ORDERING

FOM-4SF/$/+

Sync/async single fiber modem

$ Specify DTE interface type:
- **V24** for V.24 interface, female connector
- **V35** for V.35 interface, female connector
- **X.21** for X.21 interface, female connector
- **530** for RS-530 interface, female connector
- **E1B** for E1 (2048 kbps) balanced interface
- **E1U** for E1 (2048 kbps) unbalanced interface
- **T1** for T1 (1544 kbps) interface

+ Specify fiber optic interface type:
- **85ST** for 850 nm multimode, ST connector
- **85FC** for 850 nm multimode, FC connector
- **85SC** for 850 nm multimode, SC connector
- **13ST** for 1300 nm single mode, ST connector
- **13FC** for 1300 nm single mode, FC connector
- **13SC** for 1300 nm single mode, SC connector

P/S-AC/5/1200

5 VDC / 110 to 220 VAC, 1200 mA power supply

P/S-AC/5/1200/GND

5 VDC / 110 to 220 VAC, 1200 mA power supply for FOM-4SF with balanced E1 or T1 interface

4SF-PS-FERRITE

5 VDC / 110 to 220 VAC, 1200 mA power supply for FOM-4SF with X.21 or RS-530 interface

RAD

data communications

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318-100-01/01

Specifications are subject to change without prior notice.

FOM-4SF

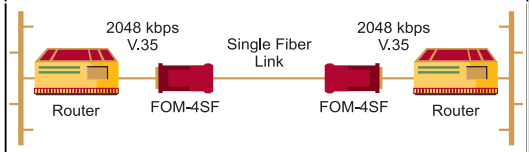
RAD

Sync/Async Single Fiber Modem

FEATURES

- Miniature sync/async modem supporting half or full duplex transmission over single fiber cable
- Data rates up to 2048 kbps or E1/T1 (synchronous) or up to 115.2 kbps (asynchronous)
- V.24, RS-530, V.35, X.21, E1 or T1 DTE interface options
- 850 nm or 1300 nm LEDs on the link
- Internal, external or receive clock for serial DTE interfaces, and transparent timing for E1/T1
- Local and remote V.54 diagnostic loopbacks
- LED status indicators
- Protection against reverse polarity
- Operates with external power supply

APPLICATION



DESCRIPTION

- FOM-4SF, miniature sync/async single fiber modem, transmits and receives data over a single fiber cable.
- The modem operates either in synchronous or asynchronous mode, and supports both half and full duplex communication.
- Transmission rates are as follows:
  - Asynchronous: up to 115.2 kbps
  - Synchronous: 64, 128, 256, 512, 1024 2048 kbps (serial or E1), or T1 (1544 kbps)
- FOM-4SF is available with the following DTE interfaces:
  - V.24
  - RS-530
  - V.35
  - X.21
  - E1 balanced or unbalanced
  - T1.
- FOM-4SF is available with either 850 nm LED for multimode transmission up to 3 km (1.9 miles), or 1300 nm LED for single mode transmission up to 25 km (15.5 miles).
- For V.35, V.24, RS-530 and X.21 interfaces operating in synchronous mode, transmit timing can be provided by three alternative sources:
  - Internal oscillator
  - External clock
  - Loopback clock derived from the receive signal.

- The E1 interface utilizes HDB3 line coding. The T1 interface utilizes B8ZS line coding.
- FOM-4SF performs diagnostic loopbacks in compliance with ITU V.54 standard. Two V.54 loopbacks are available: local loopback and remote loopback. These loopbacks are activated either by a DIP switch or via the corresponding DTE interface pins. The loopbacks can be activated separately or simultaneously.
- FOM-4SF incorporates all the advantages of a fiber optic system:
  - Lower attenuation than with copper wires; attenuation is not related to frequency
  - EMI/RFI immunity which saves the cost of expensive and heavy shielding and complex error checking routines
  - High data security: risk of eavesdropping is minimized as fibers radiate negligible power; cost of data encryption is reduced
  - Safety and electrical isolation: no spark hazard and no ground-loop noise problems.
- LED indicators enable status monitoring on the electrical and optical links.
- FOM-4SF operates with 5V/400 mA external power supply

SPECIFICATIONS

FIBER OPTIC INTERFACE

- **Transmission Mode**
  - Multimode: 850 nm over 62.5µ/125 fiber optic cable
  - Single mode: 1300 nm over 9µ/125 fiber optic cable
- **Optical Output Levels**
  -14 dBm
- **Receiver Sensitivity**
  -26 dBm for 1300 nm LED
  -28 dBm for 850 nm LED
- **Operating Range**
  - Up to 3 km (1.9 miles) over 850 nm LED with attenuation of 3.5 dB/km 62.5µ/125 fiber optic cable
  - Up to 21 km (15.5 miles) over 1300 nm LED with attenuation of 0.5 dB/km, 9µ/125 fiber optic cable
- **Optical Interface**
  ST, FC and SC (see *Ordering*)
- **Latency**
  0.68 msec, minimum

DTE INTERFACE

- **Data Rates**
  - Asynchronous: up to 115.2 kbps
  - Synchronous: 64, 128, 256, 512, 1024 2048 kbps (serial or E1), or T1 (1544 kbps)
- **Data Format (Async Mode)**
  8, 9, 10, or 11 bits, including 1 start bit and 1 stop bit, with odd or even parity
- **Type**
  - RS-530, V.24: DB-25 female connector
  - V.35: provided via an adapter cable, terminated with a DB-25 connector on one end and a V.35 male or female physical connector on the other end
  - X.21: provided via an adapter cable terminated with a DB-25 connector on one end, and an X.21 15-pin connector on the other end
  - E1: RJ-45, balanced or two BNC coax, unbalanced
  - T1: RJ-45, balanced (see *Ordering*)
- **E1/T1 Standard**
  - E1 unframed, HDB3 coding
  - T1 unframed, B8Z3 coding

GENERAL

- **LED Indicators**

V.24, V.35, RS-530 and X.21:

PWR	– Power
TST	– Test
ELECTRICAL RX	– Electrical Receive
ELECTRICAL TX	– Electrical Transmit
OPTICAL LOS	– Optical Loss of Signal

E1 and T1:

PWR	– Power
TST	– Test
ELECTRICAL AIS	– Electrical Alarm Indication Signal
ELECTRICAL LOS	– Electrical Loss of Signal
OPTICAL AIS	– Optical Alarm Indication Signal
OPTICAL LOS	– Optical Loss of Signal

- **Timing**
  V.35, V.24, RS-530 and X.21:
  - Internal
  - External
  - Receive

  E1 and T1:
  - Transparent
- **Power**
  External 5V/400 mA power supply.

  Follow these guidelines to comply with electromagnetic requirements:
  - For FOM-4SF with balanced E1 or T1 interface, use an external power supply with signal ground connected to chassis ground (see *Ordering*).
  - For FOM-4SF with RS-530 or X.21 interface, install a ferrite core (Steward type 28A2025-0A2 or equivalent) on the cable, connecting the power supply to the modem, or order RAD's power supply with the ferrite core already installed (see *Ordering*).
- **Physical**
  Length: 100 mm / 3.9 in
  Height: 23 mm / 0.9 in
  Width: 53 mm / 2.1 in
  Weight: 140g / 4.9 oz
- **Environment**
  Temperature: 0–50°C / 32–122°F
  Humidity: Up to 90%, non-condensing

Declaration of Conformity

Mfr. Name: RAD Data Communications Ltd.
Mfr. Address: 24 Raoul Wallenberg St.
Tel Aviv 69719
Israel

declares that the product:

Product Name: FOM-4SF

Conforms to the following standard(s) or other normative document(s):

EMC: EN 55022 (1994): Limits and methods of measurement of radio disturbance characteristics of information technology equipment.
EN 50082-1 (1992): Electromagnetic compatibility – Generic immunity standards for residential, commercial and light industry.

SAFETY: EN 60950/A4 (1996): Safety of information technology equipment, including electrical business equipment.

Supplementary Information:
The product herewith complies with the requirements of the EMC Directive 89/336/EEC and the Low Voltage Directive 73/23/EEC. The product was tested in a typical configuration.

Tel Aviv, November 26th, 2000

Haim Karshen
VP Quality

European Contact: RAD Data Communications GmbH, Berner Strasse 77, 60437 Frankfurt am Main, Germany

Safety Instructions

The exclamation point within a triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

IMPORTANT

North American Users

FOM-4SF is powered by an external power supply. To reduce the risk of electric shock, fire and injury to persons, use only with a UL listed or CSA certified Class 2 power supply rated 5 VDC, 400 mA.

Instructions de Sécurité

IMPORTANT

Utilisateurs Au Canada

Le FOM-4SF est renforcé par un transformateur extérieur. Afin de réduire le risque d'électrocution, d'incendie ou de blessure, utiliser seulement avec un transformateur 5 VDC, 400 mA certifié Class 2 CSA ou repris sur la liste UL.

CAUTION

European Users

To reduce the risk of electric shock and fire, use only with a power supply which is approved according to EN 60950.

ACHTUNG

Installation – Bedieningsanleitung

Um das Risiko eines elektrischenSchlages oder Brandes so weit wie möglich zu vermeiden, verwenden Sie nur ein Netzteil, das gemäß der neuesten Version des Standards EN 60950 zugelassen ist.

INSTALLATION

Caution. *Be careful when setting jumpers or performing any actions within the product so that you do not bend or break any components.*

Use an insulated tool to change switch settings.

Installation of FOM-4SF is simple and straightforward. Follow these instructions:

1. Open the plastic case by pressing on the points indicated on the sides.
2. Configure FOM-4SF, using the DIP switches located on the modem's board (see *Figure 1, Figure 2* and *Table 1*):
   - Select the data rate.
   - Select the timing reference.
   - When working with E1 or T1 interface, enable the AIS option.
     In this case, FOM-4SF operates as follows:
     - If an electrical LOS occurs, an AIS signal is transmitted toward the remote modem.
     - If an optical LOS occurs, an AIS signal is transmitted toward the DTE.

Note: *The AIS setting of the two modems working opposite each other must be the same.*

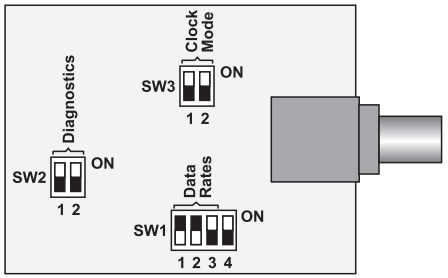


Figure 1. DIP Switch Locations (FOM-4SF with V.24, RS-530, V.35 or X.21 Interface)

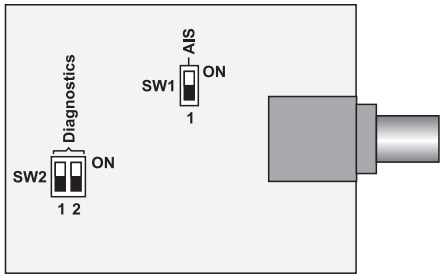


Figure 2. DIP Switch Locations (FOM-4SF with E1 or T1 Interface)

Table 1. DIP Switch Selection

Function	Possible Settings				Factory Setting
To select data rate, SW 1-1, 1-2, 1-3		S1-1	S1-2	S1-3	
	Async	OFF	OFF	OFF	
	64	OFF	OFF	ON	
	128	OFF	ON	OF	
	256	OFF	ON	ON	
	512	ON	OFF	OF	
	1024	ON	OFF	ON	
	2048	ON	ON	OFF	**2048 kbps**
Notes: *The SW 1-1, 1-2, 1-3 switches are available only for FOM-4SF with V.24, X.21, V.35 or RS-530 interfaces. The maximum data rate supported by the V.24 interface is 128 kbps.*					
To select clock source, SW 3-1, 3-2		S3-1	S3-2		
	Internal	OFF	OFF		**Internal**
	Receive	OFF	ON		
	External	ON	OFF		
Notes: *The SW 3-1, 3-2 switches are available only for FOM-4SF with V.24, X.21, V.35 or RS-530 interfaces. When using X.21 interface, set one modem to the internal clock, and configure the rest to the receive clock. FOM-4SF modems with E1 or T1 interface transfer timing signals transparently.*					
To activate or deactivate a loopback, SW 2-1, 2-2		S2-1	S2-2		
	Normal Operation	OFF	OFF		**Normal Operation**
	Local Loopback	OFF	ON		
	Remote Loopback	ON	OFF		
To enable or disable the AIS transmission for E1 or T1 interface, SW 1-1		S1-1			
	AIS Enabled	ON			**AIS Enabled**
	AIS Disabled	OFF			

3. Connect the line:
   - Remove the plastic dust cap from the fiber optic connector
   - Connect the cable to the unit.
4. Connect the DTE:
   - FOM-4SF with V.24, RS-530 interfaces:
     - Plug the unit directly into the 25-pin connector of the DTE.
     - Fasten the screws on each side of the modem connector.
   - FOM-4SF with V.35 and X.21 interfaces:
     - Connect the modem to the adapter cable.
     - Fasten the screws on each side of the modem connector.
     - Connect the other end of the adapter cable directly to the DTE and fasten the screws.
   - FOM-4SF with balanced E1 or T1 interfaces:
     - Connect the corresponding E1 or T1 cable line directly to the FOM-4SF RJ-45 connector.
   - FOM-4SF with unbalanced E1 interface:
     - Connect the DTE transmit cable to the FOM-4SF connector, designated OUT.
     - Connect the DTE receive cable to the FOM-4SF connector, designated IN.
5. Connect the external power supply to the unit and then plug it into the main power. Wrap the power supply cord through the power stabilizer clip on the side panel of the modem.

OPERATION

- **Normal Operation**
  For normal operation, make sure that the test and diagnostic switches (SW2-1 and SW2-2) are set to OFF (see *Table 1*).

- **Diagnostic Loopbacks**
  FOM-4SF performs two V.54 loopbacks: local loopback and remote loopback (see *Figure 3*, *Figure 4* and *Figure 5*). Both loopbacks can be activated by the SW2-1 and SW2-2 switches. Alternatively, you can activate the loopbacks by raising the DTE interface pin 18 (local loopback), and pin 21 (remote loopback) for V.24 and RS-530 interfaces. When using the V.35 interface the loopback activating pins are pin JJ for LLB and pin HH for RLB.

  Local Loopback

  When a local loopback is activated in the local modem, the transmit signal of the local modem is looped back toward the modem's receive path and data received from the remote modem is ignored. The local loopback checks modem integrity on the local modem while continuing to send signals to the remote modem (see *Figure 3*).

Figure 3. Local Loopback

Remote Loopback

When a remote loopback is activated from the local modem, the receive signal of the remote modem is looped back toward the modem's transmit path and data transmitted from the remote DTE is ignored; data continues to be sent over the DTE (see *Figure 4*). The remote loopback checks integrity of the local modem, the line and the remote modem.

Figure 4. Remote Loopback

Note: *For FOM-4SF with E1 or T1 interface, if the AIS is enabled when a local or remote loopback is active, an AIS is sent to the remote DTE.*

Simultaneous Loopbacks

If both modems activate remote loopback, the first request sent is activated.

For FOM-4SF with V.24, V.35, RS-530 and X.21 interfaces, the local loopbacks take priority over remote loopbacks requested from the remote modem.

For FOM-4SF with E1 and T1 interfaces, the local modem can run a local loopback at the same time that the remote modem initiates a remote loopback (see *Figure 5*).

Figure 5. Simultaneous Loopbacks (FOM-4SF with E1 or T1 Interfaces)

To return to normal operation, set the test DIP switches to OFF, or lower the loopback activation pins of the DTE. The TST LED will turn off automatically.