



**F2238A and F2245A
Fiber-Optic
EIA-530/MIL-STD-188-114 Modem
Technical Manual**

Revision C

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1 DESCRIPTION OF EQUIPMENT

1.1 INTRODUCTION

This manual provides general and detailed information on the installation and operation of Model F2238A and F2245A FOM II Series RS-530 High-Speed Fiber Optic Modems. Section 1 contains a general description of the equipment. Section 2 contains installation instructions. Section 3 contains operating instructions. Section 4 provides the theory of operation. Section 5 contains maintenance and troubleshooting information. Figure 1 and Figure 2 show front and rear views of these modems.



Figure 1: Front View

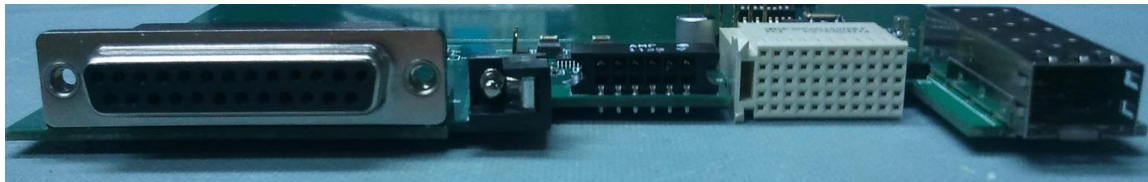


Figure 2: Rear View

1.2 DESCRIPTION OF EQUIPMENT

1.2.1 Functional Characteristics

Model F2238A and F2245A modems are high-speed modems that allow the full duplex transmission of data, clock and a control signal (data terminal ready (DTR), data set ready/data carrier detect (DSR/DCD)) over fiber optic cable. Table 4 shows the modem link configuration. The fiber circuit consists of two modems connected by two fiber optic strands with data rates and electrical signal characteristics that conform to EIA RS-530 and MIL-STD-188-114 balanced/unbalanced standards. The modems provide synchronous or asynchronous data

transmission at speeds up to 10 Mbps. The link is fully transparent in both directions and is data agile. The F2238A is for use with multi-mode fiber and utilizes an 850nm SFP fiber optic module with LC connectors. The F2245A is for use with single-mode fiber and utilizes a 1310nm SFP fiber optic module with LC connectors. Basically, model F2238A and F2245A modems operate as two channel multiplexers/modems. For high-speed synchronous operation the first channel is used for data and the second for transmit clock. The data channel may be used for data in low-speed, asynchronous operation at less than 100 Kbps.

1.2.2 Physical Characteristics

Model F2238A and F2245A modems measure 7 x 1 x 11 in. WxHxL (17.8 x 2.5 x 27.9 cm). They are designed to be mounted in VERSITRON's FOM II Series HF enclosures and chassis (see Table 1). Model HF-1 (single card) desktop enclosures are available for standalone applications. Standard 19" rack mountable options include models HF-2SS (2-slot) and HF-20A (20-slot) chassis. Each modem installed in models HF-1 or HF-2SS requires its own VAC to VDC power adapter. Each power adapter uses the one-pin connector on the back of the modem for power input. (Customer provided power may be supplied to the modem using the same one-pin connector.) When installed into the HF-20A chassis model AC300WR power supply is used to provide power to the chassis and to the modems. Power is provided from the AC300WR power supply to the HF-20A chassis via model HF-CA3 power interface cable where it is then distributed to *any* FOM II Series modem installed in the chassis. Power redundancy is included with the AC300WR power supply with two separate AC input cables provided for power input from separate VAC sources. The RS-530 copper interface is a female DB25 connector and is located on the back of the modem. The fiber optic interface, also located on the back of the modem, consists of an SFP cage which is populated with an SFP fiber optic module. Model F2238A and F2245A Modems have seven indicator LEDs (see Figure 1): power on (PWR), alarm indicator (ALM), transmit data present (TXD), receive data present (RXD), transmit clock present (TXC), receive clock present (RXC), and loop-back indicator (LOOP).

Table 1: Dimensions of Enclosures and Chassis

Model # (Part #)	Dimensions	Description	Power Supply Required* ¹
HF-1 (19052)	1.3" H x 7.1" W x 11.6" D (3.3 x 18.0 x 29.5 cm)	Single Card Desktop Enclosure	PSAC08 PSAC09 (LTWPD1220PLX) (LTWPD1220EPL)
HF2-SS (19629)	1.7" H x 19.0" W x 13.8" D (4.3 x 48.0 x 35.0 cm)	Dual Card Rack-Mount Chassis* ² (Side-by-Side)	PSAC08 PSAC09 (LTWPD1220PLX) (LTWPD1220EPL)
HF-20A (32406)	7.0" H x 19.0" W x 11.6" D (17.8 x 48.0 x 29.5 cm)	20 Card Rack-Mount Chassis	AC300WR (19320-03)

*¹ Note: US Model – PSAC08; European Model – PSAC09

*² Note: One Power Supply per Modem required.

1.3 Modem Specification:

1.3.1 General Specifications:

Models	F2238A and F2245A
Dimensions	(7" H x 7/8" W x 11" L) (17.8 x 2.1 x 27.9 cm)
Weight	0.28 kg (10.0 oz)
Operating Temperature	0° to 50°C (32° to 100°F)
Humidity	Up to 95% relative humidity (non-condensing)
Altitude	Up to 10,000 ft

1.3.2 Electrical Interface:

Models	F2238A and F2245A
Power Requirements	12VDC, 1.0Amp
Data Connector	DB25, 25-pin female
Data Signal	EIA 530/MIL-STD-188-114
Data Rate	56Kbps to 10Mbps, Synchronous 20bps to 100kbps, Asynchronous
DCE/DTE Options	Switch Selectable

1.3.3 Fiber-Optic Interface:

F2238A: multi-mode 850nm LC connectors, 2km.

F2245A: single-mode 1310nm LC connectors, 10km.

1.3.4 Major Features:

<ul style="list-style-type: none"> EIA-530/MIL-STD-188-114 balanced operation.

- Switch Selectable DCE or DTE operation.
- Compatible with F2238 and F2245 modems

2 INSTALLATION

2.1 GENERAL

This section contains detailed information on the installation and initial checkout of the F2238A and F2245A EIA-530 Modem. Section 2.2 contains general information on site selection and mounting. Section 2.3 contains the description for selecting different options on the Modem. Sections 2.4 and 2.5 contain detailed instructions for connecting Model F2238A and F2245A products to your system. Section 2.6 contains initial checkout procedures.

2.2 SITE SELECTION AND MOUNTING

The Model F2238A and F2245A products are designed to be used as an interface extender for EIA-530 and MIL-STD-188-114 standard protocols. When connecting the F2238A and F2245A to a DCE or DTE device, the copper and fiber-optic cable should be securely installed so as to prevent accidental disconnection. Care should be taken to ensure that the copper and fiber-optic cables are not mechanically separated from the Modem during operation. When installed in either desktop chassis or in the dual-card rack-mount chassis, space for the power transformer must also be provided.

2.3 SWITCH AND JUMPER SETTINGS

There are ten switches provided for configuration of selectable options. Switch locations are shown in Figure 3. Switch settings are as follows:

2.3.1 Modem Configuration Settings

Table 2: S1 Switch Settings

Position	On	Off
S1-1	DCE	DTE
S1-2	Force Clock (see S1-3 position)	Auto Clock
S1-3	Force Async operation or Forces Sync < 100kbps	Force Sync Clock
S1-4	Forced Sync < 100kbps	Normal setting
S1-5	Inverted Clock	Non-inverted Clock
S1-6	Inverted Data	Non-inverted Data
S1-7	Force DSR/DTR asserted	DSR/DTR Control Optic Link
S1-8		Factory setting*

** Note: Factory setting for the marked S1 positions as indicated by *. Do Not Change.*

Table 3: S2 to S9 Switch Settings

Position	On	Off
S2	DCE	DTE
S3	DCE	DTE
S4	DCE	DTE
S5	DCE	DTE
S6	DCE	DTE
S7	DCE	DTE
S8	DCE	DTE
S9	DCE	DTE

Note: All switches must be set to the same configuration. All 'ON' or all 'OFF'. On the switch the dot indicates the 'ON' position.

The switch SW10 is located on the front panel of the modem. This switch enables a local loop of all modem circuitry before the fiber-optic module when in the on position. The loop indicator will be illuminated when this switch is in the ON position. Note: The ALM indicator will be illuminated when the loop switch is enabled.

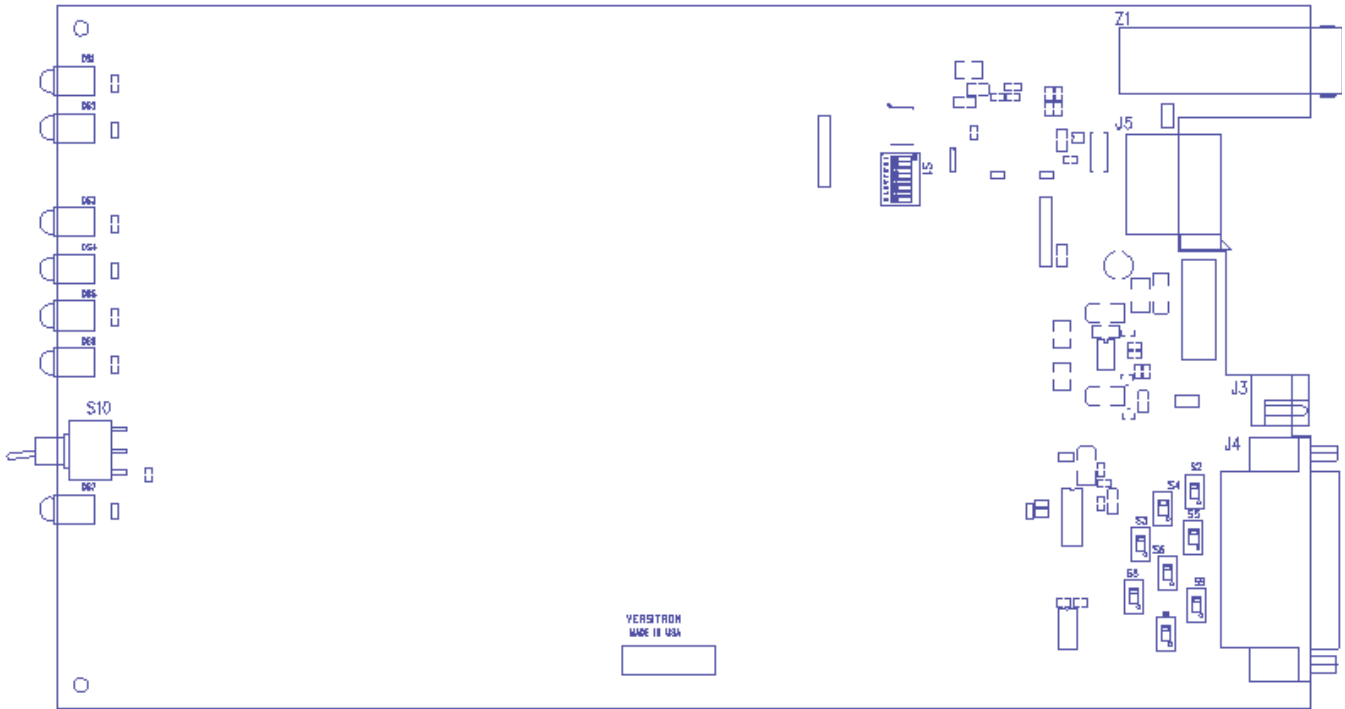


Figure 3: Switch and Connector Locations

2.4 POWER REQUIREMENTS

The F2238A and F2245A products are designed to operate from an AC power transformer or a DC power source in the range of +10 to +16 VDC.

2.4.1 Installation with AC Power

Before inserting the VERSITRON power transformer, PSAC08 (US) or PSAC09 (EUR), into an AC power source, the plug should be connected to the Modem. There are no special tools required.

2.4.2 Installation with DC Power

DC power may be used instead of a power transformer. This requires a 2.5 mm socket, J3

(location shown in Figure 3) with the positive voltage on the center and the common on the concentric supplying 12VDC at 1.0A as shown below (Figure 4):

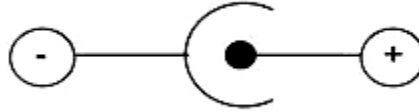
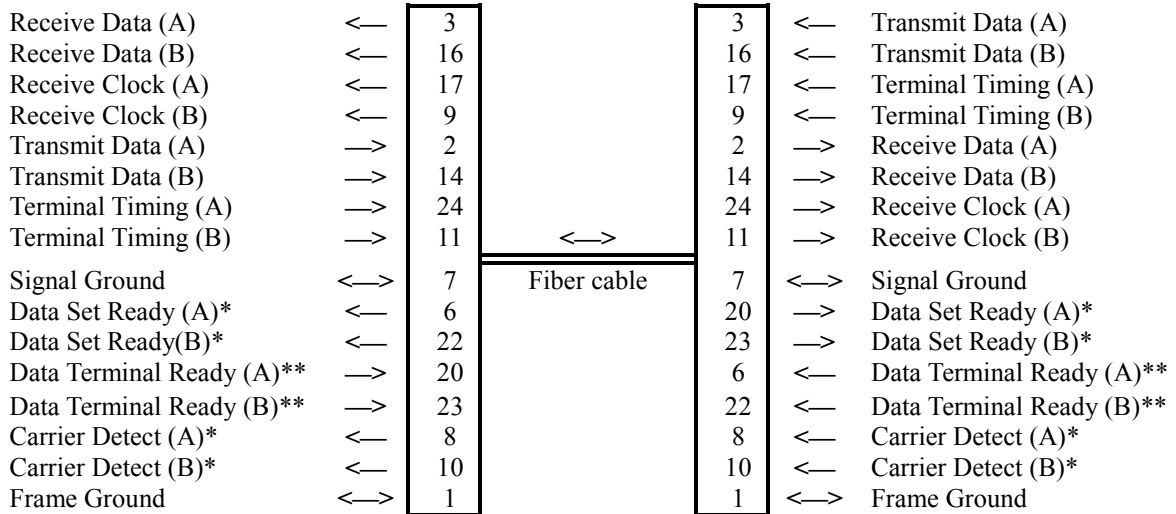


Figure 4: DC Power Supply Connection

2.5 INTERFACE WIRING

Table 4 and Table 5 list the interface wiring for the F2238A and F2245A Modems. A female DB25 connector is used as shown in Table 4. The modular connector (J3) is wired in parallel with the 12-pin connector (P1) for power. When installing the modem in a standalone or dual-card rack-mount chassis, a power transformer is plugged into modular jack (J3). When installing the F2238A and F2245A Modems in a 20-card rack-mount chassis (HF20A) with optional power supplies (AC300WR) the 12-pin connector (P1) is used. Wiring for the 12-pin connector is shown in Table 5. Illustration 3 identifies the locations for the 12-pin power connector (P1) and modular power jack (J3).

Table 4: F2238A and F2245A Data Interface



LOCAL MODEM

DCE

DTE

REMOTE MODEM

* Produced by local modem, not received from remote modem.

** Signal not physically passed, used to control signal flow through local modem.

Table 5: (P1) Chassis Power/Alarm Wiring

Pin Number	Signal Designation
1	+12 VDC
2	+12VDC
3	Signal Ground
4	Signal Ground
5	Signal Ground
6	Frame Ground (Chassis)
7	System Alarm Interface
8	Signal Ground
9	Signal Ground
10	+12 VDC
11	+12 VDC
12	+12 VDC

2.5.1 Fiber-Optic Cable Installation

After the electrical and digital interface cables have been wired according to sections 2.4

and 2.5 , make sure the SFP module is firmly seated into the SFP cage (Z1) and attach the fiber-optic cable to it (see Figure 3 for location of Z1). The SFP module slides into the RFI Cage label side up. There will be a slight click when it locks into place. After the SFP module is installed the fiber-optic cable can be installed. The cable must be an LC type connection. The cable should be oriented with the thumb tab at the top, when completely inserted the tabs will click into place.

2.6 INITIAL CHECKOUT PROCEDURE

F2238A and F2245A Modems contain no power on/off switch. Once power is connected the modem will go through its power-up sequence, when the Power LED (see Figure 1) is lit the modem is ready for use. Before beginning system operation check the following to verify proper installation:

1. Verify that the power plug is seated fully into the modem or the modem is seated fully in the rack-mount enclosure (HF20A).
2. Verify that the fiber cable is connected on each end.
3. Verify that the Alarm LED (see Figure 1) is not lit when the fiber-optic cable is connected and the units, both local and remote, are powered. DSR/DTR must be asserted or forced via S1-7.

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

3 OPERATION

3.1 INTRODUCTION

This chapter contains a description of the operating controls and indicators associated with the F2238A and F2245A Modems. Since the F2238A and F2245A are designed for continuous and uninterrupted operation, there are no setting requirements after the unit is operational. Once the Modem is powered up it should remain in service as long as required.

3.2 STATUS INDICATORS

There are 7 indicators on the F2238A and F2245A: Power Status(Power), Alarm, Transmit Data(TXD), Receive Data(RXD), Transmit Clock(TXC), Receive Clock(RXC), and Loop-back(LOOP) (see Table 6 for descriptions).

Table 6: Status Indicators

LEDs*	Color	Function
Power	Green	Indicates the modem is powered and ready for use.
Alarm	Red	Indicates no fiber-optic link with remote end when lit.
TXD	Yellow	Indicates transmit data
RXD	Yellow	Indicates receive data
TXC	Yellow	Indicates transmit clock
RXC	Yellow	Indicates receive clock.
Loop	Red	Indicates local loopback just before fiber-optic module

* See Figure 1 for LED mapping

4 THEORY OF OPERATION

4.1 INTRODUCTION

The F2238A and F2245A are EIA-530/MIL-STD-188-114 standard modems which can be configured as either Data Communications Equipment (DCE) or Data Terminal Equipment (DTE). These modems are designed to be used in pairs as a transparent interface extension over a fiber-optic link. These units are housed in VERSITRON FOM II chassis: HF1, HF2SS and HF20A. Chassis descriptions are found in section 1.2.2 .

4.2 POWER SUPPLY AND ALARM CIRCUITRY

4.2.1 Power Supply Circuit

When 12VDC is applied to the circuit, the unit should draw approximately 100mA. The unit has a switching power supply circuit, which converts 12V to 3.3VDC, and 1.2VDC. .

4.2.2 Alarm Circuit

This unit does not have an alarm circuit. Therefore, the Alarm signal on the AC300WR will not be driven by this unit.

4.3 FUNCTIONAL DESCRIPTION

The unit consists of the following circuits:

4.3.1 - Logic Conversion

4.3.2 - FPGA (Mux/Demux)

4.3.3 - Fiber-Optic Transceiver Circuit

4.3.1 Logic Conversion

There is a transceiver chipset that converts the EIA-530 interface signals to logic level signals for processing and transmission over the fiber-optic link.

4.3.2 FPGA (Mux/Demux)

The FPGA is used to multiplex/demultiplex the RS interface signals from the chipset for transmission over the fiber-optic link. The FPGA is a proprietary VERSITRON design that provides serial conversion and synchronization of the EIA-530 interface signals on the fiber-optic link.

4.3.3 Fiber-Optic Transceiver Circuit

Fiber-optic communications are handled by the SFP module. The power for this module is isolated from the other power circuits through filters. This helps reduce the supply noise being coupled into the SFP module. The SFP interfaces directly with the FPGA.

5 MAINTENANCE AND TROUBLESHOOTING

5.1 INTRODUCTION

This chapter contains general information designed to isolate a malfunction in the Models F2238A and F2245A to a replaceable unit. These units are not equipped with redundancy. Therefore, a failure in one of these units will interrupt service.

5.2 FAULT ISOLATION

The steps in Table 7 should be taken to check a non-operating modem. Contact VERSITRON Customer Service for additional diagnostic assistance or to arrange for repair as necessary.

Table 7: Non-Operational Indicators

STATUS INDICATOR	PROBABLE CAUSE	CORRECTIVE ACTION
Power LED is OFF	No AC power	Check that both ends of the transformer are connected
	Other	Contact VERSITRON for assistance
Alarm LED is ON	Incorrect optical signal level received at receiver input	<ol style="list-style-type: none"> 1. Check that fiber-optic cables are properly connected 2. Check that the remote unit power is on and the fiber-optic connectors are properly attached 3. Check that the SFP module on each end is seated properly 4. Contact VERSITRON for assistance
Modem is not working properly	Default switch settings are not set properly	<ol style="list-style-type: none"> 1. Check if S1 positions are set properly 2. Check if S2-S9 are set properly 3. Contact VERSITRON for assistance