

Fiber Optic Multi-Protocol
Data System
Model S710D

installation instructions



GENERAL

This manual is a guide to the installation and operation of the S710D series fiber optic multi-protocol data (MPD) transmission system. Please read the entire manual before installing the equipment.

NOTE: The series number S710D is used to describe all models unless noted otherwise.

The Series S710D MPD transmission systems offer simultaneous digital transmission of duplex digital control data. The S710D system operates over two multimode fibers.

A complete system consists of two transceivers. Units are designed for standalone operation or for installation in Fiber Options' 503H, 515R1 or 517R1 Card Cages.

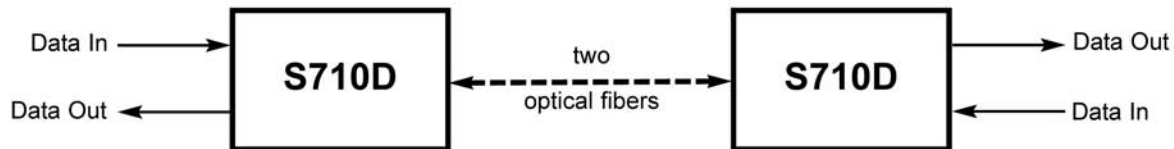
Unpacking the Unit

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

S710D Transceiver

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

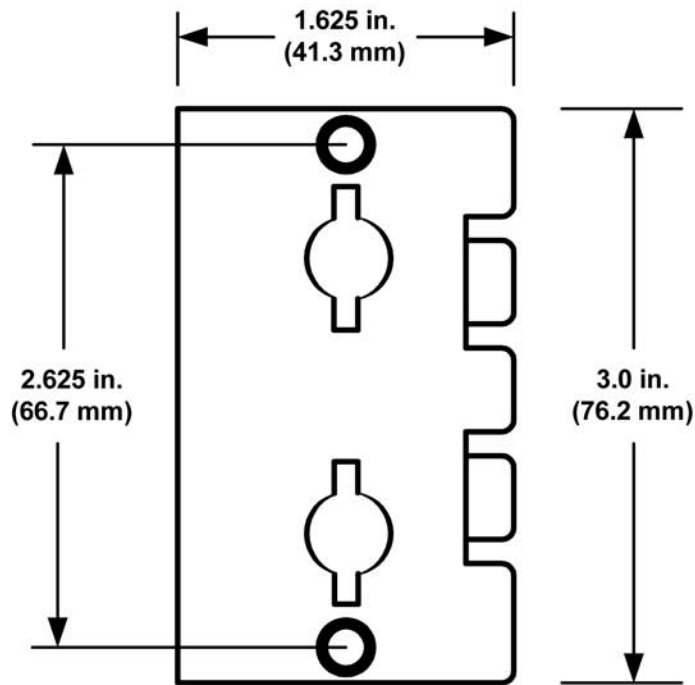
Standalone modules are provided with a mounting plate with holes for two No. 6 flat head screws (3-mm or 3.5-mm). The type of screws must be suitable for the surface where a module will be mounted. See Figure 1.

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. Attach the mounting plate to a flat surface using two mounting screws. Once the plate is securely attached, align the tabs in the plate with the holes in the rear of the module and apply downward pressure until the module snaps in place.

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.

FIGURE 1: STANDALONE MODULE MOUNTING PLATE



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 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.

2. 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.

3. 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 2. See Figures 3 and 4 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 7.

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 with jumper JP4 set to position 1-2. If the alarm output is not desired, remove jumper JP4 or move it to position 2 (OFF) only. 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 S710DV 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.

CONNECTIONS

Data Connections

Data connections are made to the 8-pin removable screw terminal on the S710D according to the selected format. Refer to Tables 2 through 10. 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.

See Figures 3 and 4 for the location and orientation of the data connector.

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 3 and 4.

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

All S710D standalone modules are powered by 13.5 VDC. Connect input power according to the label on the module. See Figure 3.

FIGURE 2: DATA SELECT SWITCH SETTINGS

Setting	Mode	Setting	Mode
0	Disable (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	Reserved
6	RS-485 2-wire standard	E	Reserved
7	RS-485 2-wire 1V	F	Test Mode

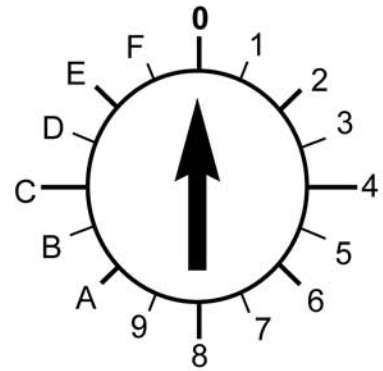
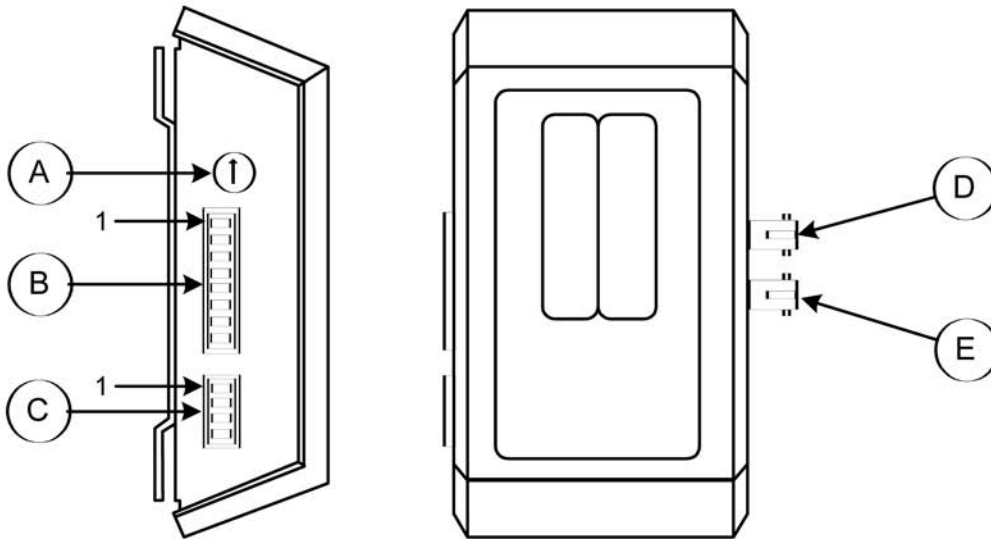


FIGURE 3: STANDALONE MODULES - CONNECTOR AND SWITCH LOCATIONS



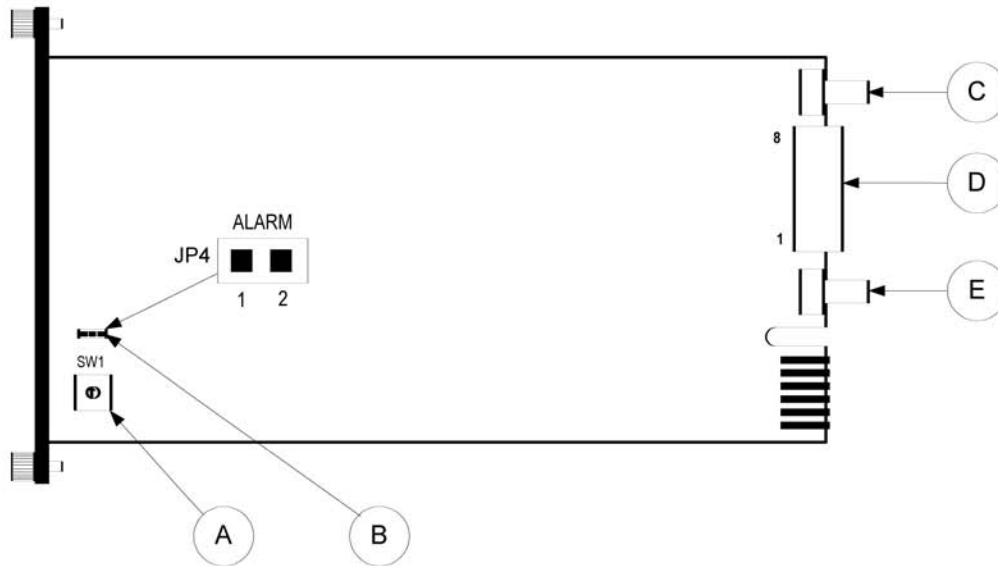
Legend

Item	Description
A	DATA SELECT Switch
B	Data Connector
C	Power Connector
D	Optical (Fiber) RECEIVE Connector
E	Optical (Fiber) TRANSMIT Connector

Power Connections

Pin	Description
1	DC+
2	No Connection
3	No Connection
4	Ground

FIGURE 4: RACK-MOUNT MODULE



Legend

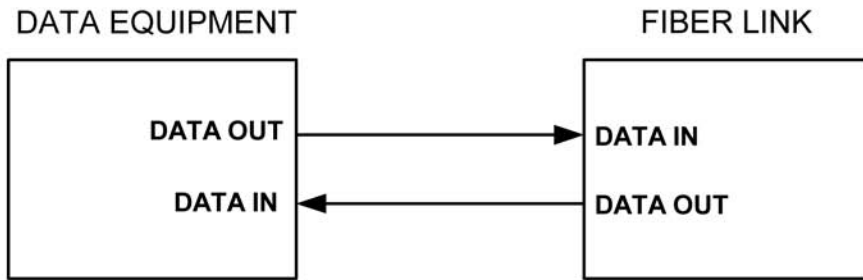
Item	Description
A	DATA SELECT Switch
B	ALARM Jumper
C	Optical (Fiber) TRANSMIT Connector
D	Data Connector
E	Optical (Fiber) RECEIVE Connector

TABLE 1: DATA TRANSLATIONS

NOTE: When configuring a pair of transceivers to translate data, the unit originating a signal is considered the transmitter and the unit receiving and translating the signal is considered the receiver.

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.

FIGURE 5: FIBER LINK DATA CONNECTIONS



**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	nc
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	nc
6	Manchester/Biphase in +
5	Manchester/Biphase in -
4	nc
3	nc
2	Manchester/Biphase out +
1	Manchester/Biphase out -

**TABLE 7:
Manchester/Biphase Interface
Termination Unit**

Mode Switch SW1: Position 5

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

nc = no connection

**TABLE 8:
RS-485 2-Wire Interface**

Mode Switch SW1:

Position 6 = standard offset

Position 7 = 1V offset

Position 8 = 2V offset

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

**TABLE 9:
RS-485 4-Wire Interface**

Mode Switch SW1:

Position 9 = standard offset

Position A = 1V offset

Position B = 2V offset

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

**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

nc = no connection

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 S710D has built in Status Monitoring And Reliability Test System (*SMARTS™*) diagnostic capabilities. This includes LED indicators for monitoring data and optical status.

LED Operation

Refer to the Table 11 for an explanation of how to diagnose system faults using the LEDs built into the Fiber Options units.

The S710D 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/LOSSSM, DATA IN, DATA OUT, and ENABLED. See Figure 6. The LEDs function as follows:

LEVEL/LOSSSM 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.

DATA IN Indicator

The Data In LED indicates the state of the data being input to the S710D 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 S710D 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.

TEST MODE

Test mode allows the user to verify the operation of the copper receiver/driver circuit in an S710D, as well as the fiber connection from one S710D to another. Using the test mode is simple:

1. Switch the S710D to be tested into position F (TEST-MODE) on the DATA SELECT rotary switch. At this end only, wire the connector as shown in Table 10.

2. At the receiving (or opposite) end, switch the S710D to position 9 on the rotary switch.

In test mode, the transmitter 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™ LED may be red or green - indicates received fiber signal strength but does not affect this part of the test.

The receiver (position 9) should behave as follows:

- a. ENABLED LED is green indicating 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 TESTMODE is reliable.
- c. DATA IN LED should be OFF since there is no input copper connection made.
- d. LEVEL/LOSS™ LED should be steady green, 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.

RS-485 APPLICATION NOTES

The S710D 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 what 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 S710D 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 RS485 bus, at the furthest ends of the link.

FIGURE 6: 710D RACK-MOUNT FRONT PANEL

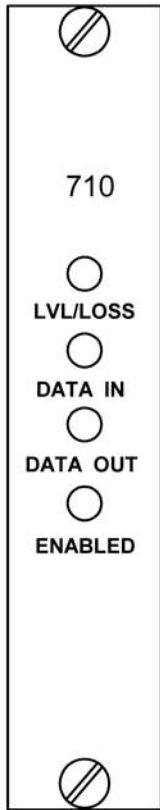


TABLE 11: LED DIAGNOSTIC INDICATORS

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>
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>

NOTE: The resistors for terminating RS-485 data are built into the S710D.

If the S710D is positioned at either end of the data bus, terminate the unit by connecting a jumper between the pins indicated in Tables 8 and 9.

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.

OPERATION

S710D links operate automatically once installed. To execute the test mode, see page 7. For an explanation of LED color codes, see LED OPERATION on page 7 and Table 11.

MAINTENANCE

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

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).

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