



MD1980A/MD1980A-DC Fast Poll Modem User's Guide



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Chapter 1

Introduction

Congratulations for purchasing the finest industrial-grade fast-poll modem available.

The BLACK BOX® MD1980A and BLACK BOX® MD1980A-DC modems are 9600/4800/0-1800 bps modem designed for 4-wire, full-duplex or 2-wire, half-duplex operation over a voice-band leased line or private line. The modem is designed utilizing the latest digital-signal processing (DSP) technology to achieve high performance. The modem employs Telenetics' proprietary modulation and encoding scheme to achieve fast modem training time. The modem is also backward compatible with Bell 202 and ITU-T V.23 modems.

The modems are ideally suited for multi-point communication systems that require fast response time, short training time, and low throughput delay. The BLACK BOX® MD1980A modem is the most technologically advanced modem on the market.

This User's Guide describes both the BLACK BOX® MD1980A (AC-powered) modem and the BLACK BOX® MD1980A-DC (DC-powered) modem. This manual is intended to let you get your modem "up and running" as quickly as possible. It contains all the information you need to configure and install your modem. It also contains troubleshooting information in the unlikely event you encounter a problem with your modem.

Introduction

Features

The BLACK BOX® MD1980A modem is specifically designed for harsh environments found in utility substations and industrial facilities. Though functionally similar to commercial modems, the BLACK BOX® MD1980A modem provides the following unique features that make it well suited for utility and industrial applications.

- ❖ Packaged in a rugged, compact enclosure for industrial applications.
- ❖ Leased-line interface protected with heavy-duty surge protection hardware (15KV).
- ❖ Requires no human intervention, making it ideal for unmanned locations.
- ❖ Works within an extended temperature range of -40°C to +85°C.
- ❖ Designed with coupling transformers for high-voltage isolation and common mode noise rejection in industrial and commercial environments.
- ❖ Operate over voice-band conditioned or unconditioned leased line and pilot wires.
- ❖ Accepts power from a wide range of AC and DC power supplies.
 - BLACK BOX® MD1980A: 85 to 265 VAC or 85 to 400 VDC
 - BLACK BOX® MD1980A-DC: 10 to 53 VDC
- ❖ Standard industrial connectors for data, analog, and power interfaces allow reliable interconnection to other industrial equipment.
- ❖ Asynchronous data rates (selectable) of 9600, 4800, and 0-1800 bps.
- ❖ Easily accessible DIP switches for user configuration and option selection.
- ❖ DB25 connector for RS-232/V.24 interface.
- ❖ Local analog, local digital, and remote digital loopback diagnostics.

Applications

The BLACK BOX® MD1980A modem is designed for point-to-point and multipoint data communications. Figure 1-1 shows a typical multipoint configuration.

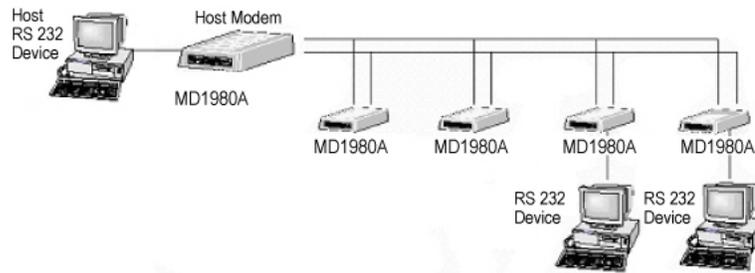


Figure 1-1. Network of Multipoint Configuration

There are a number of factors that can affect the network's and modem's operation and performance. These include:

- ❖ Operating speed
- ❖ 2-wire or 4-wire configuration
- ❖ Transmission line characteristics, noise, and line impairments
- ❖ Network configuration (point-to-point or multipoint)
- ❖ Number of nodes on the network

Chapter 2

Installation

This chapter describes how to install the modem.

Unpacking Your Hardware

Your package should include:

- ❖ At least one of the following modems:
 - BLACK BOX® MD1980A for 85 to 265 VAC
 - BLACK BOX® MD1980A-DC for 10 to 53 VDC
- ❖ A leased-line cable
- ❖ A wall-mount power supply (BLACK BOX® MD1980A modem only)
- ❖ A shielded DC power cable (BLACK BOX® MD1980A-DC modem only)
- ❖ This User's Guide

If your package contents are damaged or missing, please contact your place of purchase immediately.

Additional Items You Need

To use your modem, you need the following additional items:

- ❖ Two- or four-wire transmission line or leased line

- ❖ A DB25-F data cable for your Data Terminal Equipment (DTE) port
- ❖ A power supply that provides either:
 - 85 to 265 Volts AC, 50 to 60 Hz, single phase or 85 to 400 VDC (if you have the Black Box® MD1980A modem), or
 - 10 to 53 Volts DC (if you have the Black Box® MD1980A-DC modem)

Hardware Overview

Back View

The Black Box® MD1980A and Black Box® MD1980A-DC modems have identical back panels. Figure 2-1 shows the back view of the modems. Starting from the left side, this view shows:

- ❖ A 4-wire/2-wire configuration block. See page 22.
- ❖ A female, 25-pin RS-232 connector, for connecting a standard DTE (RTU). See page 24.
- ❖ A **POWER ON/OFF** switch.
- ❖ A power connector. See page 23.

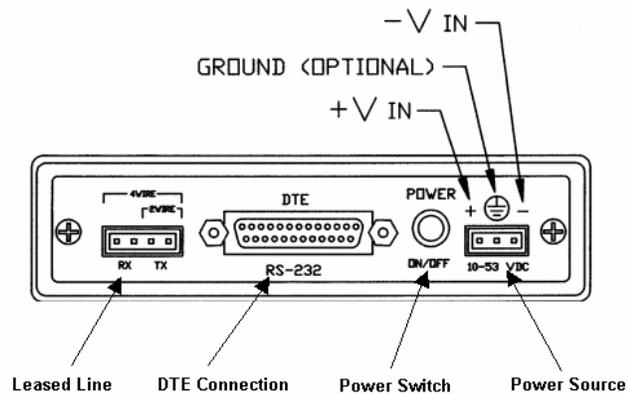


Figure 2-1. Back View of the Modems

Installation

Front View

The Black Box® MD1980A and Black Box® MD1980A-DC modems have identical front panels. Figure 2-2 shows the front view of the modems. Starting from the left side, this view shows:

- ❖ A set of nine LEDs. See page 25.
- ❖ A loopback test switch. See page 26.



Figure 2-2. Front View of the Modems

Installation Summary

The modem installation involves the following steps:

1. Finding a suitable location for the modem. See the section below.
2. Configuring the modem. See page 10.
3. Connecting to a transmission line. See page 21.
4. Connecting to a voltage source. See page 23.
5. Connecting a DTE device. See page 24.

Finding a Suitable Location

The location you select should provide easy access to the back panel communications interface(s) and front panel power interface. It should also let you view all the LEDs on the front panel.

Note: A rack-mount version of this modem as a plug-in module is also available. Please contact Black Box for more information.

Configuring the Modem

You configure the modem using the three sets of DIP switches on the bottom of the modem.



IMPORTANT

It is important to follow the three steps described below, in the order shown, to ensure that you configure your modem properly using the modem DIP switches:

1. Use DIP switch 3 (SW3) to configure the modem for your host DTE interface and network topology. Using SW3, you select the modem to operate in high-speed fast-poll or low-speed (FSK) mode.
 2. If you set SW3 for FSK mode in step 1, use DIP switch 2 (SW2) to configure the modem for either Bell 202T or ITU-T V.23 compatibility. Otherwise, you can use the modem in fallback mode.
 3. Use DIP switch 1 (SW1) to select the modem's transmitter output level and receiver dynamic range. The SW1 settings apply for both high-speed fast-poll and low-speed (FSK) modes.
-

SW1 DIP Switch Settings

SW1 is an 8-position DIP switch. Table 2-1 shows the modem switch settings for DIP switch SW1. A description of the SW1 switch settings follows the table.

Note: SW1 settings apply for both high-speed fast-poll and low-speed (FSK) modes

Table 2-1. Modem Switch Settings for DIP Switch SW1

Switches	Switch Settings	
	ON	OFF (Default)
SW1-1 – 1-4: Transmit Level (page 11)	(see Table 2-2 on page 11)	
SW1-5: Receiver Dynamic Range (page 12)	-10 to -43 dBm	+3 to -30 dBm
SW1-6: TX Cable Equalizer (page 12)	Enabled	Disabled
SW1-7: RX Cable Equalizer (page 12)	Enabled	Disabled
SW1-8: Anti-streaming (page 12)	Active	Inactive

SW1-1 through SW1-4 – Transmit Level

Switches SW1-1 through SW1-4 adjust the modem’s transmit level. Table 2-2 shows the transmit levels you can select using these switches.

Table 2-2. Transmit Levels

Transmit Level	SW1 through SW4 Switch Settings			
	SW1-1	SW1-2	SW1-3	SW1-4
0 dBm	OFF	OFF	OFF	OFF
-1 dBm	OFF	OFF	OFF	ON
-2 dBm	OFF	OFF	ON	OFF
-3 dBm	OFF	OFF	ON	ON
-4 dBm	OFF	ON	OFF	OFF
-5 dBm	OFF	ON	OFF	ON
-6 dBm	OFF	ON	ON	OFF
-7 dBm	OFF	ON	ON	ON
-8 dBm	ON	OFF	OFF	OFF
-9 dBm	ON	OFF	OFF	ON
-10 dBm	ON	OFF	ON	OFF
-11 dBm	ON	OFF	ON	ON
-12 dBm	ON	ON	OFF	OFF
-13 dBm	ON	ON	OFF	ON
-14 dBm	ON	ON	ON	OFF
+3 dBm	ON	ON	ON	ON

Installation

SW1-5 – Receiver Dynamic Range

SW1-5	ON = -10 to -43 dBm OFF = +3 to -30 dBm
-------	--

For a low receive signal level, set SW1-5 to ON (-43 dBm). For short distances or to select a strong receive signal, set SW1-5 to OFF.

SW1-6 and SW1-7 – Cable Equalizer (Fast-Poll Mode Only)

SW1-6	ON = Enable TX Cable Equalizer OFF = Disable TX Cable Equalizer
SW1-7	ON = Enable RX Cable Equalizer OFF = Disable RX Cable Equalizer

To improve or extend the modem's polling performance, use the fixed Compromise Cable Equalizer when polling on long metallic circuits. The cable equalizer is active only when the modem is in fast-poll mode (SW3-1 set to OFF).

SW1-8 – Anti-streaming

SW1-8	ON = Anti-streaming active OFF = Anti-stream inactive
-------	--

Typically, anti-streaming is used in multi-point applications to prevent a malfunctioning slave modem from occupying the line indefinitely.

When anti-streaming is active, the modem can transmit data for a maximum of 27 seconds before the transmitter turns off automatically. The modem then looks for an ON-to-OFF Request To Send (RTS) transition before proceeding with normal operation. Anti-streaming can be selected in either high-speed or low-speed mode.

SW2 DIP Switch Settings

SW2 is an 8-position DIP switch. Table 2-3 shows the modem switch settings for DIP switch SW2. A description of the SW2 switch settings follows the table.

Table 2-3. Modem Switch Settings for DIP Switch SW2

Switches	Switch Settings	
	ON	OFF (Default)
SW2-1: FSK Mode (page 14)	V.23	Bell 202
SW2-2: Receiver Squelch (page 14) (valid for FSK mode, 2-wire half-duplex operation only)	Turnaround Squelch (Bell 202): 8ms Turnaround Squelch (V.23): 150ms	Turnaround Squelch (Bell 202): 0ms Turnaround Squelch (V.23): 0ms
SW2-3: FSK Soft Carrier (page 15)	Disabled	Enabled
SW2-4 and SW2-5: FSK RTS-CTS Delay (page 15)	(see Table 2-4)	
SW2-6: FSK CD Delay (page 16)	23ms	6ms
SW2-7: Remote Loopback (page 16)	Enabled	Disabled
SW2-8: Reserved (Test Only) (page 16)	Test	Normal

Installation

SW2-1 — FSK Mode

SW2-1 ON = ITU-T V.23 mode OFF = Bell 202 mode
--

The modem has two FSK modes:

- ❖ Bell 202, which supports data rates from 0 to 1800 bps
- ❖ ITU-T V.23, which supports data rates from 0 to 1200 bps

SW2-1 configures the modem for either of these FSK modes. Setting SW2-1 to ON selects ITU-T V.23 mode. In this mode, the modem complies with ITU-T (CCITT) recommendation V.23 with the following parameters:

- ❖ Mode 2 modulation only
- ❖ No backward channel
- ❖ No provisions for disablement of echo suppressors
- ❖ DTR (circuit 108) is ignored

Setting SW2-1 OFF selects Bell 202 mode.

SW2-2 — Receiver Squelch (FSK Mode 2-Wire Half-Duplex Only)

SW2-2 ON = 8ms for Bell 202, 150ms for ITU-T V.23 OFF = 0ms

SW2-2 configures the turnaround squelch delay and is valid when the following are active:

- ❖ FSK mode (SW3-1 ON)
- ❖ 2-wire half-duplex operation (SW3-7 ON)

Setting this switch to OFF configures the modem to enable its receiver immediately after the Request To Send (RTS) signal is turned off. When this switch is set to OFF and the modem is configured for 2-

wire, half-duplex mode (SW3-7 ON), the modem squelches the receiver after RTS is turned off to prevent far-end echoes from causing data errors. The duration that the modem squelches the receiver is either:

- ❖ 8 milliseconds if the modem is configured for Bell 202 mode (SW2-1 OFF)
- ❖ 150 milliseconds if the modem is configured for ITU-T V.23 mode (SW2-1 ON)

SW2-3 — FSK Soft Carrier (Bell 202 FSK Mode Only)

SW2-3	ON = None OFF = 8ms
-------	------------------------

SW2-3 controls the soft carrier and is valid for Bell 202 FSK mode only (SW2-1 set to OFF). Setting this switch to OFF configures the modem to transmit a 900 Hz soft carrier to the remote modem for 8 milliseconds after RTS is turned off. Setting this switch to ON prevents the modem from transmitting a soft carrier after RTS is turned off.

SW2-4 and SW2-5 — RTS-CTS Delay (Bell 202 Mode Only)

Switches SW2-4 and SW2-5 determine the duration of the RTS-CTS delay in Bell 202 mode. Table 2-4 shows how to set these switches to select the appropriate setting.

Table 2-4. RTS-CTS Delay Settings in Bell 202 Mode

To Select a Delay of...	Set SW2-4 to...	And Set SW2-5 to...
8ms	OFF	OFF
33ms	OFF	ON
59ms	ON	OFF
219ms	ON	ON

Installation

When the modem is configured for V.23 operation (SW2-1 ON), the RTS-CTS delay is fixed at 33 ms.

SW2-6 — FSK CD Delay (Bell 202 Mode Only)

SW2-6	ON = 23ms OFF = 6ms
-------	------------------------

SW2-6 selects the FSK CD delay and is valid when Bell 202 mode is active (SW2-1 OFF). Setting SW2-6 ON configures the modem to turn on CD 23 milliseconds after it detects a valid carrier signal. Setting this switch to OFF configures the modem to turn on CD 6 milliseconds after it detects a valid carrier signal.

This switch setting is deactivated when the modem is configured for V.23 mode (SW2-1 ON) and a delay of 18 milliseconds is used instead.

SW2-7 — Remote Loopback

SW2-7	ON = Loopback enabled OFF = Loopback disabled
-------	--

During instances of channel noise, the modem may mistaken a received preamble as a request to go into remote digital loopback. Setting SW2-7 to OFF prevents the modem from participating in a remote digital loopback with another modem. SW2-7 does not prevent the modem from sending a remote digital loopback request to a remote modem.

SW2-8 – Reserved (Test Only)

SW2-8	Must be OFF
-------	-------------

SW2-8 must be in the OFF position for normal operation.

SW3 DIP Switch Settings

SW3 is a 10-position DIP switch. Table 2-5 shows the modem switch settings for DIP switch SW3. A description of the SW3 switch settings follows the table.

Table 2-5. Modem Switch Settings for DIP Switch SW3

Switches	Switch Settings	
	ON	OFF (Default)
SW3-1: Fast Poll/FSK (page 18)	FSK	Fast Poll Auto-Rate
SW3-2: Data Rate (page 19)	4800 bps	9600 bps
SW3-3: Async Character (page 19)	11 bits	10 bits
SW3-4: Auto RTS (page 19)	Enabled	Disabled
SW3-5: Transmitter Termination (page 20)	Switched by RTS	600 Ω
SW3-6: Reserved (Test Only) (page 20)	Test	Normal
SW3-7: 2- or 4-wire (page 20)	2-wire, half-duplex	4-wire, full-duplex
SW3-8: Carrier Control (page 21)	Constant	Switched
SW3-9: Rx Termination (page 21)	600 Ω	High Rx Impedance
SW3-10: Signal Ground and Earth Ground Option (page 21)	Connected	Separated

Installation

SW3-1 – Fast Poll Auto Rate/FSK

SW3-1	ON = Low-Speed Mode (FSK) OFF = High-Speed Mode (Fast Poll)
-------	--

The modem has two operating modes:

- ❖ FSK mode, which supports data rates from 0 to 1800 bps.
- ❖ Fast-poll mode, which supports data rates of 4800 and 9600 bps.

SW3-1, along with the Data Rate Selector (DRS) pin on the modem's RS-232 connector, configures the modem for either FSK or fast-poll mode. Table 2-6 shows how SW3-1 and the DRS signal configure the modem for these operating modes.

Table 2-6. Modem Operating Mode

To Select...	Set SW3-1 to...	And the DRS Signal...
Fast-poll mode	OFF	Is not connected or is set HIGH
FSK mode	OFF	Is set LOW
FSK mode	ON	Doesn't care

You should use the DRS signal in RTS control mode. It does not work in either constant carrier mode (SW3-8 set to ON) or in the auto-RTS mode (SW3-4 set to ON). The DRS signal is only sampled when the transmitter is idle (when not sending a preamble, data, or a turn-off sequence).

Note that DRS controls both the transmitter and receiver. If DRS changes states while the modem is receiving a preamble, data, or a turn-off sequence, the state of the receiver is unknown until the carrier drops and a new preamble is received. We recommend that DRS does not change states until both the local and remote modems' transmitters are in the idle state. When they are, both the local and remote modems' DRS signal should change states.

SW3-2 – Data Rate (Fast-Poll Mode Only)

SW3-2	ON = 4800 bps OFF = 9600 bps
-------	---------------------------------

SW3-2 configures the modem speed. When the modem is in high-speed fast-poll mode (SW3-1 OFF), setting SW3-2 ON selects 4800 bps, while setting SW3-2 OFF selects 9600 bps.

SW3-3 – Async Character (Fast-Poll Mode Only)

SW3-3	ON = 11 bits OFF = 10 bits
-------	-------------------------------

Switch SW3-3 selects whether the async character is 10 or 11 bits long. When the modem is in high-speed fast-poll mode (SW3-1 OFF), setting SW3-3 ON selects an 11-bit async characters, while setting SW3-3 OFF selects a 10-bit async character.

SW3-4 – Auto RTS (Fast-Poll Mode Only)

SW3-4	ON = Enable Auto RTS OFF = Disable Auto RTS
-------	--

For data terminals that do not support hardware RTS, set SW3-4 to ON to enable auto RTS mode. In this mode, TXD is detected at the modem and an internal RTS signal is turned ON. After training completes, the TXD is transmitted to the remote modem. The transmitter turns off if no TXD is detected after 1 character length of idle time. Auto RTS is used in fast-poll mode only (SW3-1 set to OFF).

Installation

SW3-5 – Transmitter Termination

SW3-5	ON = Switched by RTS OFF = 600 Ω
-------	--

SW3-5 is used for multi-point configuration networks. When multiple modems are connected on the same metallic circuit:

- ❖ The transmitter termination should be of high impedance if the modem is not transmitting.
- ❖ The transmitter is only terminated with 600 ohms when RTS is asserted.

This configuration should be used for all slave modems to prevent the transmitting modem from being unnecessarily burdened. To select this configuration, set SW3-5 ON on the slave modems.

If you use the modem with transmission lines that are transformer-coupled or with an impedance-isolated network (such as a transformer bridge), set SW3-5 OFF for proper operation.

SW3-6 – Reserved (Test Only)

SW3-6	Must be OFF
-------	-------------

SW3-6 must be in the OFF position for normal operation.

SW3-7 – 2-/4-Wire Operation

SW3-7	ON = 2-Wire, Half-Duplex Mode OFF = 4-Wire, Full-Duplex Mode
-------	---

SW3-7 configures the modem for 4-wire full-duplex or 2-wire half-duplex operation.

SW3-8 – Carrier Control

SW3-8	ON = Constant OFF = Switched
-------	---------------------------------

SW3-8 selects either constant or switched carrier. Constant carrier allows DTEs, such as asynchronous dumb terminals or RTUs, to operate with modems, without the input RTS signal. When constant carrier mode is enabled (SW3-8 set to ON), the modem forces the transmit carrier active and the RTS-CTS delay is minimum (<0.5 ms.).

You can use constant carrier in 4-wire, point-to-point or multi-point applications (from master to slave modems).

In switched-carrier mode (SW3-8 set to OFF), the RTS/CTS delay is active.

SW3-9 – RX Termination

SW3-9	ON = Enable Rx Termination OFF = Disable Rx Termination
-------	--

SW3-9 selects whether RX termination is enabled for a modem. If you set this switch ON, the receiver is terminated with 600 Ω . If you set this switch OFF, the receiver is not terminated.

SW3-10 – Grounding Option

SW3-10	ON = Signal Ground and Earth Ground are Connected OFF = Signal Ground and Earth Ground are Separated
--------	---

Installation

Connecting to a Transmission Line

The modem has a transmission line interface that can be configured for 2- or 4-wire, analog connection, where one pair is used to transmit data (Tx and Tx) and one pair is used to receive data (Rx and Rx). Table 2-7 shows the pin numbers and corresponding signals for the modem. Figure 2-3 shows the transmission line interface.

Note: For communication to occur, the Rx line of one modem must connect to the Tx line of the other modem. The modem's Tx/Rx pair are non-polarized.

Note: The modem does not support leased-line operations with DC current.

Table 2-7. Transmission Line Connector Pin Assignments

This Pin Number...	Corresponds to This Signal...
1	Rx
2	Rx
3	Tx
4	Tx

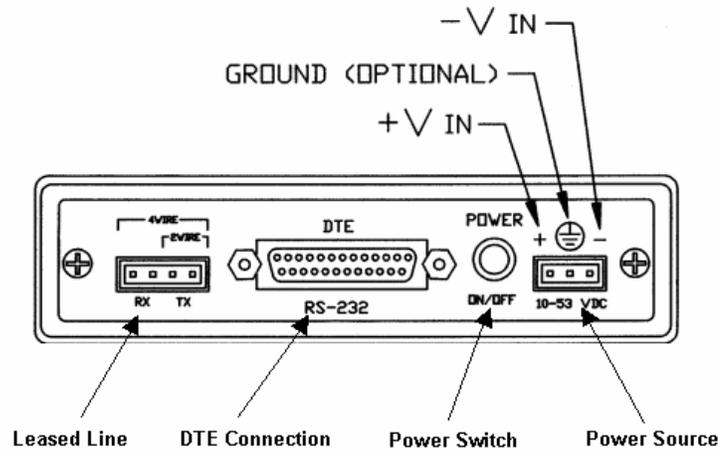


Figure 2-3. Transmission Line Interface

Connecting to a Voltage Source

The back panel of the modem provides the power interface. For convenience, the modems can be powered from the following power sources:

- ❖ Black Box® MD1980A (AC version): 85 to 265 Volts AC, 50 to 60 Hz, single phase. An AC adapter and cable are provided for this connection (see Figure 2-4).
- ❖ Black Box® MD1980A-DC (DC version): 10 to 53 Volts DC. The modem comes with a shielded power cord for making this connection.



Figure 2-4. Power Cable Adapter



Before you connect a voltage source, observe the following power supply voltage guidelines. Otherwise, you will void your warranty if the wrong voltage is applied.

- ❖ Be sure the voltage source is within the permitted ranges shown above. Otherwise, your modem and any attached devices may be damaged.
 - ❖ Customer-supplied cables must be suitable for the site environmental conditions.
 - ❖ Screw terminals on the power interface accept 24 to 16 AWG. However, surge protection is guaranteed only if the ground wire is greater than 18 AWG and if there is a solidly earthed ground connection.
 - ❖ Be sure the power source is not controlled by a wall switch, which can be inadvertently turned off, shutting off power to the modem.
-

Connecting an RS-232 Device

The modem back panel provides a female, 25-pin RS-232 connector that accepts an attached RS-232 device (see Figure 2-1 on page 7). This connector accepts a standard connection to a DTE (RTU) that conforms to the pin assignments shown under “RS-232 (DTE) Interface” on page 34.

LEDs

The front panel of the modem provides the LEDs shown in Table 2-8.

Table 2-8. Modem LEDs

LED	Color	Description
PWR	Green	Power Input
RTS	Yellow	Request To Send
CTS	Yellow	Clear To Send
TD	Yellow	Transmit Data
RD	Yellow	Receive Data
CD	Yellow	Carrier Detect
MR	Yellow	Modem Ready
ALB	Red*	Analog Loopback
DLB	Red*	Digital Loopback
* When the modem is in remote loopback, both the ALB and DLB LEDs go ON.		

Installation

Loopback Control Switch

The front panel of the modem has a push button for initiating the following loopback diagnostic tests:

- ❖ Local analog loopback — started by pressing the button one time.
- ❖ Local digital loopback — started by pressing the button two times.
- ❖ Remote digital loopback — set the local modem's RTS signal to low. Then press the remote modem's diagnostics button three times and raise the local modem's RTS signal to start the test. The **ALB** and **DLB** LEDs go ON when the modem is in remote digital loopback. This test is only available in fast-poll mode only.

Figure 2-5 illustrates these three diagnostics.

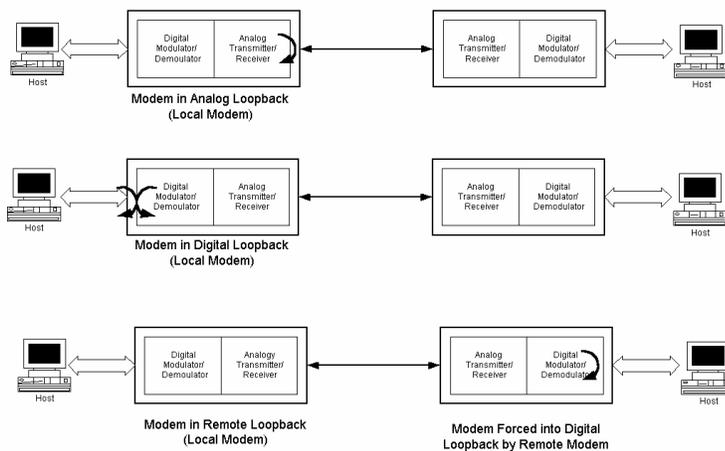


Figure 2-5. Loopback Diagnostics

Appendix A

Troubleshooting

In the event you encounter a problem using your Telenetics modem, refer to the troubleshooting information in this appendix.



IMPORTANT

If you encounter a problem with your modem, be sure the switches on the bottom of the modem are set to the appropriate positions. If a switch is halfway between an on and off setting, the modem will not operate properly.

Problem Solving

Table A-1 offers troubleshooting solutions for modem problems.

Table A-1. Troubleshooting Suggestions

If...	Perform These Procedures...
Modem does not respond to the attached DTE and the all LEDs are off.	Check the power supply input for your specific model (see page 23).
Modem does not receive data, and the DCD and RxD LEDs are off.	The receive line pair may be disconnected from the modem. Make sure the transmission line connection to the modem is accurate and secure. The receive signal level may be below the CD threshold. Set SW1-5 ON to see whether configuring the modem for a -43 dBm threshold resolves the problem.

Troubleshooting

Table A-1. Troubleshooting Suggestions

If...	Perform These Procedures...
The RTS , CTS , and TxD LEDs do not blink.	The attached terminal or DTE may not be sending data to the modem. Verify that data is being transmitted. If data is being transmitted, make sure the RS-232 cable is sound and securely connected to the modem and terminal or DTE.

Appendix B

DIP Switch Summary

Switches	Switch Settings	
	ON	OFF (Default)
SW1-1 – 1-4: Transmit Level (page 11)	(see Table 2-2 on page 11)	
SW1-5: Receiver Dynamic Range (page 12)	-10 to -43 dBm	+3 to -30 dBm
SW1-6: TX Cable Equalizer (page 12)	Enabled	Disabled
SW1-7: RX Cable Equalizer (page 12)	Enabled	Disabled
SW1-8: Anti-streaming (page 12)	Active	Inactive

SW2-1: FSK Mode (page 14)	V.23	Bell 202
SW2-2: Receiver Squelch (page 14) (valid for FSK mode, 2-wire half-duplex operation only)	Turnaround Squelch (Bell 202): 8ms Turnaround Squelch (V.23): 150ms	Turnaround Squelch (Bell 202): 0ms Turnaround Squelch (V.23): 0ms
SW2-3: FSK Soft Carrier (page 15)	Disabled	Enabled
SW2-4 and SW2-5: FSK RTS-CTS Delay (page 15)	(see Table 2-4)	
SW2-6: FSK CD Delay (page 16)	23ms	6ms
SW2-7: Remote Loopback (page 16)	Enabled	Disabled
SW2-8: Reserved (Test Only) (page 16)	Test	Normal

SW3-1: Fast Poll/FSK (page 18)	FSK	Fast Poll Auto-Rate
SW3-2: Data Rate (page 19)	4800 bps	9600 bps

DIP Switch Summary

Switches	Switch Settings	
	ON	OFF (Default)
SW3-3: Async Character (page 19)	11 bits	10 bits
SW3-4: Auto RTS (page 19)	Enabled	Disabled
SW3-5: Transmitter Termination (page 20)	Switched by RTS	600 Ω
SW3-6: Reserved (Test Only) (page 20)	Test	Normal
SW3-7: 2- or 4-wire (page 20)	2-wire, half-duplex	4-wire, full-duplex
SW3-8: Carrier Control (page 21)	Constant	Switched
SW3-9: Rx Termination (page 21)	600 Ω	High Rx Impedance
SW3-10: Signal Ground and Earth Ground Option (page 21)	Connected	Separated

Appendix C

Specifications

General Specifications

Data rate:	9600, 4800, or 0-1800 bps asynchronous
Data format:	8 or 9 data bits with 1 or more stop bits
DTE interface:	EIA RS-232 or V.24 compatible
Line conditions:	TELCO Voice band 4- or 2-wire leased line, conditioned or unconditioned Private metallic circuits up to 9.5 miles (24 AWG) without cable equalizer. Up to 15.0 miles (24 AWG) with TX and RX cable equalizer
Operating modes:	2-wire half-duplex or 4-wire full-duplex
Modulation:	High-speed fast poll – Telenetics proprietary FSK, Bell 202T or V.23 compatible <ul style="list-style-type: none">• Mark = 1200 Hz (1300 Hz, V.23)• Space = 2200 Hz (2100 Hz, V.23)• Soft Carrier = 900 Hz (Bell 202T only)
Equalizer:	Automatic, adaptive
RTS-CTS Delay:	23 ms. (fast poll) 8, 33, 59, or 219 ms (Bell 202) 33 ms (V.23)

Specifications

Receiver

dynamic range: 0 to -30 dBm or -10 to -43 dBm

Operating

temperature: -40°C to +85°C

Power supply:

Wide range switching power supply:

- MD1980A (AC version): 85 to 265Volts AC, 50/60 Hz, single phase or 85 to 400 VDC
- MD1980A-DC (DC version):10 to 53 Volts DC

Surge protection: Leased line, up to 15KV

Carrier control: Constant or switched, DIP switch selectable

Carrier loss

recovery: Train on Data

Throughput delay: Less than 10 milliseconds for fast polling.

Auto RTS: Support DTE without hardware RTS (high speed only)

Anti-Streaming: 27-second timer to prevent transmitter lock-up network

Mechanical Specifications

Enclosure: Aluminum with removable front and rear panels

Dimensions: 5.70" wide x 8.30" long x 1.50" high

Weight: 1.9 lbs.

Interface connectors

Leased line: 4-position screw terminal.

Data Terminal

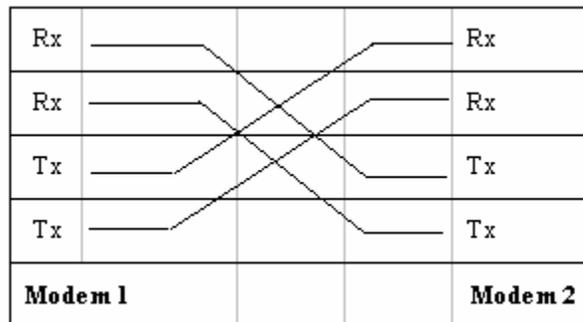
Equipment: DB-25 female connector

Interface Connector Pin Assignments

Leased Line Terminal Block Pin Assignments

This Pin Number...	Corresponds to This Signal...
1	Rx
2	Rx
3	Tx
4	Tx

Back-to-Back Connection to a Second Modem



Specifications

RS-232 (DTE) Interface

Signal Name	Modem Input/Output	DB25 Pin	Description
Earth GND	—	1	Earth Ground
TXD	Input	2	Transmit Data
RXD	Output	3	Receive Data
RTS	Input	4	Request To Send
CTS	Output	5	Clear To Send
DSR	Output	6	Data Set Ready (Modem Ready)
SG	—	7	Signal Ground
DCD	Output	8	Data Carrier Detected
DRS	Input	23	Data Rate Select

Environmental Specifications

Operating temperature: -40 to + 85° C

Storage temperature: -40 to +125° C

Operating humidity: 5 to 95 %, non-condensing.

Line Isolation: 3750 V RMS

Surge protection: Leased line up to 15K VA

Appendix D

Compliances

FCC REQUIREMENTS FOR TELEPHONE-LINE EQUIPMENT

1. The Federal Communications Commission (FCC) has established rules which permit this device to be directly connected to the telephone network with standardized jacks. This equipment should not be used on party lines or coin lines.
2. If this device is malfunctioning, it may also be causing harm to the telephone network; this device should be disconnected until the source of the problem can be determined and until the repair has been made. If this is not done, the telephone company may temporarily disconnect service.
3. If you have problems with your telephone equipment after installing this device, disconnect this device from the line to see if it is causing the problem. If it is, contact your supplier or an authorized agent.
4. The telephone company may make changes in its technical operations and procedures. If any such changes affect the compatibility or use of this device, the telephone company is required to give adequate notice of the changes.
5. If the telephone company requests information on what equipment is connected to their lines, inform them of:
 - a. The telephone number that this unit is connected to.
 - b. The ringer equivalence number.
 - c. The USOC jack required: RJ-11C.
 - d. The FCC registration number.

Compliances

Items (b) and (d) can be found on the unit's FCC label. The ringer equivalence number (REN) is used to determine how many devices can be connected to your telephone line. In most areas, the sum of the RENs of all devices on any one line should not exceed five (5.0). If too many devices are attached, they may not ring properly.

6. In the event of an equipment malfunction, all repairs should be performed by your supplier or an authorized agent. It is the responsibility of users requiring service to report the need for service to the supplier or to an authorized agent.

CERTIFICATION NOTICE FOR EQUIPMENT USED IN CANADA

The Canadian Department of Communications label identifies certified equipment. This certification means that the equipment meets certain telecommunications-network protective, operation, and safety requirements. The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single-line individual service may be extended by means of a certified connector assembly (extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility—in this case, your supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines, and internal metallic

Compliances

water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

CAUTION:

Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

The LOAD NUMBER (LN) assigned to each terminal device denotes the percentage of the total load to be connected to a telephone loop which is used by the device, to prevent overloading. The termination on a loop may consist of any combination of devices, subject only to the requirement that the total of the load numbers of all the devices does not exceed 100.

FEDERAL COMMUNICATIONS COMMISSION AND CANADIAN DEPARTMENT OF COMMUNICATIONS RADIO FREQUENCY INTERFERENCE STATEMENTS

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart B of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of the Canadian Department of Communications.

Compliances

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par le ministère des Communications du Canada.

NORMAS OFICIALES MEXICANAS (NOM) ELECTRICAL SAFETY STATEMENT INSTRUCCIONES DE SEGURIDAD

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.
2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.
3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.
4. Todas las instrucciones de operación y uso deben ser seguidas.
5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc.
6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.
7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.
8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.
9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquear la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.
10. El equipo eléctrico debe ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.

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11. El aparato eléctrico deberá ser conectado a una fuente de poder solo del tipo descrito en el instructivo de operación, o como se indique en el aparato.
12. Precaución debe ser tomada de tal manera que la tierra física y la polarización del equipo no sea eliminada.
13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.
14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.
15. En caso de existir, una antena externa deberá ser localizada lejos de las líneas de energía.
16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.
17. Cuidado debe ser tomado de tal manera que objetos líquidos no sean derramados sobre la cubierta u orificios de ventilación.
18. Servicio por personal calificado deberá ser provisto cuando:
 - a. El cable de poder o el contacto ha sido dañado; u
 - b. Objetos han caído o líquido ha sido derramado dentro del aparato; o
 - c. El aparato ha sido expuesto a la lluvia; o
 - d. El aparato parece no operar normalmente o muestra un cambio en su desempeño; o
19. El aparato ha sido tirado o su cubierta ha sido dañad



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