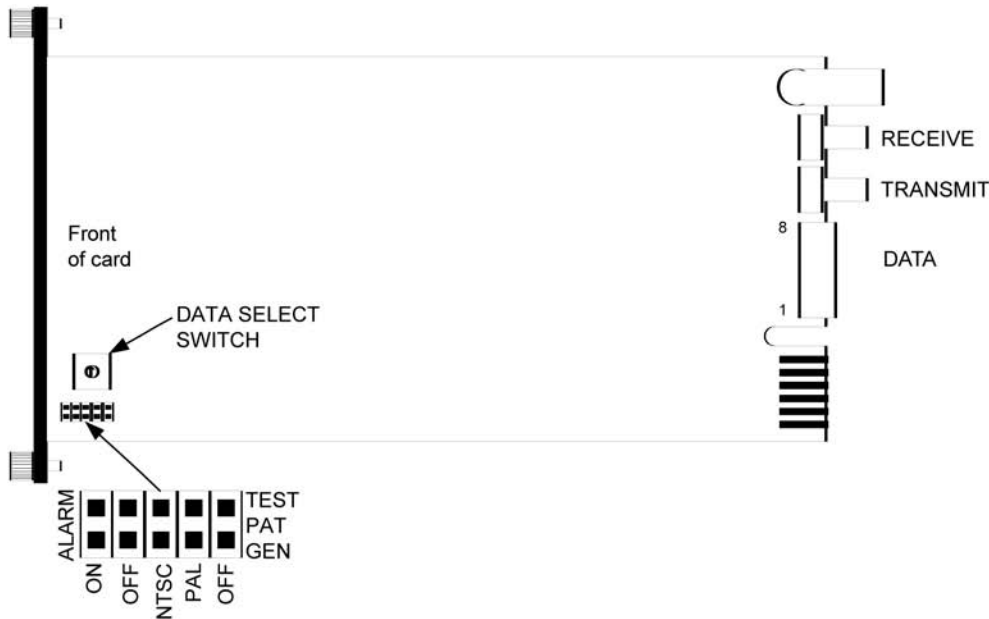
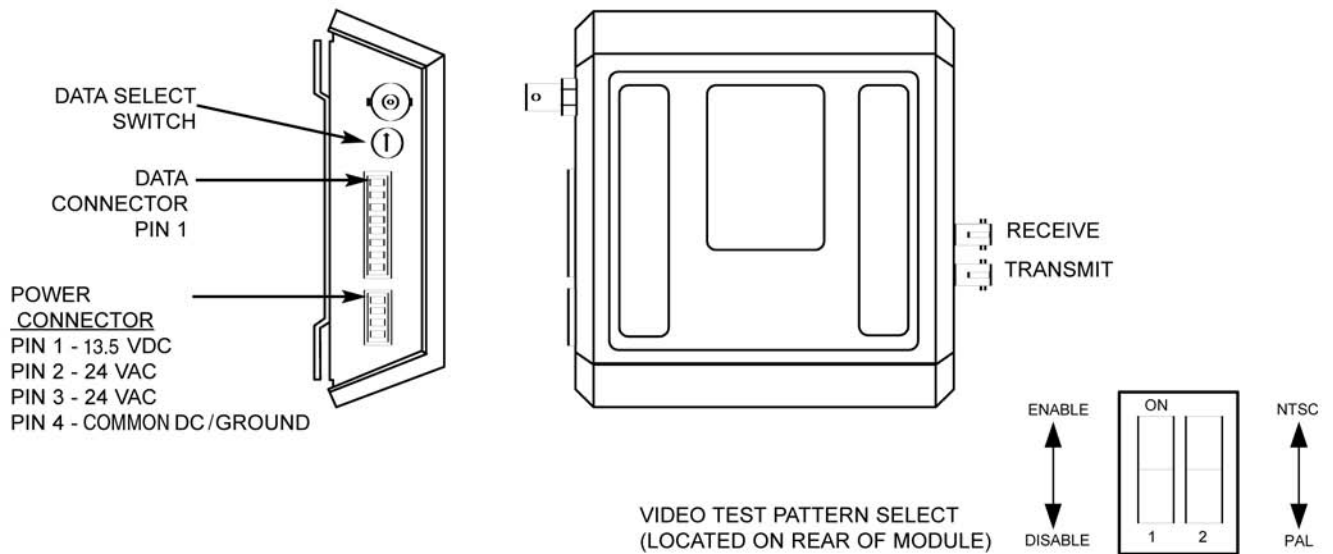


FIGURE 5: STANDALONE MODULE



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 S731DV 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 S731DV includes a special data mode to transport DTMF/FSK control signals. This feature is included in the S731DV as a control signal data path used on some PTZ control equipment.

It can be utilized in two ways:

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.

CONNECTIONS

Data Connections

Data connections are made to the 8-pin removable screw terminal on the S731DV according to the selected format. Refer to Tables 2 through 8 for transmitters and Tables 9 through 15 for 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, and 5.

Video Cable Connection

Both the S731DVT transmitter and the S731DVR receiver have one video connection.

Connect the video source cable to the input BNC jack on the S731DVT transmitter. Connect monitor equipment to the output BNC jack on the S731DVR 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.

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	RS232 Handshaking bit is used to indicate tri-state.
RS-485 → RS-232, 5 wire	7 - A	2	Tri-State detection circuitry activates handshaking bit.
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.

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.

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.

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.

Transmitters

NOTE: When making data connections listed in Tables 2 through 8, 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.

**TABLE 2:
RS-232 Interface**

Data Select Switch: Position 1

Pin No.	Function
8	Ground
7	nc
6	Contact in
5	Contact in
4	nc
3	nc
2	RS-232 out
1	Ground/Shield

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

Data Select Switch: Position 2

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

**TABLE 4:
TTL Interface**

Data Select Switch: Position 3

Pin No.	Function
8	Ground
7	nc
6	Contact in
5	Contact in
4	nc
3	TTL out
2	nc
1	Ground/Shield

**TABLE 5:
RS-422 Interface**

Data Select Switch: Position 4

Pin No.	Function
8	Ground
7	nc
6	Contact in
5	Contact in
4	nc
3	RS-422 out +
2	RS-422 out -
1	Ground/Shield

**TABLE 6:
Manchester/Biphase Interface**

Data Select Switch: Position 5

Pin No.	Function
8	Ground
7	nc
6	Contact in
5	Contact in
4	nc
3	nc
2	Manchester/Biphase out +
1	Manchester/Biphase out -

**TABLE 7:
RS-485 2-Wire SIMPLEX Interface**

Mode Switch SW1:

Position 6 = standard offset

Position 7 = 1V offset

Position 8 = 2V offset

Pin No.	Function
8	Ground
7	nc
6	Contact in
5	Contact in
4	nc
3	RS-485 out +
2	RS-485 out -
1	Ground/Shield

**TABLE 8*:
DTMF/FSK Control Interface**

Data Select Switch: Position D

Pin No.	Function
8	Ground
7	nc
6	Contact in
5	Contact in
4	nc
3	Audio out R/Diff out -
2	Audio out L/Diff out +
1	Ground/Shield

nc = no connection

*Contact closure is disabled in DTMF/FSK mode.

Receivers

NOTE: When making data connections listed in Tables 9 through 15, 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 9:
RS-232 Interface**

Data Select Switch: Position 1

Pin No.	Function
8	Ground
7	nc
6	nc
5	RS-232 in
4	nc
3	Contact out
2	Contact out
1	Ground/Shield

**TABLE 10:
RS-232 with Handshaking Interface**

Data Select Switch: Position 2

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

**TABLE 11:
TTL Interface**

Data Select Switch: Position 3

Pin No.	Function
8	Ground
7	nc
6	TTL in
5	Tie to pin 8
4	nc
3	Contact out
2	Contact out
1	Ground/Shield

**TABLE 12:
RS-422 Interface**

Data Select Switch: Position 4

Pin No.	Function
8	Ground
7	nc
6	RS-422 in +
5	RS-422 in -
4	nc
3	Contact out
2	Contact out
1	Ground/Shield

**TABLE 13:
Manchester/Biphase Interface**

Data Select Switch: Position 5

Pin No.	Function
8	Ground
7	Tie to pin 5 for termination
6	Manchester/Biphase in +
5	Manchester/Biphase in -
4	nc
3	Contact out
2	Contact out
1	Ground/Shield

**TABLE 14:
RS-485 2-Wire SIMPLEX Interface**

Mode Switch SW1:

Position 6 = standard offset

Position 7 = 1V offset

Position 8 = 2V offset

Pin No.	Function
8	Ground
7	Tie to pin 5 for termination
6	RS-485 in +
5	RS-485 in -
4	nc
3	Contact out
2	Contact out
1	Ground/Shield

**TABLE 15*:
DTMF/FSK Control Interface**

Data Select Switch: Position D

Pin No.	Function
8	Ground
7	nc
6	Audio in R/Diff in -
5	Audio in L/Diff in +
4	nc
3	Contact out
2	Contact out
1	Ground/Shield

nc = no connection

*Contact closure is disabled in DTMF/FSK mode.

SMARTS™ DIAGNOSTICS

The S731DV 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 S731DV includes an internal video test pattern generator that can ease installation and troubleshooting. Refer to Table 16. 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 S731DVT 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, place shunt on W2 as per local video standard (the PC Board is labeled "NTSC, PAL, OFF"). See Figure 4.
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 "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 fiber connection from one S731DV 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: on the transmitter, set the DATA SELECT rotary switch to position F. See Figure 3.

LED Operation

Refer to the Table 17 for an explanation of how to diagnose system faults using the LEDs built into the units.

The S731DV has 5 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, Data 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 S731DV 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 S731DV 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 S731DV 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.

TABLE 16: 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	Test Mode (Position F) selected at transmitter

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.

CONTACT IN Indicator

This LED indicates whether the contact closure switch input is closed or open. A green LED indicates the switch is closed, a red LED indicates the switch is open.

CONTACT Out Indicator

This LED indicates the state of the relay output. A green LED indicates the relay is closed, a red LED indicates the relay is open.

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.

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. 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

S731DV links operate automatically once installed. Refer to Test Mode on page 8 for information on how to execute the test mode. Refer to Table 16 for a description of on-screen diagnostic indications. For an explanation of LED color codes, refer to LED Operation on page 8 and Table 17.

MAINTENANCE

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

TABLE 17: LED DIAGNOSTIC INDICATORS

LED Name	Color	Indicates/Corrective Action
LEVEL/ LOSS	Green	Sufficient optical power received. <i>No action required.</i>
	Red	Insufficient optical power received. <i>Verify fiber connected & 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>
CONTACT IN	Green	Closed contact sensed on transmitter.
	Red	Open contact sensed on transmitter.
CONTACT OUT	Green	Closed contacts output.
	Red	Open contacts output from receiver.
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

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