

M8000T Series
RS-232 / MIL-STD-188C (Unbalanced)
Fiber Optic MicroModem
Technical Manual

Revision E

Copyright January 2004

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E040130275

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TABLE OF CONTENTS

| PARAGRAPH | TITLE | PAGE |
|---------------------------------------------------|-----------------------------------|------|
| SECTION 1: DESCRIPTION OF EQUIPMENT | | |
| 1.1 | INTRODUCTION | 1 |
| 1.2 | DESCRIPTION OF EQUIPMENT | 1 |
| 1.2.1 | Functional Characteristics..... | 1 |
| 1.2.2 | Physical Characteristics | 2 |
| 1.3 | SPECIFICATIONS..... | 4 |
| SECTION 2: INSTALLATION | | |
| 2.1 | GENERAL | 5 |
| 2.2 | SITE SELECTION AND MOUNTING | 5 |
| 2.2.1 | Signal Interface | 5 |
| 2.2.2 | User Selected Options..... | 5 |
| 2.3 | POWER REQUIREMENTS..... | 6 |
| 2.3.1 | Installation With AC Power..... | 6 |
| 2.3.2 | Installation With DC Power..... | 6 |
| 2.4 | INITIAL CHECKOUT PROCEDURE | 6 |
| SECTION 3: OPERATION | | |
| 3.1 | INTRODUCTION | 7 |
| 3.2 | STATUS INDICATORS/ALARM..... | 7 |
| 3.3 | OPERATING CONTROLS..... | 7 |
| SECTION 4: THEORY OF OPERATION | | |
| 4.1 | INTRODUCTION | 8 |
| SECTION 5: MAINTENANCE AND TROUBLESHOOTING | | |
| 5.1 | INTRODUCTION | 9 |
| 5.2 | FAULT ISOLATION | 9 |

LIST OF ILLUSTRATIONS

| FIGURE | TITLE | PAGE |
|--------|----------------------------------------|------|
| 1. | OVERALL VIEW, M8000T MICROMODEM | 2 |
| 2. | INTERFACE EXTENDER CONFIGURATION | 3 |
| 3. | MODEM LINK CONFIGURATION | 3 |
| 4. | SWITCH SETTINGS..... | 6 |

SECTION 1

DESCRIPTION OF EQUIPMENT

1.1 INTRODUCTION

This manual provides general and detailed information on the installation and operation of the M8000T Series MicroModems. 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.

| Model Number | Part Number | Description |
|--------------|-------------|----------------------------------------------------------------------------------------------------------------------------|
| M8213T | 30275-42 | RS-232 or MIL-188C Unbalanced, Multimode, 850nm optics, ST connectors, <i>DCE</i> , 2 Km distance, EMI/RFI suppressed. |
| M8214T | 30275-44 | RS-232 or MIL-188C Unbalanced, Multimode, 1300nm optics, ST connectors, <i>DCE</i> , 8 Km distance, EMI/RFI suppressed. |
| M8215T | 30275-45 | RS-232 or MIL-188C Unbalanced, Single Mode, 1300nm optics, ST connectors, <i>DCE</i> , 15 Km distance, EMI/RFI suppressed. |
| M8223T | 30275-32 | RS-232 or MIL-188C Unbalanced, Multimode, 850nm optics, ST connectors, <i>DTE</i> , 2 Km distance, EMI/RFI suppressed. |
| M8224T | 30275-34 | RS-232 or MIL-188C Unbalanced, Multimode, 1300nm optics, ST connectors, <i>DTE</i> , 8 Km distance, EMI/RFI suppressed. |
| M8225T | 30275-35 | RS-232 or MIL-188C Unbalanced, Single Mode, 1300nm optics, ST connectors, <i>DTE</i> , 15 Km distance, EMI/RFI suppressed. |

1.2 DESCRIPTION OF EQUIPMENT

1.2.1 Functional Characteristics

The M8000T Series Fiber Optic MicroModems provide copper-to-fiber conversion for data transmission over fiber optic cable as interface extenders or as modem links for synchronous or asynchronous data. M8213T and M8223T models are equipped with multimode 850nm LED optics and can transmit over a pair of multimode fiber cables for up to 2 Km (6,600 ft). M8214T and M8224T models are equipped with multimode 1300nm LED optics and can transmit over a pair of multimode fiber cables for up to 8 Km (26,400 ft). M8215T and M8225T models are equipped with single mode 1300nm LED optics and can transmit over a pair of single mode fiber cables for up to 15 Km (49,500 ft). The link is fully transparent in both directions and is data agile for any data rate from 1 Bps to 100 Kbps with terminal timing or from 1 Bps to 64 Kbps with source timing. Interface control signals associated with RS-232 and MIL-STD-188C Unbalanced standards are fully supported. This is accomplished by multiplexing the control signals along with the clock and data signals and transmitting the combined signal to the remote unit. At the remote end the combined signal is demultiplexed and applied to the interface.

1.2.2 Physical Characteristics

The M8000T Series Fiber Optic MicroModems measure 2.5 x 1.0 x 4.5in (6.35 x 2.54 x 11.43cm) (HxWxL). Housed in extruded aluminum, these modems are self-contained and may be mounted directly to electrical interface connectors. M821XT is a DCE unit with a female DB25 for connecting to a terminal electrical interface. The M822XT is a DTE unit with a male DB25 for connecting to a modem electrical interface. ST optical connectors are standard for all models with the transmitter optic located closest to the power connector.



FIGURE 1. OVERALL VIEW, M8000T MICROMODEM

MicroModems require VDC power for operation, with a one-pin connector for electrical input. VDC power (+5 to +15 VDC) may be applied to pin 9 of the DB25 interface if host power is available. An external power adapter is available for converting VAC to VDC if host power or chassis power is not used. Reference Section 2.3 for more information.

A 19" standard rack mount chassis (Model MRR-16) is available for rack mounting up to 16 MicroModems (Figure 4). The Model MRR-16 chassis measures 19 x 3.5 x 11.2 in (48.3 x 8.9 x 28.4 cm) and receives power from a power supply (Model M0004) providing VDC power from a VAC power source. Two Model M0004 power supplies are recommended for power redundancy. The M0004 power supply measures 1.3 x 2.5 x 5.1 in (3.33 x 6.35 x 13.02 cm). The M0004 power supplies provide VDC power to the MRR-16 chassis power bus bar. From the power bus bar, VDC is provided to each modem by a 6" power cable (Model M0001). Please note that each MicroModem requires a Model M0001 power cable.

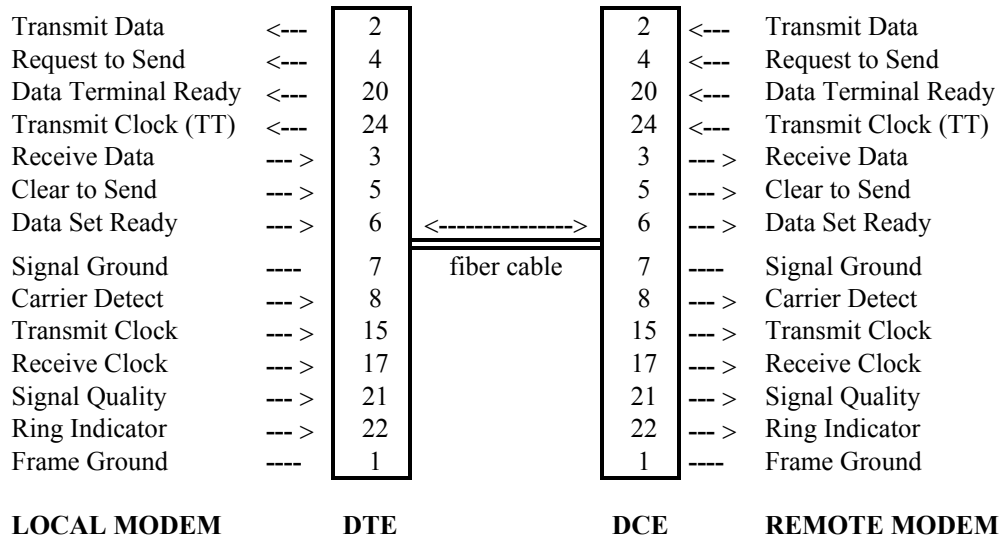


FIGURE 2. INTERFACE EXTENDER CONFIGURATION

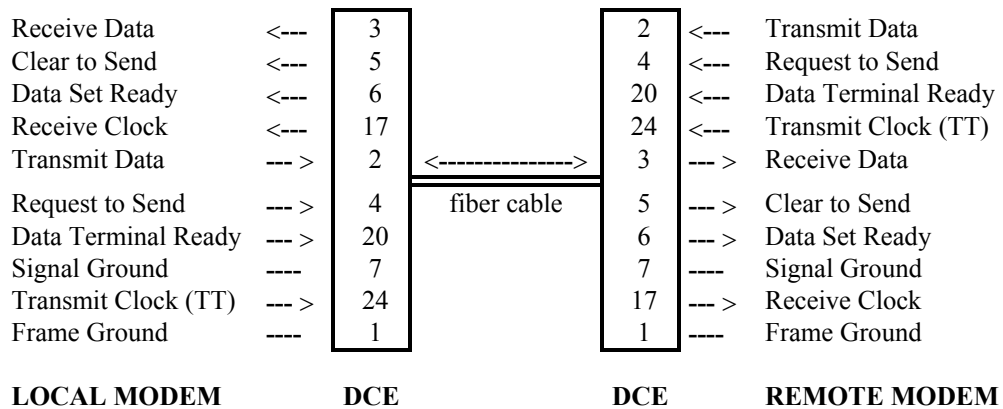


FIGURE 3. MODEM LINK CONFIGURATION

1.3 SPECIFICATIONS

Data Signal: Signal level and format conform to EIA RS-232 and MIL-STD-188C Unbalanced standards.

Data Rate: Source Timing - continuously variable from 1 Bps to 64 Kbps for synchronous or asynchronous signals.

Terminal Timing - continuously variable from 1 Bps to 100 Kbps for synchronous or asynchronous signals.

Operating Mode/Range: Full duplex or simplex operation over a fiber optic cable pair with maximum range of 2 Km (6,600 ft) for 850nm multimode optics, 8 Km (26,400 ft) for 1300nm multimode optics, and 15 Km (49,500 ft) for 1300nm single mode optics.

Optical Specifications:

| Models | M8213T | M8223T | M8214T | M8224T | M8215T | M8225T |
|-------------------|---------------------------|--------|--------------------------|--------|---------------------|--------|
| Interface | DCE | DTE | DCE | DTE | DCE | DTE |
| Wavelength | Multimode 850nm | | Multimode 1300nm | | Single Mode 1300nm | |
| Connector | ST | | ST | | ST | |
| Link Budget | 20 ± 1 dB | | 18 ± 1 dB | | 18 ± 1 dB | |
| Maximum Range | 2 Km | | 8 Km | | 15 Km | |
| 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.

Single Mode tests were performed on 9/125 μM fiber optic cable.

Electrical Connector: DCE - DB25 female for terminal interface connections.

DTE - DB25 male for modem interface connections.

Bit Error Rate: Better than 10⁻⁹.

Sampling Rate: 300 KHz (clock and data), 18.75 KHz (control lines). When asynchronous data is applied to control lines, there is approximately 5% jitter at a data rate of 1 Kbps.

Dimensions: 2.5 x 1.0 x 4.5 in (6.35 x 2.54 x 11.43 cm) (HxWxL)

Weight: 6 oz (0.17 kg)

Power Requirements: 115/230 VAC, 1.4 Watts, with power adapter providing 12 VDC, 1 A (Model PSAC08, US; Model PSAC09, European). If using host power, +5 to +15 VDC may be provided on pin 9 of the DB25 connector.

Environment: 0° to +50°C (32° to +122°F) operating temperature; up to 95% relative humidity (non-condensing); up to 10,000ft altitude; storage temperature -40° to +70°C.

SECTION 2 INSTALLATION

2.1 GENERAL

This section contains information on installation and checkout of the M8000T Series Fiber Optic MicroModems. Paragraph 2.2 contains general information on site selection and rack mounting. Paragraph 2.3 contains instructions for making connections to your system and selecting options. Paragraph 2.4 contains initial checkout procedures.

2.2 SITE SELECTION AND MOUNTING

The M8000T Series Fiber Optic MicroModems connect to the electrical interface with two hand-tightened jackscrews. When mounting to a PC, facsimile equipment or STU III telephone, securely position the modem allowing space for the power adapter, if used. Up to 16 MicroModems may be installed in a MRR-16 rack mount chassis (Figure 4). The MRR-16 chassis measures 19.0 x 3.5 x 11.2 in (48.3 x 8.9 x 28.4 cm) (HxWxL). Model M0004 power supply provides VDC power to the chassis from a VAC power source. Two Model M0004 power supplies may be plugged into the MRR-16 chassis for power redundancy. When MicroModems are installed into the Model MRR-16 chassis each MicroModem requires a Model M0001 6" power jumper cable.

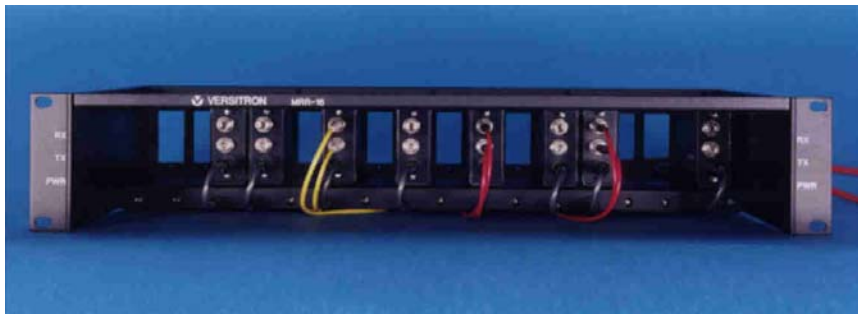


FIGURE 2. OVERALL VIEW, MRR-16 CHASSIS

2.2.1 Signal Interface

DCE modems have a DB25 female connector for the terminal interface connection. DTE modems have a DB25 male connector for the modem interface connection.

2.2.2 User Selected Options

An internal switch, SW1, is provided to select EIA or MIL operation (Figure 5). Default settings for SW1 Positions 1, 2, 3, 4 and 6 are OFF; Positions 5, 7 and 8 are ON. With switch position 7 in the ON position, the modem is set for EIA operation. With switch position 7 in the OFF position, MIL operation is set. By selecting EIA on one end of the link and MIL on the other, interface conversion occurs. The rest of the switches on the circuit board are for diagnostic purposes only and should not be moved by the user.

2.3 POWER REQUIREMENTS

The M8000T Series Fiber Optic MicroModems operate either from a VAC to VDC power adapter or a VDC power source with a DC voltage of +5 to +15. Using pin 9 of the DB25 connector, host power may be used to supply modem power. Power adapters used are Model PSAC08 (US) for 115 VAC input and Model PSAC09 (VDE) for 230 VAC input.

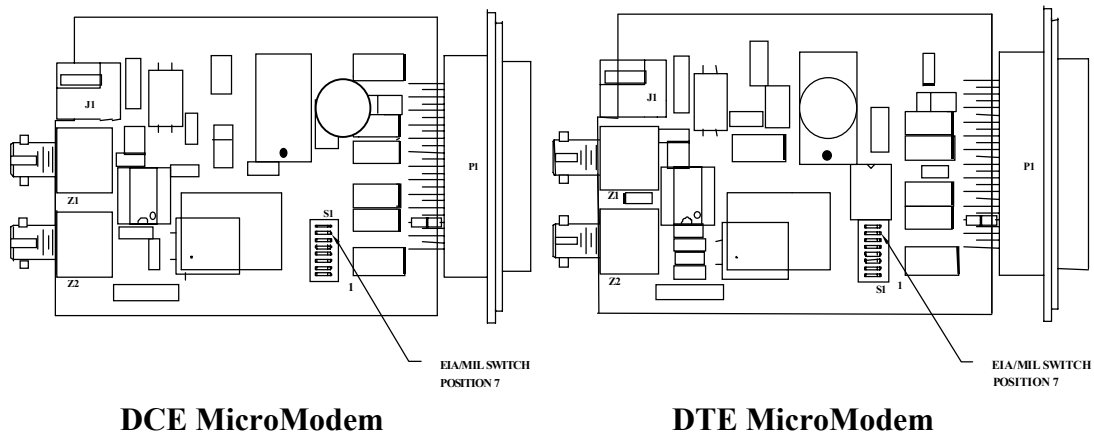


FIGURE 5. SWITCH SETTINGS

2.3.1 Installation with AC Power

Connect the power adapter to the modem before inserting its plug into an AC power source. There are no special tools required.

2.3.2 Installation with DC Power

DC power may be used instead of an AC power adapter, if available. This requires a 2.5 mm socket with the positive on the center and common on the concentric, and providing +12 VDC at 250mA.

2.4 INITIAL CHECKOUT PROCEDURE

MicroModems contain no power on/off switch. The unit is fully operational once installed and power is applied. Before beginning operation verify the following:

1. MIL/EIA switch is set for your configuration: ON for EIA, OFF for MIL. Please note that the factory setting is ON for EIA.
2. Fiber cable is "crossed" (connected from transmit to receive from one unit to the other). Note that the transmitter is closest to the power connector.
3. Power plug is seated fully into the MicroModem or seated firmly in the rack mount enclosure.

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

SECTION 3 OPERATION

3.1 INTRODUCTION

This chapter contains a description of the operating controls and indicators associated with the M8000T Series Fiber Optic MicroModems. Since these units are designed for continuous and uninterrupted operation, there are no operating requirements. Once the modem is powered up it should remain in service as long as required.

3.2 STATUS INDICATORS/AUDIBLE ALARM

There are no status indicators or audible alarms associated with the M8000T Series Fiber Optic MicroModems. If these features are required, VERSITRON Fiber Optic Modem Series II (FOM II) modems offer LED indicators and other features for monitoring the circuit. Please refer to <http://www.versitron.com/RS232FOM.html> for additional information.

3.3 OPERATING CONTROLS

The only operating control associated with the M8000T Series Fiber Optic MicroModems is an internal switch used to select between RS-232 and MIL-STD-188C Unbalanced. Factory setting is for RS-232. Further changes are not required unless the system requirements change.

SECTION 4

THEORY OF OPERATION

4.1 INTRODUCTION

Basic operation of the M8000T Series Fiber Optic MicroModems is similar to a four-channel, full duplex multiplexer. The first channel is used for data. The next two channels are used for transmit and receive clock, while the fourth multiplexer channel is used for aggregated control signals. This technique provides full transparency for the link, even when both clocks originate at the modem. The modem supplies both transmit and receive clocks to which are transmitted through the link and applied directly to the terminal.

The interface control signals are processed in a similar manner. The Request to Send signal from the terminal is transmitted through the link and applied to the modem. When the modem responds with Clear to Send, it will be transmitted through the link and applied to the terminal. With this technique, the terminal will see the RTS/CTS delay established by the modem.

If a fully transparent synchronous link is not required, the clock and control paths may be used as additional asynchronous data paths. The transmit and receive clock inputs will handle data rates from 0 to 64 Kbps asynchronously; the control paths will handle data rates up to 1 Kbps with 5% distortion.

SECTION 5

MAINTENANCE AND TROUBLESHOOTING

5.1 INTRODUCTION

This chapter contains general information designed to isolate a malfunction in the M8000T Series Fiber Optic MicroModems 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

There are no status indicators on the modem. Therefore, you must remove the transmit fiber optic cable to verify that the unit is emitting light (transmitting). If no light is present, check Pin 9 of the DB25 connector (if being used) or check the power transformer plug to insure that it is seated correctly and power is supplied to the unit. If light is still not present, swap out transformers to check for a bad power unit.

If data is inverted on one end of the link, check the EIA/MIL switch for correct placement. The data will be inverted relative to the associated clock.

If you are still experiencing problems, please contact VERSITRON customer service for assistance at 302-894-0699 or 800-537-2296.