

# FOM-485

**RAD**

*Miniature RS-485 Fiber  
Optic Modem*



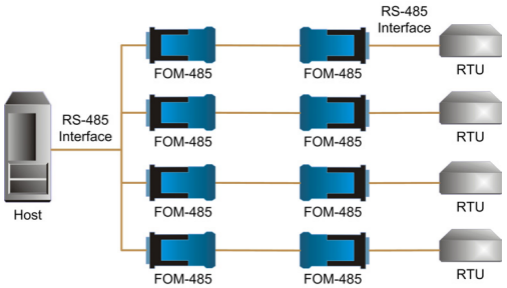


## FEATURES

- Provides asynchronous transmission at data rates of up to 115.2 kbps
- Operates in full-duplex over 4-wire or half-duplex over 2-wire and 4-wire lines
- Meets ITU RS-485 and ITU V.11 requirements
- Meets ITU V.54 and ITU V.52 requirements (in V.11 only)
- Operates over multimode fiber optic cables
- Point-to-point or multipoint applications with up to 32 units in RS-485
- Six LED indicators
- Miniature, lightweight and easy to install
- Operates with an external power supply



# APPLICATION





## DESCRIPTION

- FOM-485, asynchronous RS-485 miniature fiber optic modem, transmits an RS-485 or V.11 signal via a fiber optic link. FOM-485 is typically used for data transmission in utility applications. The asynchronous data rate can be up to 115.2 kbps in full- or half-duplex mode.
- FOM-485 performs diagnostic loopbacks in compliance with ITU V.54 standard. Two V.54 loopbacks are available: local analog (Loop 3) and remote digital (Loop 2). The loopbacks are activated via external DIP switches. Local digital loopback is also available. The loopbacks are available in V.11 mode only.
- FOM-485 includes a built-in V.52 standard BER tester for testing link integrity. The internal BER tester is activated by an external DIP switch. The ERR LED blinks when an error is detected in the data transmission.

- FOM-485 incorporates all the advantages of a fiber optic system, providing:
  - Lower attenuation than with copper wire
  - EMI/RFI immunity, saving the cost of expensive and heavy shielding, and complex error checking routines
  - Almost absolute security and reduction in the cost of data encryption
  - Eavesdropping is virtually impossible as negligible power is radiated from the fiber
  - Safety and electrical isolation: no spark hazard and no ground-loop noise problems.
- FOM-485 operates with an external 9 VDC, 300 mA power supply.



# SPECIFICATIONS

## DTE INTERFACE

- **Type (user-selectable)**
  - V.11 over 4-wire
  - RS-485 over 2-wire or 4-wire
- **Data Rate**  
Up to 115.2 kbps
- **Pulse Width Distortion**  
Less than 25%
- **DTE Transmission Mode**  
Full- or half-duplex, user-selectable
- **DTE Connectors**  
RJ-45 or 5-clip terminal block (see *Ordering*)

## FIBER OPTIC INTERFACE

- **Transmission Line**  
Optical duplex cable
- **Transmission Mode**  
Full- or half-duplex
- **Fiber Optic Characteristics**  
See *Table 1*
- **Fiber Optic Connectors**  
ST, FC, or SC (see *Ordering*)

- **LED Indicators**

TD (yellow) – Transmit Data

RD (yellow) – Receive Data

ERR (yellow) – BERT error

RTS (yellow) – Request to Send

DCD (yellow) – Data Carrier Detect

TST (red) – A test is active

- **Power**

9 VDC, 300 mA

- **Physical**

Length: 10.0 cm (3.9 in)

Height: 2.3 cm (0.9 in)

Width: 5.3 cm (2.1 in)

Weight: 140g (4.9 oz)

- **Environment**

Temperature: 0°–50°C (32°–122°F)

Humidity: Up to 90%, non-condensing

**Table 1. Fiber Optic Characteristics**

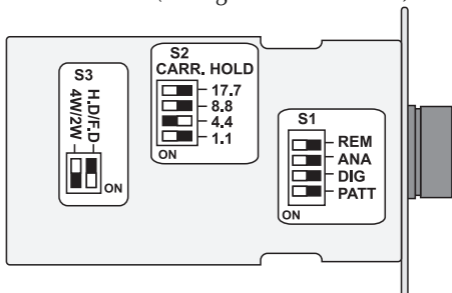
<b>Operating Wavelength/ Transmitter</b>	<b>Fiber Type</b>	<b>Typical Output [dBm]</b>	<b>Receiver Sensitivity [dBm]</b>	<b>Range [km] [mi]</b>
850 nm / VCSEL	62.5/125 $\mu$ m multimode	-18	-40 Full-duplex	5.4 3.3
850 nm / VCSEL	62.5/125 $\mu$ m multimode	-18	-36 Half-duplex	4.3 2.6

# INSTALLATION

**Caution:** When setting the jumpers or performing any actions inside the open product, be careful not to bend or break any components.

To install FOM-485:

1. Open the plastic case by pressing on the points indicated on the sides.
2. Configure the modem according to the desired mode (see *Figure 1* and *Table 1*).



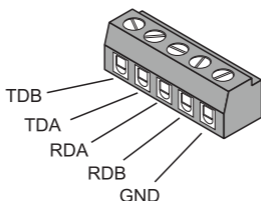
**Figure 1. DIP Switch Locations**

- For full- or half-duplex operation over 4-wire:
  - Set the H.D./F.D. switch to F.D. for full-duplex or H.D. for half-duplex
  - Set the 4W/2W switch to 4W.
- For half-duplex operation over 2-wire:
  - Set the H.D./F.D. switch to H.D.
  - Set the 4W/2W switch to 2W.

3. Set the CARR. HOLD switch to 4.4 msec.
4. Close the unit by pressing the two halves of the unit together.
5. Connect the DTE:
  - For terminal block:

Connect the 4- or 2-wire UTP or STP line, observing the following polarity:

    - **4-wire:** TDA and TDB clips are data output from the modem; RDA and RDB clips are data input to the modem (see *Figure 2*).
    - **2-wire:** RDA and RDB clips are data input/output in and from the modem (see *Figure 2*).



**Figure 2. Terminal Block Connector Pinout**

**Table 1. DIP Switch Settings**

<b>Switch</b>	<b>Switch Identity</b>	<b>Function</b>
S3-1	H.D./F.D.	Selects the transmission mode on the DTE side
S3-2	4W/2W	Selects the operation type of the RS-485 interface
S2-1, S2-2, S2-3, S2-4	CARR. HOLD (see Note)	Selects the length of time that the modem maintains transmission when received data from RS-485 interface becomes mark or idle (carrier delay)
S1-1	PATT	Controls the BER testing
S1-2	DIG	Controls the local digital loopback
S1-3	ANA	Controls the local analog loopback
S1-4	REM	Controls the remote digital loopback

**Note:** Set the carrier delay to 1.1 msec when working at the high data rate. For the low data rate applications, set the carrier delay to 17.7 msec.

---

## Possible Settings

(Factory settings shown in bold)

---

**H.D. – Half-duplex operation, RS-485**

F.D. – Full-duplex operation, V.11

---

4W – 4-wire operation

**2W – 2-wire operation**

---

1.1 msec

**4.4 msec**

8.8 msec

17.7 msec

---

*See Operation (OFF)*

---

*See Operation (OFF)*

---

*See Operation (OFF)*

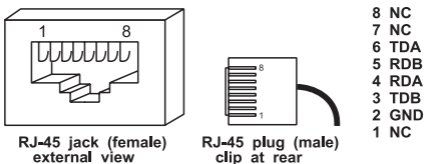
---

*See Operation (OFF)*

---

- For RJ-45:

Plug the cable into the RJ-45 jack  
(see *Figure 3*).



**Figure 3. RJ-45 Connector Pinout**

6. Connect the line:

Remove the plastic dust caps from the fiber optic connectors, and connect the cable, observing the following polarity:

- Connect Tx on the local modem to Rx on the remote modem
- Connect Rx on the local modem to Tx on the remote modem.

7. Connect the external power supply to FOM-485, and then plug it into the mains.

# **OPERATION**

---

## **NORMAL OPERATION**

For normal operation, make sure that the test and diagnostic switches (S1-1, S1-2, S1-3, and S1-4) are set to OFF.

## **TESTS AND DIAGNOSTICS**

### **BERT Test Mode V.52**

BERT enables testing of the local modem and the communication line. When the PATT DIP switch 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 indicator LED lights. The test can be carried out in local analog loopback, in remote digital loop, or in normal point-to-point operation, opposite a remote modem.

### **V.54 Loopback Tests**

FOM-485 features diagnostic loopbacks according to ITU V.54. The modem performs local analog loopback (ANA), as well as local and remote digital loopbacks (DIG, REM). All tests are controlled by the S1-2, S1-3, S1-4 switches.

The TST LED turns on when a diagnostic loopback is active.

The ANA V.54 loopback (Loop 3) tests the local FOM-485 only. The XMT signal is returned to the receiver (see *Figure 4*).

The REM V.54 loopback (Loop 2) tests the remote modem and the communication link (see *Figure 5*).

To return to normal operation, set the test DIP switches to OFF.



**Figure 4. Local Analog Loopback (ANA)**



**Figure 5. Remote Digital Loopback (REM)**

## 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-485

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, August 3rd 1999



Haim Karshen

Quality Manager

European Contact: RAD Data Communications  
GmbH, Otto-Hahn-Str. 28-30, 85521  
Ottobrunn-Riemerling, Germany

## **ORDERING**

---

### **FOM-485/\*/&**

Miniature RS-485 fiber optic modem

\* Specify fiber optic connector:

**ST85** for 850 nm multimode, ST connector

**FC85** for 850 nm multimode, FC connector

**SC85** for 850 nm multimode, SC connector

& Specify DTE connector:

**RJ45** for RJ-45

**TB** for terminal block

### OPTIONAL ACCESSORY

#### **P/S-AC/9/500**

9 VDC / 90 to 264 VAC, 500 mA power supply



**data communications**

[www.rad.com](http://www.rad.com)

#### **International Headquarters**

24 Raoul Wallenberg Street

Tel Aviv 69719, Israel

Tel: 972-3-6458181

Fax: 972-3-6498250

Email: [market@rad.com](mailto:market@rad.com)

#### **North America Headquarters**

900 Corporate Drive

Mahwah, NJ 07430, USA

Tel: (201) 529-1100

Toll free: 1-800-444-7234

Fax: (201) 529-5777

Email: [market@radusa.com](mailto:market@radusa.com)

319-100-01/06

Specifications are subject to change without prior notice.

© 1987–2006 RAD Data Communications Ltd.