



**F280XA
FOM II Series
Fiber Optic Modem
Technical Manual**

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SECTION 1 DESCRIPTION OF EQUIPMENT

1.1 INTRODUCTION

This manual provides general and detailed information on the installation and operation of the Model F280XA FOM II Series Fiber-optic Modems. Section 1 contains a general description of the equipment. Section 2 covers installation instructions. Section 3 contains operating instructions. Section 4 provides the theory of operation. Section 5 contains maintenance and troubleshooting information. Figure 1 is an overall view of the Model F280XA products.

Model Number	VERSITRON Part Number	Description
F2802A	30390-12	RS-232 input, 20 bps -128 Kbps, short-wave, multimode, 850nm optics, ST output, 2 Km operational distance.
F2804A	30390-14	RS-232 input, 20 bps -128 Kbps, long-wave, multimode, 1300nm optics, ST output, 6 Km operational distance.
F2805A	30390-15	RS-232 input, 20 bps -128 Kbps, long-wave, Singlemode, 1300nm optics, ST output, 14 Km operational distance.

1.2 DESCRIPTION OF EQUIPMENT

1.2.1 Functional Characteristics

The Model F280XA products are fiber-optic links designed for use as an RS-232 interface extender (See Figure 2), a modem link (See Figure 3) and a four channel synchronous/asynchronous data multiplexer (See Figure 4). These units are DTE/DCE switch selectable and interface with other VERSITRON FOM II series F28XXA Fiber Optic Modems. A Model F280XA link uses fiber-optic cable of up to 2 Km (6,560 ft./1.2 mi) for 850nm LED, 8 Km (26,240 ft/5 mi) for 1300nm multimode LED optics and 14 Km (46,200 ft/8.7 mi) for singlemode 1300nm optics. The link has a maximum data rate of 128Kbps, providing synchronous, asynchronous or isochronous full-duplex, half-duplex, or simplex data transmission with fully transparent operation. The Model F280XA FOM II modems fully support the interface control signals associated with the EIA/TIA RS-232 or CCITT V.24/V.28 (**Note: Pins 14, 16 and 18 are not supported for V.24/V.28**), and MIL-STD-188C standards. This is accomplished by multiplexing the control signals along with clock and data signals and transmitting this serialized signal to the remote unit. At the remote unit the signal is demultiplexed and applied to the interface.

1.2.2 Physical Characteristics

The Model F280X FOM II products measure 7.0" wide x 0.84" high x 11.6" deep and are designed to be placed in a variety of VERSITRON enclosures and chassis (see Table 1 for dimensions of enclosures and chassis). "Desktop" applications use the HF-1 single-card enclosure. Rack-mount options include the HF-2SS 2-card and HF-20A 20-card chassis. The Unit requires a wall transformer for the HF-1 desktop operation, with a one-pin connector for electrical input on the back of the card. There is a female DB25 connector for the RS-232 interface and two ST connectors for the fiber-optic interface, also on the back of the card. The unit requires a VERSITRON Model AC300W or AC300WR rack-mount power supply for HF-20A 20-card operation. The unit has seven indicators: power (PWR), alarm (ALM), transmit data (TXD), receive data (RXD), transmit clock (TXC), receive clock (RXC), and loopback (LB).

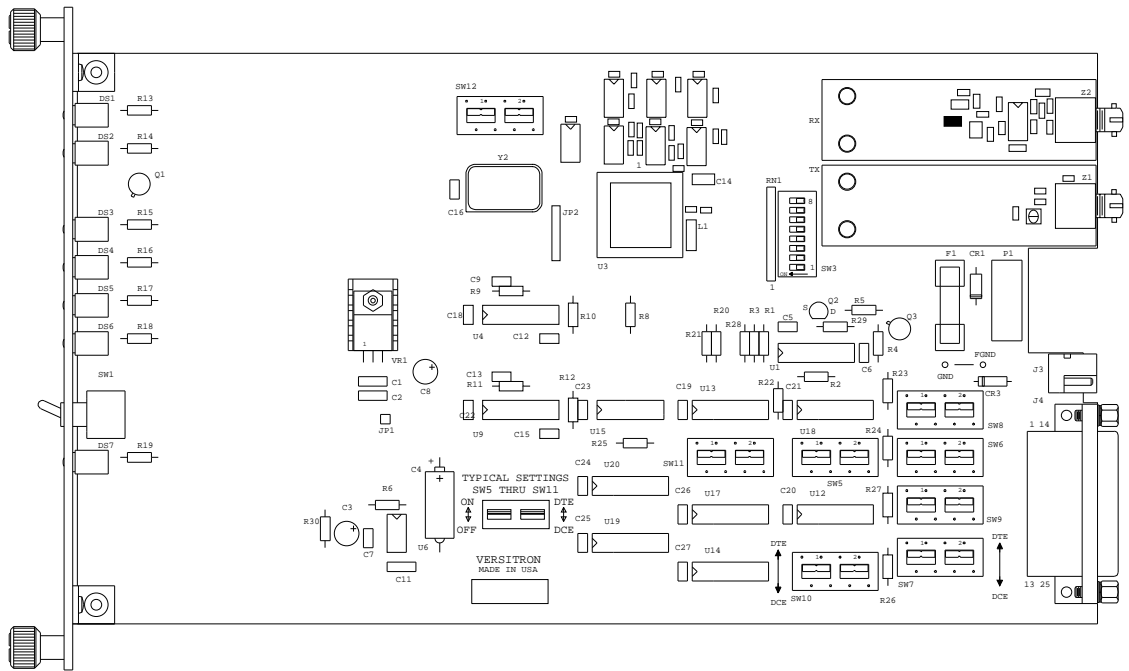


FIGURE 1. OVERALL VIEW, F280X MODEMS

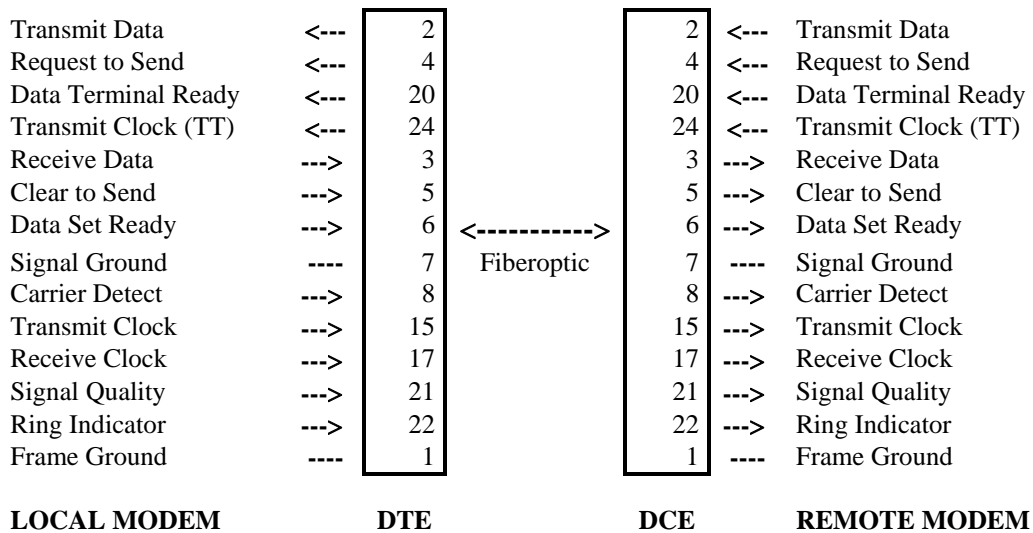


FIGURE 2. INTERFACE EXTENDER CONFIGURATION

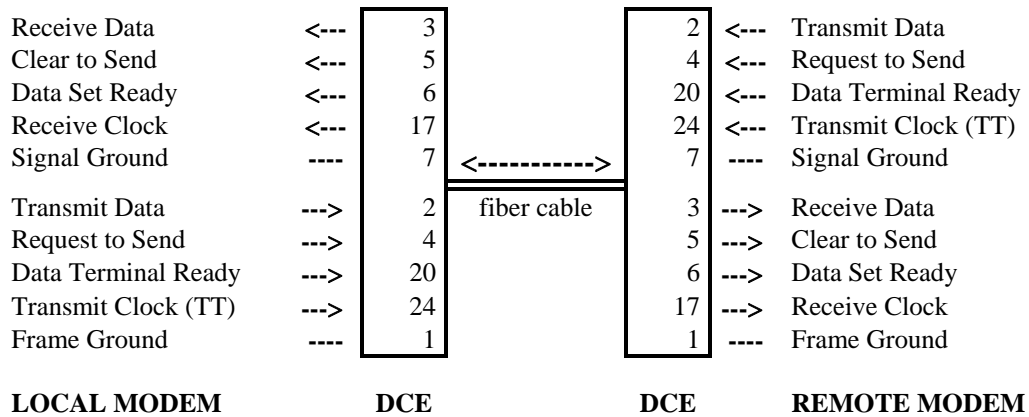


FIGURE 3. MODEM LINK CONFIGURATION

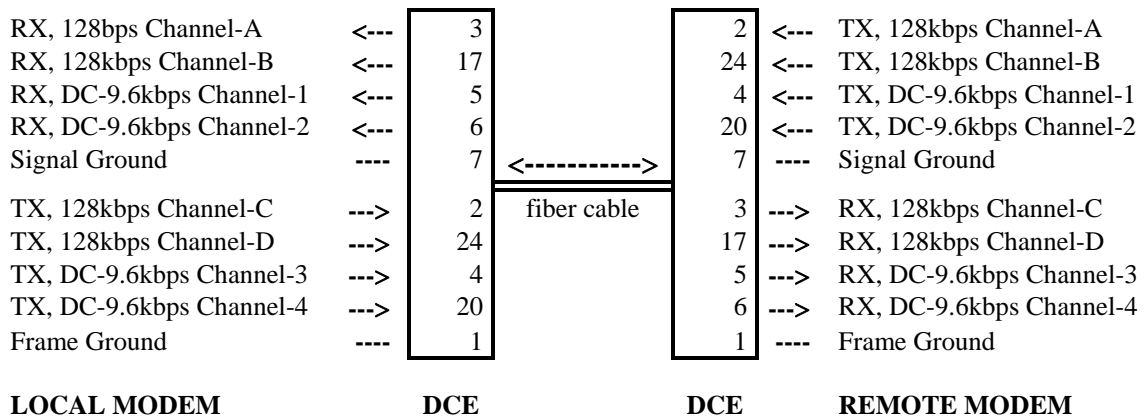


FIGURE 4. MULTIPLEXER CONFIGURATION

VERSITRON Model (Part) Number	Dimensions	Description	VERSITRON Power Supply Required
HF-1	1.31" H x 7.12" W x 11.6" D	Single Card Desktop Enclosure	PSAC08 (US) or PSAC09 (Eur)
HF-2SS	1.72" H x 19" W x 13.75" D	Dual Card Rack Mount Chassis (Side-by-Side)	PSAC08 PSAC09
HF-20A	7" H x 19" W x 11.6" D	20 Card Rack Mount Chassis	AC300W or AC300WR

TABLE 1. ENCLOSURES / CHASSIS

1.3 SPECIFICATIONS

General Specifications:

Models	F280XA*1
Dimensions	(7" H x 7/8" W x 11" L) (17.8 x 2.1 x 27.9cm)
Weight	0.34 kg (12 oz)
Operating Temperature	0° to 50°C (32° to 100°F)
Humidity	Up to 95% relative humidity (noncondensing)
Altitude	Up to 10,000 ft

Note: *1 X is replaced with 2, 4, or 5 for 850nm MM, 1300nm MM, or 1300nm SM, respectively.

Electrical Interface:

Models	F282XA*1
Power Requirements	12VDC, 1Amp
Connector	Female DB-25
Data Signal	EIA/TIA RS-232 / MIL-STD-188C Asynchronous, Synchronous, and Isochronous
Terminal Timing Data Rate	20 bps upto 128 Kbps
Source Timing Data Rate	20 bps upto 76.8 Kbps (Switch Selectable)
DCE/DTE Options	Switch selectable

Note: *1 X is replaced with 2, 4, or 5 for 850nm MM, 1300nm MM, or 1300nm SM, respectively.

Fiber-optic Interface:

Models	F2802A	F2804A	F2805A
Wavelength	Multimode 850nm	Multimode 1300nm	Single Mode 1310nm
Connector	ST	ST	ST
Link Budget	21 ± 1 dB	18 ± 1 dB	14 ± 1 dB
Maximum Range	Up to 2 Km	Up to 8 Km	Up to 14 Km
Fiber-optic Cable Size	50/125, 62.5/125, 100/140	50/125, 62.5/125, 100/140	8/125, 9/125, 10/125

Major Features:

<ul style="list-style-type: none"> • Data rate up to 128kps • DCE/DTE Switch Selectable • Terminal/Source Timing Option • 850nm Multimode, 1300nm Multimode and 1300nm Single Mode Options • Eight Channel Data Multiplexer (Four in each direction)

SECTION 2

INSTALLATION

2.1 GENERAL

This section contains detailed information on the installation and initial checkout of the Model F280XA FOM II Series Modems. Paragraph 2.2 contains general information on site selection and rack mounting. Paragraphs 2.3 and 2.4 provide instructions for connecting Model F280XA products to your system and selecting the different options. Paragraph 2.5 has the initial checkout procedures.

2.2 SITE SELECTION

The Model F280XA FOM II products are designed to connect to the serial port (DB25 Connector) of the terminal equipment with a cable (customer supplied). The Modem is designed to be placed in a VERSITRON Model HF-1 desktop enclosure, or rack mounted in a VERSITRON Model HF-2SS or Model HF-20A 19-inch standard chassis. The enclosure and chassis dimensions are provided in Table 1 in the previous section. When placed in a desktop enclosure, space for the transformer must also be provided.

2.3 POWER REQUIREMENTS

The Model F280X FOM II products are designed to operate from an AC power transformer or a DC power source with a DC voltage of +12 VDC. Before inserting the power transformer (VERSITRON Model PSAC08 US, PSAC09 EUR) into an AC power source, the plug should be connected to the Modem. There are no special tools required. DC power may be used instead of the power transformer if available. This requires a 2.5 mm socket with the positive voltage on the center and the common on the concentric using +12 VDC at 1 A.

2.4 SWITCH SETTINGS

There are a number of switches on the circuit card of the Model F280XA modem, used to select between DTE/DCE operation, Terminal/Source timing selection. Figure 5 shows the physical location of all of the switches, labeled SW1 through SW12. With the exception of the loopback switch (SW1), which is on the front panel of the modem card, **all of the switches should be set to the desired position prior to applying power to the modem**, and then left in those positions unless the overall link characteristics change.

Switch 3 (SW3), located between the optics and the XILINX CPLD Complex programmable Logic Device chip U3, contains 8 ON-OFF switch positions. The first two positions determine the interface standard that is expected as an input. For SW3, Position 2 is set to ON for DCE operation, and OFF for DTE operation. Position 1 is set to OFF for DCE operation, and ON for DTE operation.

The settings for SW12 should only be used on the modem which is configured for DTE configuration. This switch is used to set the Terminal or Source timing operation for a DTE modem. Both positions on this switch should be OFF for Terminal timing, and ON for Source timing. SW12 should always be set to the OFF position for a modem which is configured for DCE settings. These settings are listed in Table 2.

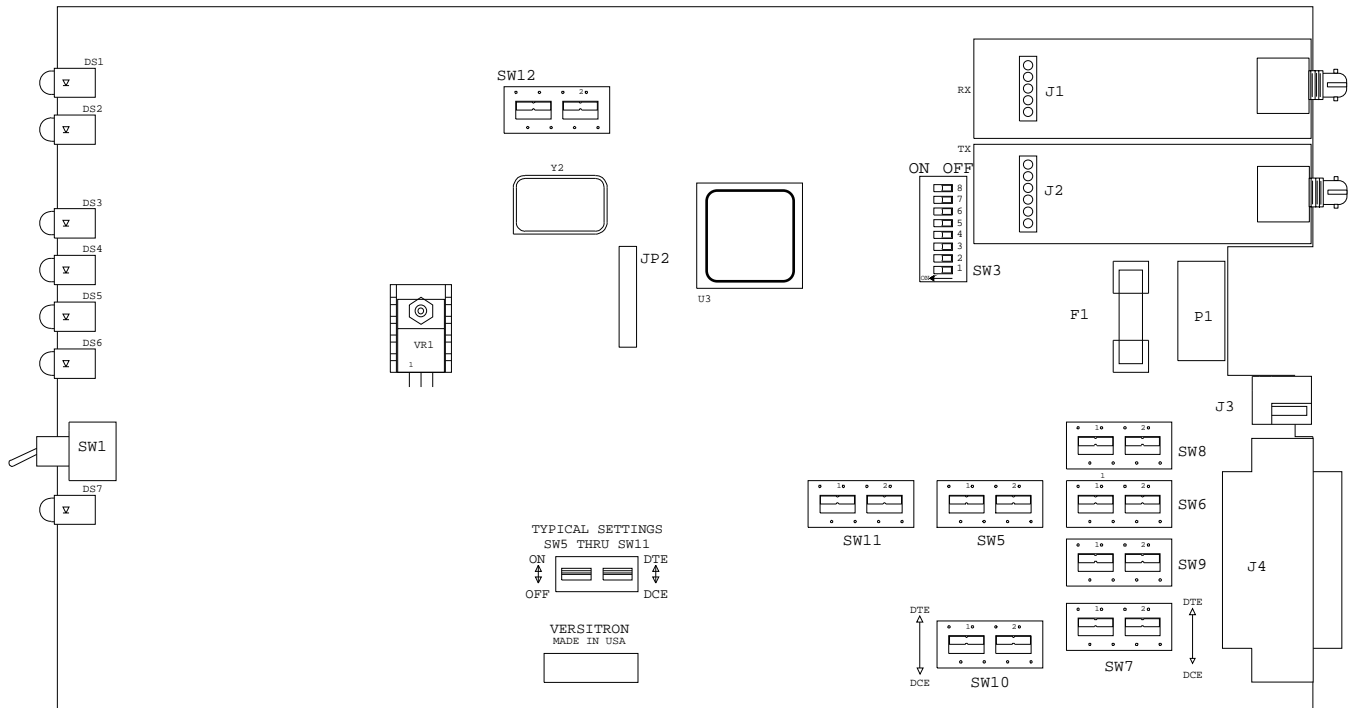


FIGURE 5. SWITCH SETTINGS

SW12 POSITION SETTINGS				
Switch Positions	DCE Terminal Timing	DCE Source Timing	DTE Terminal Timing	DTE Source Timing
1 and 2	OFF	OFF	OFF	ON

TABLE 2. TERMINAL AND SOURCE TIMING SWITCH SETTINGS

SWITCH	POSITION	ON	OFF	Description
1	Front Panel	X		Loopback enabled
1	Front Panel		X	Loopback function disabled
2	---	---	---	Does not exist on this modem
3	1	X		Circuits set for RS-232 DTE configuration
3	1		X	Circuits set for RS-232 DCE configuration
3	2	X		Interface set for RS-232 DCE
3	2		X	Interface set for RS-232 DTE
3	3	X		Sets to 180° phase inversion (MIL-STD-188C)
3	4 - 8		X	Set to OFF (Do not change)
4	---	---	---	Does not exist on this modem
5,6,7,8,9,10,11	1 - 2	X		Interface set for DTE
5,6,7,8,9,10,11	1 - 2		X	Interface set for DCE
12	1 - 2	---	---	Refer to Table 2 for instructions

TABLE 3. MODEL F280XA SWITCH SETTINGS

The Model F280XA FOM II Series Modem can operate in two different timing modes: Source Timing, and Terminal Timing. All timing modes are application specific and can be configured using Switch 12, Position 1 and 2 as listed in Table 2. As shown in Figure 5, Switch 12 (SW12), located to the left of the CPLD U3, and above a silver colour crystal Y2. The following sections describe the operation and associated required switch settings for each mode.

2.5.1 Source Timing

A realignment circuit is needed in the Source (external) Timing configuration to account for the inherent delays and jitter introduced by noise and asynchronous sampling at all frequencies. The realignment circuit is only used on the DTE units. A clock detection circuit checks for a clock signal on input pin 15 of the DB25 interface. If there are no clock signals on pin 15, no realignment takes place and data is output from the unit as it was received from the fiber-optic input. If there are clock signals present, the realignment circuit processes the data signal recovered from the fiber-optic receiver before it is output onto pins 2. In Source Timing mode, the F280XA modem supports transmitted and received data, transmitted and received clocks, and eight control signals. The unit shall transmit and receive balanced signals at a data rate between 20 Bps and 76.8 Kbps with a bit error rate of 1×10^{-9} . Refer to Table 2 for switch settings.

2.5.2 Terminal Timing

The Terminal (external) Timing mode is the basic mode of operation for the Model F280XA FOM II Series Modems. There is no circuit needed for data realignment. In Terminal Timing mode, the Model F280XA supports transmitted and received data, transmitted and received clocks, and eight control signals. Balanced signals, at a data rate from 20 Bps to 128 Kbps, are processed transparently by the modem, with a bit error rate of 1×10^{-9} . Refer to Table 2 for switch settings.

2.6 LOOPBACK

The Model F280XA has one loopback features. This loopback feature allows the user to test the fiber-optic circuitry of the unit, the fiber-optic circuitry of the unit at the receiving end, the copper circuitry of the unit, and the copper circuitry of the unit at the receiving end.

2.6.1 Fiber / Copper Loopback

This loopback feature of the Model F280XA allows the user to test the fiber-optic circuitry of the unit and the fiber-optic circuitry of the unit at the receiving end. The fiber-optic input and outputs are connected to a multiplexer. The multiplexer is controlled by the front-panel switch (SW1). When SW1 is **ON**, the multiplexer control bit goes high, the fiber-optic input data is looped to the fiber-optic output and sent back to the source. The copper signal enters the board through the interface circuitry to the multiplexer circuit. The signals get multiplexed, demultiplexed and transmitted back to their source. This is true for all data, clock, and control signals. If the fiber-optic output and input signals match, and the copper signals match, the optical and interface circuits of both units are working properly. When SW1 is **OFF**, the multiplexer control bit goes low, and the unit functions normally.

2.7 INITIAL CHECKOUT PROCEDURE

The Model F280XA FOM II Series products contain no power on/off switch. Once the unit is properly installed and power is applied it may be considered fully operational. The power indicator should remain on as long as power is supplied to the unit

Before beginning system operation the following items should be checked to verify proper installation:

1. Verify that the power plug is seated fully into the modem or the modem is seated firmly in the rack-mount enclosure.
2. Verify that the fiber-optic cable is crossed transmit to receive from unit one to unit two.
3. Verify that the alarm LED goes out when the signal is applied to the optical receiver of the F280XA.
4. Verify the switch settings for the circuit configuration (i.e. Source/Terminal timing).

If a malfunction is detected during the initial checkout procedure, refer to Chapter 5 for information on isolating the malfunction in the unit.

SECTION 3 OPERATION

3.1 INTRODUCTION

This chapter contains a description of the operating controls and indicators associated with the Model F280XA FOM II Series modems. Since the Model F280XA is designed for continuous and uninterrupted operation, there are no operating requirements. Once the Model F280XA is powered up it should remain in service as long as required.

3.2 STATUS INDICATORS/AUDIBLE ALARM

There are 7 indicators on the Model F280XA: power (PWR), alarm (ALM), transmit data (TXD), receive data (RXD), transmit clock (TXC), receive clock (RXC), and Loopback (LOOP). No audible alarm is available.

3.3 OPERATING CONTROLS

The only operating controls associated with the Model F280XA modems are those used to select between DTE/DCE, Source/Terminal timing selection, and the loopback functions. These selections are normally made only at the time of installation. Further changes are not required unless the system requirements change.

SECTION 4 THEORY OF OPERATION

4.1 INTRODUCTION

Basic operation of the Model F280XA is similar to a four-channel, full duplex multiplexer. The first channel is used for data. The next two channels are used for transmit and receive clock, while the fourth multiplexer channel is used for aggregated control signals. This technique provides full transparency for the link, even when both clocks originate at the modem. The modem supplies both transmit and receive clocks to the Model F280XA, which are transmitted through the link and applied directly to the terminal.

The interface control signals are processed in a similar manner. The Request to Send signal from the terminal is transmitted through the link and applied to the modem. When the modem responds with Clear to Send, it will be transmitted through the link and applied to the terminal. With this technique, the terminal will see the RTS/CTS delay established by the modem.

If a fully transparent synchronous link is not required, the clock and control paths may be used as additional asynchronous data paths. The transmit and receive clock inputs will handle data rates from 20 bps to 128 Kbps asynchronously; the control paths will handle data rates up to 9.6Kbps.

SECTION 5 MAINTENANCE AND TROUBLESHOOTING

5.1 INTRODUCTION

This chapter contains general information designed to isolate a malfunction in the Model F280XA to a replaceable unit. These units are not equipped with redundancy. Therefore, a failure in one of these units would interrupt service.

5.2 FAULT ISOLATION

The steps in Table 4 should be taken to check a non-operating modem.

STATUS INDICATOR	PROBABLE CAUSE	CORRECTIVE ACTION
POWER (PWR) LED is off.	No AC power.	Check that both ends of the Transformer are connected.
	Blown Fuse.	Replace with 250V 1A slo-blo fuse.
	Other power supply circuit problem.	Contact VERSITRON Customer Service for assistance.
LOSS of OPTICAL POWER (PWR) LED is on.	Incorrect optical signal level received at receiver input.	<ol style="list-style-type: none"> 1. Check that fiber-optic cable is properly connected to RX connector. 2. Check that the remote unit power is on and the TX fiber-optic connector is connected properly. 3. Measure the optical levels on both ends (if possible) in order to check the optical link. 4. Contact VERSITRON Customer Service for assistance.
DATA and CLOCK (TXD, RXD, TXC, RXC) LEDs are off or not responding as expected.	Switches in wrong position.	Check that the switch is set for the correct electrical interface.
	No input on the electrical interface connector.	Check that the interface connector is connected securely.
DATA AND CLOCK signal inverted.	Switches in wrong position.	Check that the switch is set for the correct electrical interface.
DATA signal inverted.	Inverted input on the electrical interface connector.	Check that the interface connector is wired per interface standard RS-232.

TABLE 4. NON-OPERATIONAL INDICATORS