

**F220x / F224x
FOM II Series
Dual Channel Isolator
Technical Manual**

Rev B

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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 F220x / F224x FOM II Series Dual Channel Isolators. 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 is an overall view of the modem.

Model Number	Part Number	Description
F2202	30243-02	Dual Channel (1 data, 1 contact closure) transmitter, 850nm, ST optics, simplex, multimode, distances to 2km*, 250bps – 10Mbps (Balanced), 250bps – 100Kbps (Unbalanced).
F2204	30243-04	Dual Channel (1 data, 1 contact closure) transmitter, 1300nm, ST optics, simplex, multimode, distances to 6km*, 250bps – 10Mbps (Balanced), 250bps – 100Kbps (Unbalanced).
F2205	30243-05	Dual Channel (1 data, 1 contact closure) transmitter, 1300nm, ST optics, simplex, single mode, distances to 15km*, 250bps – 10Mbps (Balanced), 250bps – 100Kbps (Unbalanced).
F2242	30243-14	Dual Channel (1 data, 1 contact closure) transmitter, 850nm, ST optics, simplex, multimode, distances to 2km*, 250bps – 10Mbps (Balanced), 250bps – 100Kbps (Unbalanced).
F2244	30243-16	Dual Channel (1 data, 1 contact closure) transmitter, 1300nm, ST optics, simplex, multimode, distances to 6km*, 250bps – 10Mbps (Balanced), 250bps – 100Kbps (Unbalanced).
F2245-I	30243-17	Dual Channel (1 data, 1 contact closure) transmitter, 1300nm, ST optics, simplex, single mode, distances to 15km*, 250bps – 10Mbps (Balanced), 250bps – 100Kbps (Unbalanced).

* Note: Multimode tests performed @ 100Kbps on 62.5/125µm fiber optic cable.

Single mode tests performed @ 100Kbps on 10/125µm fiber optic cable.

1.2 DESCRIPTION OF EQUIPMENT

1.2.1 Functional Characteristics

Model F220x / F224x Isolators are fiber optic transmitters and receivers designed to allow for simplex information channels over a pair of fiber optic cables. Using both channels the unit may be configured as one data or clock channel plus one contact closure channel may be isolated and extended transparently. Model F220x / F224x Isolators use fiber optic cable up to 2km (1.25mi/6,560ft) for 850nm multimode optics, up to 6km (3.75mi/19,800ft) for 1300nm multimode optics, or up to 15km (9.375mi/49,500ft) for 1300nm single mode optics. The link is fully transparent and data agile from 250bps to 10Mbps (Balanced), 250bps – 100Kbps (Unbalanced). Model F220x / F224x Isolators fully support the interface control signals associated with the EIA RS-232, RS-449, RS-530, MIL-STD-188-114 Balanced/Unbalanced, TTL and NRZ standards.

1.2.2 Physical Characteristics

Model F220x / F224x Isolators measure 7.0W x 0.84H x 11.6L in. (17.8 x 2.1 x 28.9 cm) and are designed for mounting in a variety of VERSITRON enclosures and chassis (see Table 1). Standalone options include enclosure Models HF-1 (single card) and HF-2 (dual card). Rack mount options for standard 19" racks include chassis Models HF-2SS (2-slot) and HF-20 (20-slot). Each Isolator installed in a HF-1, HF-2 or HF-2SS requires a power adapter Model PSAC08 (US) or PSAC09 (European) providing 12VDC, 1A with a one-pin connector for electrical input on the back of the card. There is a female DB25 connector for the digital interface and two ST connectors for the fiber optic interface, also on the back of the card. Isolators installed in a HF-20 require a Model AC150W Power Supply / System Monitor. Note that a Model AC150W utilizes two slots of the Model HF-20 chassis. Also, two power supplies are recommended for redundancy. Model F220x Transmitters have four LED indicators on the front panel: DC power on (PWR), loss of signal (ALM), transmit Ch. 1 data present (TXC1), and transmit Ch. 2 data present (TXC2). Model F224x Receivers have four LED indicators on the front panel: DC power on (PWR), loss of signal (ALM), receive data present (RX), and contact closure active (RSYNC). No audible alarm is available.

Model # (Part #)	Dimensions	Description	Power Supply Required*¹
HF-1 (19052)	1.3" H x 7.1" W x 11.6" D	Single Card Standalone Enclosure	PSAC08 PSAC09 (LTWPD1210PLX) (LTWPD1210EPL)
HF-2*² (19053)	2.3" H x 7.1" W x 11.6" D	Dual Card Standalone Enclosure	PSAC08 PSAC09 (LTWPD1210PLX) (LTWPD1210EPL)
HF-2SS*² (19629)	1.7" H x 19.0" W x 13.8" D	2-Slot Rack Mount Chassis	PSAC08 PSAC09 (LTWPD1210PLX) (LTWPD1210EPL)
HF-20 (19032)	7.0" H x 19.0" W x 11.6" D	20-Slot Rack Mount Chassis	AC150W (19320-03)

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

*² Note: One Power Adapter per Isolator required.

TABLE 1. ENCLOSURES / CHASSIS

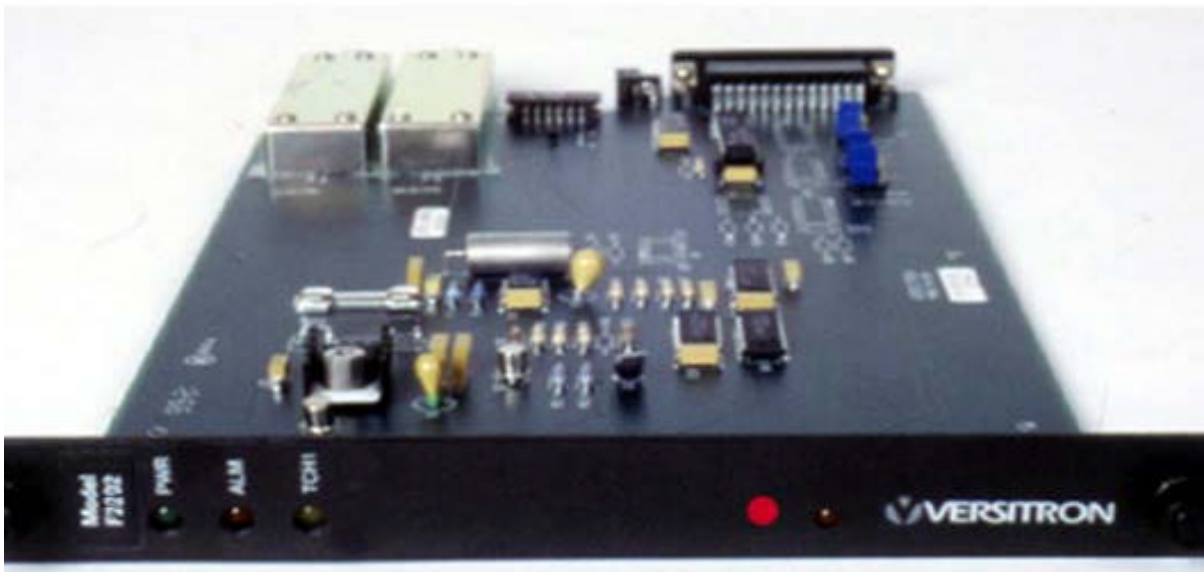


FIGURE 1. OVERALL VIEW, MODEL F220x ISOLATOR

1.3 SPECIFICATIONS

Data Rate: Any data rate from 250bps - 10Mbps (Balanced), from 250bps - 100Kbps (Unbalanced).

Operation: Dual channel simplex over a fiber optic cable pair.

Optical Interface: ST connectors.

Digital Interface: Signal levels and format conform to EIA RS-232, RS-449, RS-530, MIL-STD-188-114 Balanced/Unbalanced, TTL and NRZ standards.

Electrical Interface: DB25 Female.

Bit Error Rate: Better than 10^{-9} .

Dimensions: 7.0W x 0.9H x 12.2D in. (17.8 x 2.3 x 31.0 cm).

Weight: 12.0 oz (0.34 kg).

Power Requirements: HF-1, HF-2, or HF-2SS Installation: VAC source with optional power adapter (PSAC08 (US) or PSAC09 (European) providing 12 VDC, 1A). HF-20 Installation: Model AC150W Power Supply / System Monitor (110/250 VAC, $\pm 10\%$; 47-63 Hz (auto-selecting)).

Environment: 0° to $+50^{\circ}\text{C}$ (32° to $+122^{\circ}\text{F}$) operating temperature; up to 95% relative humidity (non-condensing); up to 10,000 feet altitude; storage temperature -40° to $+70^{\circ}\text{C}$.

Model	F2202 / F2242	F2204 / F2244	F2205 / F2245-I
Connector	ST	ST	ST
Wavelength	Multimode 850nm	Multimode 1300nm	Single Mode 1300nm
Link Budget*	20 ± 1 dB	21 ± 1 dB	21 ± 1 dB
Maximum Range	2km / 1.25mi / 6,560ft	6km / 3.75mi / 19,800ft	15km / 9.375mi / 49,500ft
Fiber Optic Cable	50/125, 62.5/125, 100/140	50/125, 62.5/125, 100/140	8/125, 9/125, 10/125

*Note: Multimode tests were performed on 62.5/125 μM fiber optic cable @ 2Kbps.

Single Mode tests were performed on 10/125 μM fiber optic cable @ 2Kbps.

SECTION 2 INSTALLATION

2.1 GENERAL

This section contains detailed information on the installation and initial checkout of the Model F220x / F224x Isolators. Paragraph 2.2 contains general information on site selection and rack mounting. Paragraph 2.3 contains instructions for connecting a Model F220x / F224x Isolator to your system and selecting the different options. Paragraph 2.4 contains initial checkout procedures.

2.2 SITE SELECTION AND MOUNTING

Model F220x / F224x Isolators are designed to connect directly to the serial port (DB25 Connector) with a customer-supplied cable. Installation options include standalone enclosure Models HF-1 (single card) or HF-2 (dual card) and rack mountable chassis Models HF-2SS (2-slot) and HF-20 (20-slot).

2.2.1 Signal Interface

Table 4 lists the signal interface pinout for the F220x Transmitters and Table 5 lists the signal interface pinout for the F224x Receivers. Both Isolators have a DB25 Female connector.

2.2.2 User Selected Options

Several jumpers are provided on the Model F220x / F224x Isolators. Both may be set for unbalanced or balanced signals in/out. They may be set differently, so that the Isolator pair becomes an interface converter. The Model F224x Receivers additionally can be set for a 0° or 180° phase shift of the output data. Another jumper (JP2) on the Model F220x Transmitters selects between the front-panel push-button and Pin 6 of the DB25 interface as the activation of the contact closure function. Tables 2 and 3 provide lists of all options available via jumper settings.

2.3 POWER REQUIREMENTS

The Model F220x Isolators operate from an AC power source and a power adapter or a DC power source with a DC voltage of +12 VDC, 1A. The power adapters used when installed in a Model HF-1 or HF-2 enclosure, or in a Model HF-2SS chassis are Model PSAC08 (US) or Model PSAC09 (European) providing 12VDC, 1A. Connect the power adapter to the Isolator before inserting its plug into an AC power source. No special tools are required. DC power may be used instead of an AC power adapter, if available. This requires a 2.5mm socket with positive on the center and common on the concentric. When installed in a Model HF-20 chassis, a Model AC150W Power Supply / System Monitor supplies power to all FOM II series circuit cards installed in the HF-20 chassis. Note that a Model AC150W utilizes two slots in a Model HF-20 chassis. For power redundancy, two Model AC150W units are recommended.

2.4 INITIAL CHECKOUT PROCEDURE

Model F220x Isolators contain no power on/off switch. Once you install and apply power to the unit, it is fully operational. The power indicator should remain on as long as power is supplied to the unit.

To ensure proper operation, before beginning system operation verify:

1. Power plugs are seated fully into the Isolator or if in a Model HF-20 chassis, the Isolator is seated firmly in the chassis.
2. Fiber optic cables are connected from transmit channel 1 or 2 to receive channel 1 or 2, respectively, from unit one to unit two.
3. Alarm LED goes out when a signal is applied to the Model F220x Isolator DB25 interface.
4. Alarm LED on the Model F224x goes out when a signal is applied to the Model F220x Isolator DB25 interface and fiber is connected between the two units.

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

	1-2	2-3
JP2	Resync Pushbutton ON	Resync via pin 6 Input
JP3	TX Data Balanced Input	TX Data Unbalanced Input
JP5	Factory set for Resync	Not Used
J1-JP1* ¹	180° Phase Shift TX Data	0° Phase Shift TX Data
J2-JP1* ¹	Not Used	Factory set for Resync

*¹ These jumpers are on the daughterboards within the optic modules and are factory set for non-inverted signals (0° phase shift).

TABLE 2. JUMPER SETTINGS, MODEL F220x TRANSMITTER

	1-2	2-3
JP1	0° Phase Shift Data Output	180° Phase Shift Data Output
JP4	Factory set for Resync	Not Used
JP8	RX Data Balanced Output	RX Data Unbalanced Output

TABLE 3. JUMPER SETTINGS, MODEL F224x RECEIVER

F220x	
DB25F Pin	Signal Function
1	Frame Ground
2	Not Used
3	Not Used
4	Not Used
5	Not Used
6*	Resync Active or Off
7	Signal Ground
8	Not Used
9	Not Used
10	Frame Ground
11	Not Used
12	Balanced Data Input +
13	Frame Ground
14	Not Used
15	Balanced Data Input -
16	Not Used
17	Not Used
18	Not Used
19	Not Used
20	Unbalanced Data Input
21	Frame Ground
22	Not Used
23	Not Used
24	Frame Ground
25	Not Used

Table 4

F224x	
DB25F Pin	Signal Function
1	Frame Ground
2	Not Used
3**	Resync Output Open
4**	Resync Output Common
5**	Resync Output Closed
6	Not Used
7	Signal Ground
8	Not Used
9	Not Used
10	Frame Ground
11	Not Used
12	Balanced Data Output +
13	Frame Ground
14	Not Used
15	Balanced Data Output -
16	Not Used
17	Not Used
18	Not Used
19	Not Used
20	Unbalanced Data Output
21	Frame Ground
22	Not Used
23	Not Used
24	Frame Ground
25	Not Used

Table 5

* The contact closure function is activated via Pin 6 of the Model F220x Transmitter or by the front-panel RESYNC push-button. When Pin 6 is grounded, the Resync signal is transmitted (active). If Pin 6 is +5V or floating, Resync is OFF and no signal is transmitted by the Model F220x Transmitter. Jumper JP2 on the circuit board allows the user to choose between Pin 6 and the front-panel push-button. With JP2 set in the 1-2 position, the Resync push-button is ON. With JP2 set in the 2-3 position, the Resync push-button is OFF and contact closure is via Pin 6 of the DB25.

** The contact closure control output comes via Pins 3, 4 and 5 of the Model F224x Receiver DB25 interface. The contact closure device may be wired to Pins 3 & 4 ("normally OPEN") or Pins 4 & 5 ("normally CLOSED").

DB25F CONNECTOR PIN ALLOCATIONS

SECTION 3 OPERATION

3.1 INTRODUCTION

This chapter contains a description of the operating controls and indicators associated with the Model F220x / F224x Isolators. Since the isolators are designed for continuous and uninterrupted operation, there are no operating requirements.

3.2 STATUS INDICATORS/AUDIBLE ALARM

There are four LED status indicators on the Model F220x Transmitter: DC power ON (PWR), Alarm (loss of signal) (ALM), Transmit (TX), and Resync. There are also four status indicators on the Model F224x Receiver: DC power ON (PWR), Alarm (loss of signal) (ALM), Receive Ch. 1 (RXC1), and Receive Ch. 2 (RXC2). No audible alarm is available.

3.3 OPERATING CONTROLS

The only operating controls associated with the Isolators are the front-panel push-button on the F220x Transmitters and those jumpers on the circuit card used to select between unbalanced and balanced, phase-shifted and non-phase-shifted signals. Settings of the jumpers, as described in Tables 2 and 3 of the previous section, permit the input and output of signal levels meeting EIA RS-232, EIA RS-422, EIA RS-423, MIL-STD-188-114 balanced or unbalanced, TTL, and/or NRZ standards. The selection of jumpers is normally done during installation, and therefore the standard transmission and reception of data across the fiber optic path require no operator intervention. The front-panel push-button on the Model F220x Transmitter provides initiation of the contact closure, or resynchronization provided jumper JP2 is set to position 1-2. Otherwise the contact closure may be activated remotely using Pin 6 of the Model F220x Transmitter DB25 interface.

After installation, further changes are typically not required unless the system requirements change.

SECTION 4 THEORY OF OPERATION

4.1 INTRODUCTION

Model F220x / F224x Isolators are capable of transmitting and receiving one simplex signal at a data rate of 250bps to 10Mbps, plus one contact closure (resynchronization) signal. Balanced or unbalanced data signals may be isolated and converted from one to the other, with full transparency for the links.

4.2 DUAL CHANNEL TRANSMITTER F220x

The Model F220x Transmitter provides two dedicated simplex channels. The first channel handles a digital clock or data signal. The user has the option of inputting a balanced signal as specified in the EIA-RS-422 or MIL-STD-188-114 balanced digital interface specification, or an unbalanced signal as per EIA-RS-423, MIL-STD-188-114, RS-232 or MIL-STD-188C specifications. The circuit board contains separate device drivers, user selectable by jumpers as described in Section 2, for both signal types. The second simplex channel transmits a contact closure control signal, input from the front-panel push-button or from the DB25 interface. Both unbalanced and balanced data plus contact closure inputs are converted to TTL (+5V or Ground) prior to input to the optic modules. The optic modules convert the TTL digital data stream to light and provide the connection to the fiber optic cable.

4.3 DUAL CHANNEL RECEIVER F224x

The Model F224x Receiver provides the inverse process of the F220x Transmitter. Light signals are received by two optic modules. Isolation is maintained between the two channels as well as between electrical interfaces by the two independent optical paths. Like the Transmitter circuit, the Receiver circuit contains user-selectable options for a balanced or unbalanced data signal on Channel 1 of the Receiver. Setting the F224x Receiver jumpers the same as the F220x Transmitter enables a "transparent" path from the input to the transmitter to the output of the receiver. However, signal translation from balanced to unbalanced or vice versa, as well as a phase inversion (EIA-to-MIL-STD), is also possible. The second channel of the F224x Receiver provides the contact closure signal. As described in the footnote to Table 5, the contact closure Normally-OPEN / Normally- CLOSED output connections are provided.

4.4 POWER SUPPLY AND ALARM CIRCUITRY

The power supply used for the F220x and F224x Isolators utilizes a regulated +12VDC from a Model HF-20 chassis or an unregulated +12VDC from Model PSAC08 (US) or PSAC09 (European) power adapter. The source power is directed through a slo-blo fuse, filtered and re-regulated to furnish +5V and - 5V supplies throughout the circuit board. If either the +5V or -5V supplies fail, or if the +12V supply is not working, an alarm condition occurs. Standard FOM II alarm circuitry monitors both channels in addition to the power supplies. LED indicators are triggered on the circuit board and on the Model AC150W power supply by the alarm circuitry.

SECTION 5 MAINTENANCE AND TROUBLESHOOTING

5.1 INTRODUCTION

This chapter contains general information designed to isolate a malfunction in the Model F220x / F224x Isolator 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

Steps in Table 6 should be taken to troubleshoot a non-operating modem. Contact VERSITRON Customer Service for diagnostic assistance or to arrange for repair.

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 .5A slo-blo fuse.
	Other power supply circuit problem.	Contact VERSITRON Customer Service for assistance.
ALARM (ALM) 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 to connectors. 2. Check that the remote unit power is on and the fiber optic connectors are properly attached. 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 (TXC1, RXC1, TXC2, RXC2) LEDs are OFF.	Jumpers in wrong position.	Check that the jumpers are set for the correct electrical interface.
	No input on the electrical interface connector.	Check that the interface connector is connected securely.
DATA signal inverted.	Jumpers in wrong position.	Check that the jumpers are set for the correct electrical interface.
	Inverted input on the electrical interface connector.	Check that the interface connector is wired per intended interface standard.

TABLE 6. NON-OPERATIONAL INDICATORS