

ORDERING

FOM-9/*/+

Miniature Sync/Async Fiber Optic Modem

FOM-9/V.24/UP/+

Miniature Sync/Async Unpowered Fiber Optic Modem, V.24/RS-232 interface, female connector

* Specify DTE interface:

- V24** for V.24 interface, female connector
- V35** for V.35 interface, female connector
- X21** for X.21 interface, female connector
- 530** for RS-530 interface, female connector

+ Specify optical interface:

- 85ST** for 850 nm multimode ST connector
- 85SC** for 850 nm multimode SC connector
- 85FC** for 850 nm multimode FC-PC connector
- 13ST** for 1300 nm single mode ST connector
- 13SC** for 1300 nm single mode SC connector
- 13FC** for 1300 nm single mode FC-PC connector

P/S-AC/9/500

9V DC / 90 to 264V AC, 500 mA power supply

RAD

data communications

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FOM-9

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*Miniature Sync/Async
Fiber Optic Modem*



Specifications are subject to change without prior notice.

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Order from: Cutter Networks

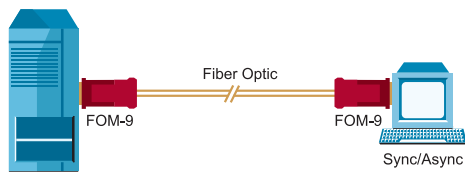
Ph:727-398-5252/Fax:727-397-9610

www.bestdatasource.com

FEATURES

- Synchronous or asynchronous
- Single mode and multimode supported
- Data rates up to 128 kbps sync and 115.2 kbps async
- V.54 diagnostics, including local and remote loopbacks
- Built-in BERT in compliance with V.52
- Full or half duplex
- Controlled or continuous carrier
- Internal, external or receive clock
- Transmission range up to 16 km (10 miles) over single mode fiber
- LED indicators
- V.24, V.35, X.21 or RS-530 interface options
- Operates with an external power supply (except FOM-9/V.24/UP)

APPLICATION



DESCRIPTION

- The FOM-9, Sync/Async Fiber Optic Modem, is used for local data distribution, connecting full or half duplex, sync or async terminals to computers over single mode or multimode fiber optic cable. FOM-9 operates at data rates of 32 to 128 kbps in sync mode or 9.6 to 115.2 kbps in async mode. FOM-9 operates at distances up to 16 km (10 miles) depending on the type of fiber optic cable.
 - Five FOM-9 models are available:
 - FOM-9/V.24/UP, unpowered, V.24 interface
 - FOM-9/V.24, V.24 interface
 - FOM-9/V.35, V.35 interface
 - FOM-9/X.21, X.21 interface
 - FOM-9/530, RS-530 interface.
- Each model has a 25-pin D-type connector for the DTE interface. The V.35 interface is supplied with a 45 cm (17.7") cable, with a 25-pin female connector on one side and a 34-pin female connector on the other side. The X.21 interface is supplied with a 45 cm (17.7") cable with a 25-pin male connector on one side, and a 15-pin X.21 female connector on the other side.
- Asynchronous transmission is provided by internal conversion from async to sync, in compliance with ITU V.22 bis standard. Different async formats are switch-selectable.

- The modem's carrier can be set for either continuous operation or for switched operation. In switched operation, the carrier is controlled by the RTS signal and enables transfer of a control signal end-to-end.
- In synchronous mode, transmit timing can be provided by one of three user-selectable sources:
 - Internal oscillator
 - External clock
 - Loopback clock derived from the receive signal.
- FOM-9 performs diagnostic loops in compliance with ITU V.54 standard. Two V.54 loops are available: analog loop (V.54 Loop 3) and remote digital loop (V.54 Loop 2). These loops are activated either by a DIP switch or by the DTE interface Circuit 141 (pin 18) and Circuit 140 (pin 21). (Loopbacks in FOM-9/X.21 can only be activated via DIP switch.) A proprietary local digital loop is available and can be activated only by the product's switches. This loop connects the local RD to the TD. A TST LED lights when any of the diagnostic loops is ON.
- FOM-9 includes a built-in V.52 standard BER tester for testing link integrity, activated by a DIP switch. The BER tester checks the receive data and turns on an ERROR LED, when an error is detected.

- FOM-9 incorporates all the advantages of a fiber optic system:
 - Lower attenuation than with copper wires; attenuation is not related to frequency
 - EMI/RFI immunity: 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.
- FOM-9 includes six LEDs for indicating signal status: RTS, TD, RD, CD, TST and ERR.
- FOM-9/V.24/UP's innovative circuitry design allows operation without power supply, by using ultra-low power from the standard RS-232/V.24 data and control signals. For proper operation, both data and control signals must be connected, i.e. TD, RD, RTS and DTR.
If the DTE cannot provide enough power for normal operation of the unit, use FOM-9/V.24.
- FOM-9/V.35, FOM-9/X.21, FOM-9/V.24 and FOM-9/530 include a power jack for connection of an external power supply. An additional external 9V DC 500 mA adapter should be ordered separately and used to power the unit.

SPECIFICATIONS

- **Data Rates (Sync or Async)**
Sync: 32, 48, 56, 64, 96, 112 and 128 kbps
Async: 9.6, 19.2, 28.8, 38.4, 57.6 and 115.2 kbps
Data rates are selectable by a DIP switch.
- **Number of Data Bits (Async Mode)**
8, 9, 10 or 11, including 1 start and 1 stop bit, with or without parity
- **Transmission Line**
Dual optical cable
- **Frequency Allowance (Async Mode)**
Shortening of the stop bit on the receive end is selectable:
 - 12.5% allows a frequency difference between the async terminal and FOM-9 of -2.5% to +1.0%
 - 25% allows a frequency difference of -2.5% to +2.3%.
- **Fiber Type**
850 nm multimode
1300 nm single mode
- **Transmission Mode**
Sync or async, full or half duplex
- **RTS/CTS Delay**
0, 1, 8 or 70 msec

- **Receiver Sensitivity**

- 44 dBm for 850 nm multimode fiber
- 46 dBm for 1300 nm single mode fiber

- **Transmission Controls**

- **DCD** (Circuit 109) turns ON after recognizing the receive signal from the line
- **CTS** (Circuit 106) turns ON in four different time delays (selectable) after the terminal raises RTS (Circuit 105)
- **DSR** (Circuit 107) turns ON when the modem is powered and is in the normal mode or in analog loop state. DSR turns OFF when the modem is in digital loopback state
- **TEST** Mode (Circuit 142) turns ON when the modem is in one of its diagnostic loops or the internal BER tester is activated.

- **Optical Output Levels**

- 30 dBm for 850 nm multimode fiber
- 30 dBm for 1300 nm single mode fiber

- **Operating Wavelength**

- 850 nm or 1300 nm (see *Ordering*)

- **Operating Range**

- Maximum range is 3 km (2 miles) over multimode fiber and 16 km (10 miles) over single mode fiber

- **DTE Interface**

- RS-232/V.24 or RS-530 integral 25-pin D-type connector, female. V.35 and X.21 interfaces are provided via a mating cable, 45 cm (17.5") long, terminated with a 34-pin female connector for V.35, or a 15-pin female connector for X.21.

- **Optical Interface**

- ST, SC or FC connector (see *Ordering*)

- **BER Tester**

- V.52 511 pattern

- **LED Indicators**

- RTS – Power On
- TD – Transmit Data
- RD – Receive Data
- CD – Carrier Detect
- TST – Test Mode
- ERR – BER Test Error

- **Power**

- Two power options are available:

- Ultra-low power from the RS-232/V.24 data and control signals.
To ensure proper operation, equipment connected to the FOM-9/V.24/UP should provide at least one of the following signals: RTS (pin 4), DTR (pin 20), External Clock (pin 24), +V (pin 9), -V (pin 10), TD (pin 2) and RD (pin 3).
- Using an external 9V DC 500 mA adapter connected to the power jack of FOM-9/V.35, FOM-9/X.21, FOM-9/V.24 and FOM-9/530.

- **Physical**

- FOM-9/V.24/UP:

- Length: 65 mm / 2.6 in
- Height: 18 mm / 0.7 in
- Width: 53.2 mm / 2.1 in
- Weight: 90g / 3.2 oz

- All other versions:

- 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: 12 Hanechoshet St.
Tel Aviv 69710
Israel

declares that the product:

Product Name: FOM-9

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.

Supplementary Information:

The product herewith complies with the requirements of the EMC Directive 89/336/EEC. The product was tested in a typical configuration.

Tel Aviv, January 24th 1999



Haim Karshen
VP Quality

European Contact: Rad Data Communications GmbH,
Bernner 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

The FOM-9 may be 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 9 VDC, 300 mA.

Instructions de Sécurité

IMPORTANT

Utilisateurs Au Canada

Le FOM-9 est renforcé par un transformateur extérieur. Afin de réduire le risque d'électrocution, d'incendie ou de blessure, utiliser seulement avec un transformateur 9 VDC, 300 mA certifié Class 2 CSA ou repris sur la liste UL.

Safety Instructions (Europe)



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.

CAUTION

European Users

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

ACHTUNG

Installation – Bedienungsanleitung

Um das Risiko eines elektrischen Schlages 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.

Installation of FOM-9 is simple and straightforward. Follow these instructions:

- To access the setup switches:
 - FOM-9/V24/UP: snap out the LED cover.
 - FOM-9/V.35, FOM-9/X.21, FOM-9/530 or FOM-9/V.24: separate the two parts of the plastic case by pressing on the sides.
- Configure the modem according to the desired mode, referring to *Figure 1* or *Figure 2*, and *Table 1*.

Sync Mode:

- Set the Sync/Async switch to Sync (S1-4 = OFF).
- Set the baud rate (S1-1, 2, 3).
- Select clock mode (S4-1, S4-2).
- Select carrier mode (S4-5).
- Set S2-1 to full duplex (S2-1 = OFF).

Note: EXT clock mode is not available for FOM-9/X.21.

Async Mode

- Set the Sync/Async switch to Async (S1-4 = ON).
- Set baud rate (S1-1, S1-2, S1-3).
- Select clock mode (S4-1 = OFF and S4-2 = OFF).
- Select carrier mode (S4-5).
- Select async format (S2-2, S2-3, S2-4).
- Select RTS/CTS delay switches (S2-5, S2-6).
- Set S2-1 to half or full duplex.

Note: Async mode is not available for FOM-9/X.21.

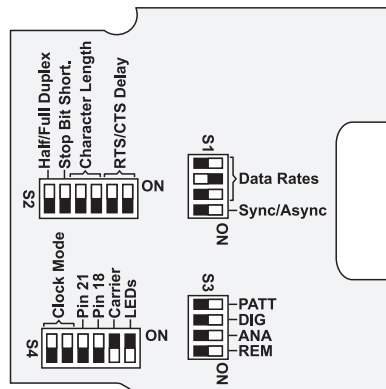


Figure 1. FOM-9/V.24/UP DIP Switch Diagram

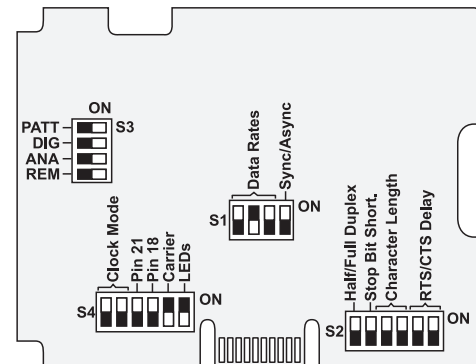


Figure 2. FOM-9/530, FOM-9/V.35, FOM-9/X.21 and FOM-9/V.24 DIP Switch Diagram

- Close the unit:
 - FOM-9/V.24/UP: Snap the LED cover back into place.
 - FOM-9/V.35, FOM-9/X.21, FOM-9/530 and FOM-V.24: Press the two halves of the case together.
- Remove the plastic dust caps from the fiber optic connectors and connect the line cable to the unit. Observe the following polarity:
 - TX on the local FOM-9 should be connected to RX on the remote FOM-9
 - RX on the local FOM-9 should be connected to TX on the remote FOM-9.

12. Connect the DTE:

- Plug the FOM-9/V.24/UP, FOM-9/V.24 or FOM-9/530 unit directly into the 25-pin connector of the DTE.
- Plug the FOM-9/V.35 or FOM-9/X.21 unit via the mating cable into the 25-pin connector of the DTE.

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.

13. Connect the external power supply to FOM-9/V.35, FOM-9/X.21, FOM-9/530 or FOM-9/V.24 and then plug it into the main power supply.

Table 1. DIP Switch Selection

Switch	Switch Identity	Function	Possible Settings					Factory Setting	
S1-4	Sync/ Async	Selects synchronous or asynchronous mode	ON OFF	Asynchronous Synchronous					Synchronous
S1-1,2,3	Baud Rates (kbps)	Selects data rate	<u>S1-1</u> OFF OFF OFF OFF ON ON ON ON	<u>S1-2</u> OFF OFF ON ON OFF OFF ON ON	<u>S1-3</u> OFF ON ON ON OFF ON OFF ON	<u>Async</u> N/A 115.2 N/A 57.6 38.4 28.8 19.2 9.6	<u>Sync</u> 128 96 64 48 32 112 56 N/A	64 kbps	
S4-1,2	Clock Mode	Selects XMT clock source in synchronous mode	<u>S4-1</u> OFF OFF ON	<u>S4-2</u> OFF ON OFF	Internal External Receive			Internal	
S4-3	Pin 21 REM	Enables DTE control of remote digital loop	<u>S4-3</u> ON OFF	Enable Disable					Disable
S4-4	Pin 18 ANA	Enables DTE control of analog loop	<u>S4-4</u> ON OFF	Enable Disable					Disable
S4-5	Carrier	Selects carrier Constantly ON or Controlled by RTS	<u>S4-5</u> ON OFF	Constantly ON Controlled					Const. ON
S4-6	LEDs	Enables signal status LED indicators	<u>S4-6</u> ON OFF	Enable Light Disable Light					Enable Light

Table 1. DIP Switch Selection (Cont.)

Switch	Switch Identity	Function	Possible Settings	Factory Setting
S2-1	Half/Full Duplex	Selects half duplex or full duplex transmission	<u>S2-1</u> ON Half Duplex OFF Full Duplex	Full Duplex
S2-2,3,4	Async Format	Selects the amount of stop-bit shortening	<u>S2-2</u> ON 25% OFF 12.5%	12.5%
		Selects character length in async mode	<u>S2-3</u> <u>S2-4</u> <u>No. bits</u> OFF OFF 8 ON OFF 9 OFF ON 10 ON ON 11	8 bits
S2-5,6	RTS/CTS Delay	Selects RTS/CTS delay	<u>S2-5</u> <u>S2-6</u> <u>No. msec</u> OFF OFF 0 OFF ON 1 Short ON OFF 8-10 Medium ON ON 69-83 Long	0 msec
S3-1	PATT	Controls BER testing	see <i>Operation</i>	OFF
S3-2	DIG	Controls local digital loop	see <i>Operation</i>	OFF
S3-3	ANA	Controls local analog loop	see <i>Operation</i>	OFF
S3-4	REM	Controls remote digital loop	see <i>Operation</i>	OFF

OPERATION

- **Normal Operation**

For normal operation, make sure that the tests and diagnostics switches (S3-1, S3-2, S3-3, S3-4) are set to OFF. If the attached DTE does not use pin 18 and pin 21, or if the cable between FOM-9 and the DTE does not contain these pins, set S4-3 and S4-4 to the OFF position (see *Table 1*).

- **Tests and Diagnostics**

BERT Test Mode V.52

BERT enables testing of the local modem and the communication line. When the PATT switch (S3-1) is set to ON, the modem generates and transmits standard V.52 pattern (511-bit pseudo-random) and checks its response. If errors are detected, the ERR LED will light. The test can be carried out in local analog loopback, in remote digital loop, or in normal point-to-point operation, opposite a remote FOM-9.

V.54 Diagnostics

FOM-9 features diagnostic loops according to ITU V.54. The modem performs local analog loopback (ANA), local and remote digital loopback (DIG, REM). All tests are controlled by switches S3-2, S3-3, S3-4. ANA and REM can also be activated by DTE interface pin 18 (ANA) and pin 21 (REM). The TST LED lights and pin 25 (Circuit 142) is ON when performing the modem's diagnostics.



Figure 3. Local Analog Loop (ANA)

The ANA V.54 loopback (Loop 3) tests the local FOM-9 only. The XMT signal is returned to the receiver (see *Figure 3*).



Figure 4. Remote Digital Loop (ANA)

The REM V.54 loopback (Loop 2) tests the remote modem and the communication link (see *Figure 4*).

To return to normal operation, set the test switches to OFF. If testing via DTE interface, lower the loopback activation pins.