

Fiber Optic System
Digital Video with Duplex Multi-Protocol Data
Models S730DV and S7730DV

installation instructions



GENERAL

This manual is a guide to the installation and operation of the S730DV and S7730DV series fiber optic video and data transmission system. Please read the entire manual before installing the equipment.

NOTE: The series numbers S730DVT and S730DVR are used to describe all models of transmitters and receivers unless noted otherwise.

The Series S730DV and S7730DV video and data transmission systems offer simultaneous transmission of duplex digital control data and one-way 10-bit digital video. The S730DV system operates over one or two multimode fibers while the S7730DV uses one or two single-mode fibers. The systems can also be configured for contact closure in the Tx-to-Rx direction, replacing the data signal in that direction.

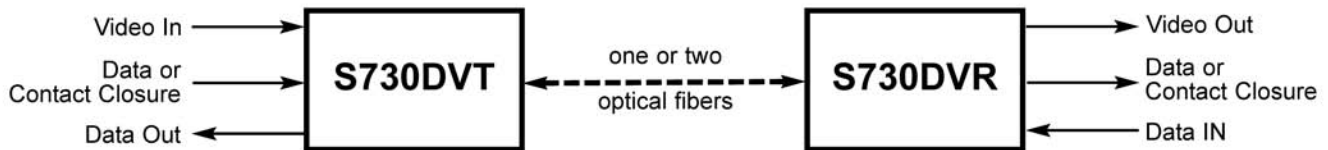
A complete system consists of an S730DVT transmitter and an S730DVR receiver. Units are designed for standalone operation or for installation in Fiber Options' 515R1 or 517R1 Card Cages.

Unpacking the Unit

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

S730DVT Transmitter or S730DVR Receiver
(S7730DVT Transmitter or S7730DVR 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 and for reading the diagnostic LEDs.

2. Standalone modules should be attached to suitable flat surfaces with four No. 6 (3-mm or 3.5-mm) screws. The type of screws used for mounting must be suitable for the surface where a module will be mounted. Some standalone modules consist of a rack card installed in a standalone enclosure. These are mounted the same as any other standalone module. The rack card is normally installed in the enclosure at the factory.

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. They may also be installed in one of the 501R standalone rack card enclosures. Follow these guidelines to install rack cards after performing the MODULE SETUP procedures.

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 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.

501R, 502R and 503R Rack Card Enclosures

CAUTION: The rack card module can only be powered by 13.5VDC. AC power must not be used.

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

1. Look inside the enclosure 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 enclosure 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 enclosure.

MODULE SETUP

Data Translation

The data translation capability of the S730DV series is unique in the industry. It allows translation from one data format to another, thus eliminating the need for external translation devices.

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. Data translation examples are shown in Table 1.

Data Selection

NOTE: Units are shipped with all jumpers and switches set for bi-directional data. The DATA SELECT switch on stand-alone units, or SW1 on rack cards, is shipped in the Disabled position (position 0).

Receiver Data Selection

Receivers are factory set for bi-directional data by setting jumpers W3, W4, and W5 to the 1-2 (DATA) position and the rotary DATA SELECT switch to a valid data format. See Figures 1 and 2.

Transmitter Data Selection

Standalone transmitters are factory set for bi-directional data by setting the DATA/CC switch to the DATA position and the rotary DATA SELECT switch to a valid data format. See Figures 2 and 3. Rack mount transmitters are configured for bi-directional data by setting jumper W3 to the 1-2 (CONTACT DISABLED) position and the rotary DATA SELECT switch to a valid data format. See Figures 2 and 4.

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 1: RACK-MOUNT RECEIVER

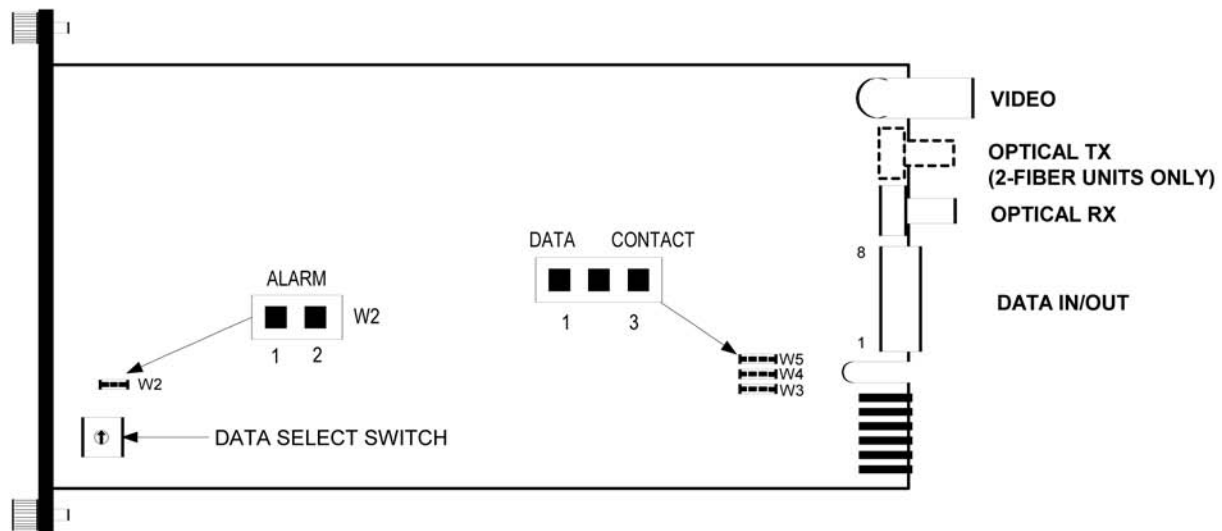


FIGURE 2: DATA SELECT SETTINGS

- | Setting | Mode |
|---------|--------------------------|
| 0 | Disable (factory preset) |
| 1 | RS-232 |
| 2 | RS-232 + handshake |
| 3 | TTL |
| 4 | RS-422 2-wire |
| 5 | Manchester/Biphase |
| 6 | RS-485 2-wire standard |
| 7 | RS-485 2-wire 1V |
| 8 | RS-485 2-wire 2V |
| 9 | RS-485 4-wire standard |
| A | RS-485 4-wire 1V |
| B | RS-485 4-wire 2V |
| C,D,E | Not Used |
| F | Test Mode |

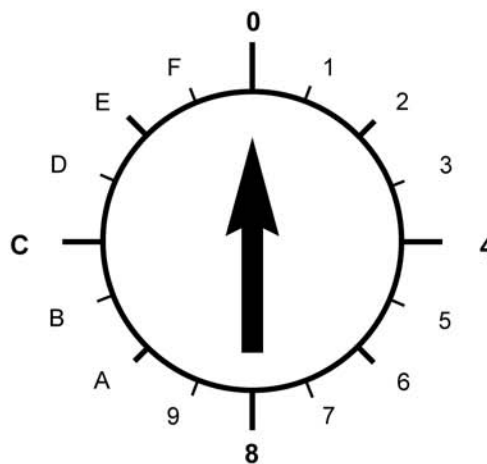


FIGURE 3: STANDALONE TWO-FIBER TRANSMITTER MODULE

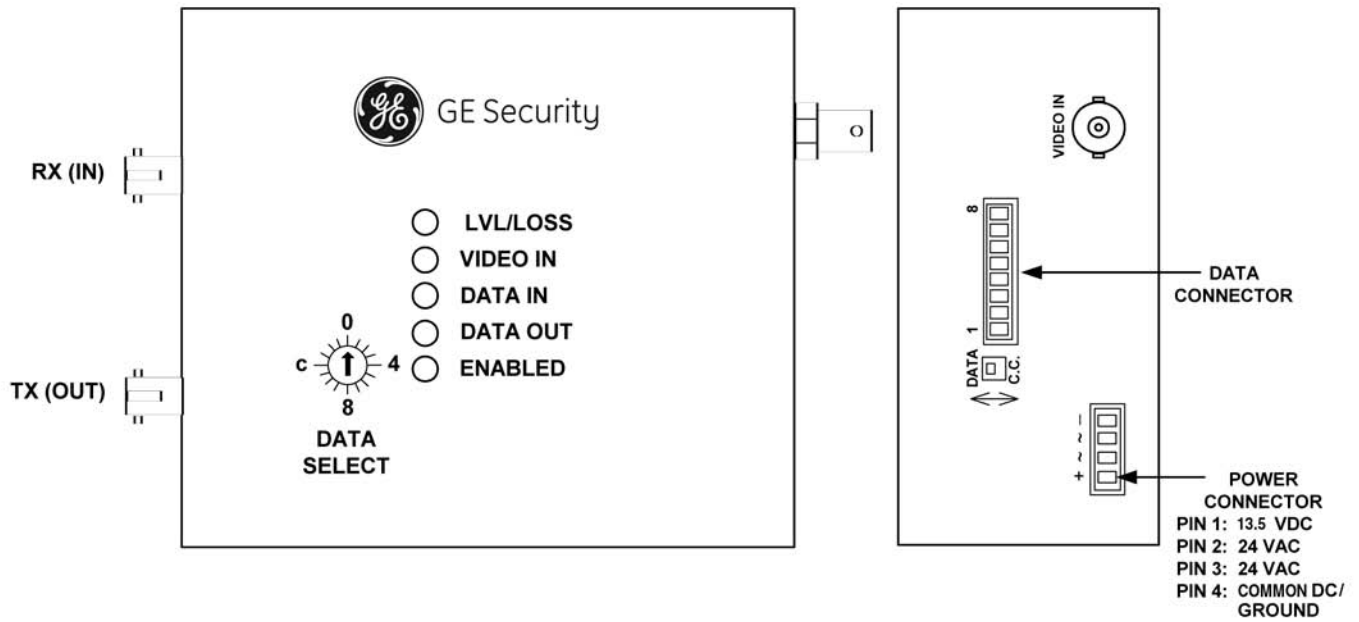
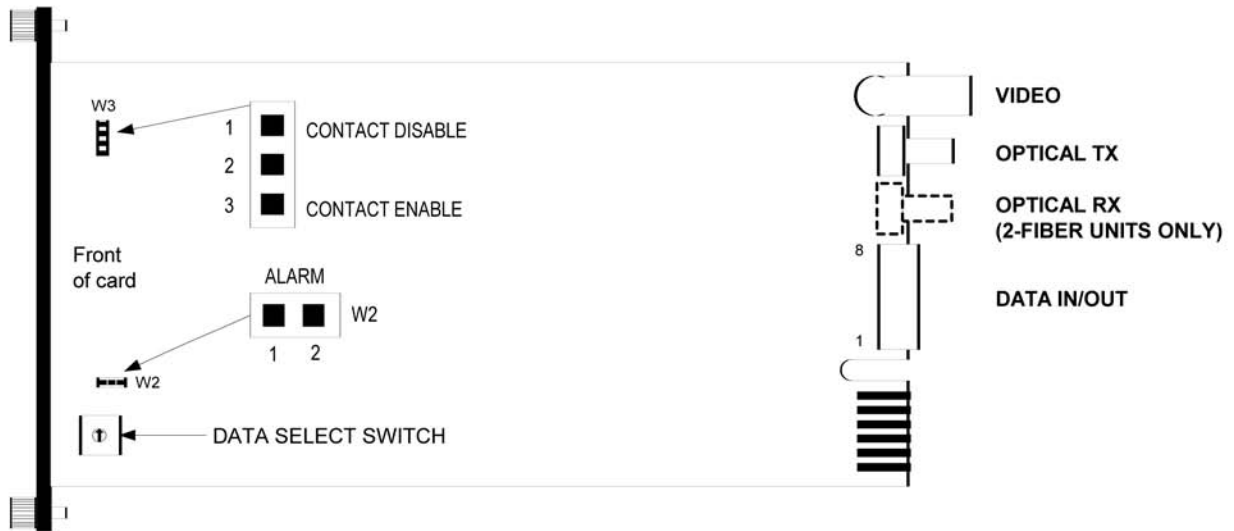


FIGURE 4: RACK-MOUNT TRANSMITTER



NOTE: If the link is going to support RS-485, refer to RS-485 APPLICATION NOTES on page 9

Contact Closure Selection

Receiver Contact Closure Selection

Receivers are configured for contact closure in the forward data path data by setting jumpers W3, W4, and W5 to the 2-3 (CONTACT) position. See Figure 1.

Transmitter Contact Closure Selection

Standalone transmitters are configured for contact closure in the forward data path by setting the DATA/CC switch to the CC position. See Figure 3.

Rack mount transmitters are configured for contact closure in the forward data path by setting jumper W3 to the 2-3 (CONTACT ENABLED) position. See Figure 4.

NOTE: When using contact closure, the reverse data path remains operational. Data can be selected via the DATA SELECT switch in accordance with the settings shown in Figure 2. Since the data is simplex, however, the duplex data modes (Tables 3, 8, and 9) will not apply.

Alarm Jumper

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

The alarm is set to ON (ACTIVE) at the factory with jumper W2 set to the 1-2 position. If the alarm output is not desired, remove jumper W2 or set it to position 2 only. See Figures 1 and 4.

NOTE: Removing jumper W2 does not affect the operation of the LEVEL/LOSS™ LED. Loss of optical signal will always be indicated by a red LEVEL/LOSS™ LED.

CONNECTIONS

All fiber-optic links convert electrical signals into a light source at the transmitter and convert the light back to electrical signals for output at the receiver.

Data Connections

Data connections are made to the 8-pin removable screw terminal on the S730DV according to Tables 2 through 9 for the selected format. 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 Figure 5.

Built-In Termination

The S730DV features a built-in termination for RS-485, Manchester, and Biphase installations. Connect a jumper as described in Tables 7, 8, and 9.

Contact Closure Connection

Contact closure connections are made according to Table 11 for transmitters and Table 12 for receivers.

Video Cable Connection

CAUTION: Make sure all peripheral equipment that will be connected to the fiber unit is turned OFF during installation.

Fiber Options recommends using Belden number 9259 or equivalent RG59/U coaxial cable between the video equipment and the fiber units. Do not exceed the maximum distance recommended by the manufacturer of the video equipment.

NOTE: Coaxial cable must be terminated with female BNC connectors to properly connect with the Fiber Options equipment.

Connect the video equipment, such as a camera, to the input BNC jack on the S730DVT transmitter using terminated coaxial cable. Connect the monitoring equipment to the output BNC jack on the S730DVR receiver with terminated coaxial cable. See Figures 1, 3, and 4.

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 1, 3, and 4.

TABLE 2:
RS-232 Interface

Data Select Switch: Position 1

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

TABLE 3:
RS-232 with Handshaking Interface

Data Select Switch: Position 2

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

TABLE 4:
TTL Interface

Data Select Switch: Position 3

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

TABLE 5:
RS422 Interface

Data Select Switch: Position 4

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

TABLE 6:
Manchester/Biphase Interface

Data Select Switch: Position 5

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

TABLE 7:
Manchester/Biphase Interface Termination Unit

Data Select Switch: Position 5

Pin No.	Function
8	nc
7	nc
6	Manchester/Biphase termination tie to pin 4
5	Manchester/Biphase in +
4	Manchester/Biphase in -
3	Manchester/Biphase out -
2	nc
1	Manchester/Biphase out +

TABLE 8:
RS-485 2-Wire Interface/Sensonet

Data Select Switch:

Position 6 = standard offset

Position 7 = 1V offset

Position 8 = 2V offset

Pin No.	Function
8	5 V BIAS
7	nc
6	RS-485 termination-tie to pin 4
5	RS-485+
4	RS-485 -
3	Ground/Shield
2	nc
1	nc

TABLE 9:
RS-485 4-Wire Interface

Data Select Switch:

Position 9 = standard offset

Position A = 1V offset

Position B = 2V offset

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

TABLE 10:
Test Mode Loopback Interface

Data Select Switch: Position F

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

nc = no connection

**TABLE 11: TRANSMITTERS
Contact Closure Interface**
Data Select Switch:*

Pin No.	Function
8	nc
7	nc
6	nc
5	Contact Closure IN
4	Contact Closure IN
3	tie to pin 4
2	**
1	**

**TABLE 12: RECEIVERS
Contact Closure Interface**
Data Select Switch:*

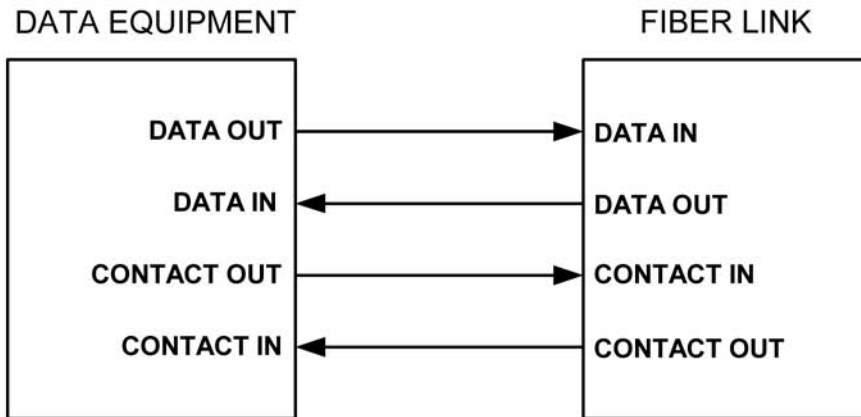
Pin No.	Function
8	nc
7	nc
6	nc
5	**
4	**
3	nc
2	Contact Closure OUT
1	Contact Closure OUT

* The Data Select Switch has no effect on contact closure operation. The switch will, however, still enable data in the reverse direction.

** These pins are used for data in and out as per the data format selected in tables 1, 3, 4, 5, & 6.

nc = no connection

FIGURE 5: FIBER LINK DATA CONNECTIONS



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 transmitters in the 4 x 4 x2 inch can may be powered either by 24 VAC or by 13.5 VDC. Connect input power according to the label on the module.

CAUTION: Standalone receivers may only be powered by 13.5 VDC. AC power must not be used.

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.

TABLE 13: STANDALONE ENCLOSURE POWER CONNECTIONS

Pin	Connection
1	Ground
2	Not Used
3	DC +

Standalone modules have a removable screw terminal connector for the electrical input connection. Refer to Table 13 for 501R and 503H rack card enclosures and Figure 3 for standalone transmitters.

1. Identify the power connector and remove it from the module.
2. Make sure the power supply is not connected to any power source, and strip approximately 0.25-in (6-mm) of insulation from the ends of the cable.
3. Taking care to observe the correct polarization of the cable, insert one lead into one of the screw sockets and tighten the screw. Repeat for the other conductor. Confirm the security of the connection by a light pull on the cable.
4. Seat the connector in its position in the fiber unit.
5. Plug the power supply into a suitable outlet.

Power up the peripheral equipment and verify system operation by observing video on the monitor at the receiver end.

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 S730DV has built in Status Monitoring And Reliability Test System (SMARTS™) diagnostic capabilities that includes LED indicators for monitoring data and optical status. They are described in the following sections.

LED Operation

The S730DV fiber units have 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 VIDEO 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. As the optical power is decreased, as happens through long fiber runs, splices or connections, the intensity of the LEVEL/LOSS™ LED will diminish until the sensitivity range limit of the S730DV has been reached. At this point, the LED will appear OFF. If any additional optical attenuation is introduced, the LEVEL/LOSS™ LED will turn bright red indicating an insufficient amount of optical power is being received. All data will default to it's failure state level to eliminate bus contention.

VIDEO IN (or OUT) Indicator

The VIDEO IN (or OUT) LED on the indicates the strength of the video signal. The VIDEO IN LED on the transmitter remains green as long as an adequate video signal is being input to the transmitter. If the video input becomes too weak, the LED will turn red. The VIDEO OUT LED on the receiver performs a similar function, except that it refers to the video output from the receiver.

NOTE: The S730DV monitors the video sync signals to determine the strength of the signal. It does not monitor the brightness signal. Thus, if the scene in front of a camera is totally dark, producing a blank monitor screen, the VIDEO IN and OUT LEDs can still be green.

DATA IN Indicator

The DATA IN LED indicates the level of the data signal being input to the S730DV 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. This LED can be used to determine the resting state of your equipment and, in the RS-485 states, verify that a tri-state is being detected properly.

Unlike most competing units, the S730DV 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 as the DATA IN LED described in the previous section.

Enabled Indicator

The ENABLED 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 indicating that NO mode has been selected.

Table 14 provides a convenient summary of the LED display functions.

TEST MODE

Test mode allows the end user to verify the operation of the copper receiver/driver circuit in a S730DV, as well as the fiber connection from one S730DV to another. Using the test mode is simple:

1. Set the DATA SELECT switch on the S730DV to be tested into position F (TEST MODE). At this end only, wire the connector as shown in Table 10.
2. At the receiving (or opposite) end, set the DATA SELECT switch on the S730DV to position 9.

In the test mode, the transmitting unit should behave as follows:

- a. ENABLED LED is RED, indicating that a valid data format has not been selected.
- b. 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. DATA IN LED should mimic the DATA OUT LED. This indicates a good, proper loopback connection, and proves that the data transmit/receive circuitry is working properly.
- d. LEVEL/LOSS™ may be red or green - indicates received fiber signal strength.

The receiving unit (position 9) should behave as follows:

- a. ENABLED LED is GREEN, since a valid data format is selected.

- b. DATA OUT LED should slowly flash amber, green, off. This indicates that the fiber path from the unit set for TEST MODE is reliable.

- c. DATA IN LED should be OFF, since there is no input copper connection made.

- d. LEVEL/LOSS™ should be green to off (but not red), indicating that sufficient optical power is being received.

After the test has been performed at one end, swap switch positions and connectors to perform the test on the other end. Having done this, you have proven that the copper-in-to-fiber-to-copper-out conversion is working in both directions.

RS485 APPLICATION NOTES

The S730DV 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 RS485; 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 S730DV 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 right 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

S730DV fiber links operate automatically once installed. Refer to TEST MODE on page 9 for details on how to execute the test mode. For description of LED color codes and an explanation of how to diagnose system faults using the LEDs built into the Fiber Options units, refer to LED OPERATION on page 8 and Table 14.

MAINTENANCE

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

TABLE 14: 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. Verify fiber connected & within optical budget, receiver power on.
VIDEO IN/OUT	Green	Valid video signal at unit. <i>No action required.</i>
	Red	No video signal at unit. Verify video connected, video source has power and is transmitting
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 data format. <i>No action required.</i>
	Red	Test mode or invalid data format. <i>Check DATA SELECT conforms to desired configuration – may be valid.</i>
	Flashing Red/Green	In disabled position. (Select a valid data format)

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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