Telenetics

MOT202TSA/MOT202TRM
Modem User's Guide

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Chapter 1
Introduction

The Telenetics MOT202TSA standalone modem and MOT202TRM rack-mount modem are Frequency Shift Keyed (FSK) modems designed for asynchronous half-duplex communication on 2-wire private line circuits or full-duplex communication on 4-wire private-line circuits.

Summary of Key Features

The following list summarizes the modem's key features.

- Bell 202T compatible

- Operates over voice-grade leased lines or private lines

- 0 to 1200 bps operation for unconditioned line.

- 0 to 1800 bps operation for conditioned line (C2).

- Point-to-point or point-to-multipoint polling network

- 4-wire full-duplex or 2-wire half-duplex leased-line configuration.

- Analog Loopback Test, Digital Loopback Test, Self Test, and Test Pattern Transmit.

- LED displays for power, RS-232 control, data status, and test mode.

Models

The Telenetics modem is available in two models:

❖   The MOT202TSA is a desktop modem.

❖   The MOT202RTM is a rack-mount modem that installs into a standard 19-inch rack.

In this manual, the term "modem" will be used to refer to both models collectively. If information pertains to one model only, that model will be identified by its model number.

Using This Manual

This manual contains all the information you need to install, configure, use, and test your modem.

❖   Chapter 1 contains general information on what the 202T modem does, contents of this manual, and contact information for Telenetics.

❖   Chapter 2 describes how to install and configure the modem.

❖   Chapter 3 provides general operating procedures.

❖   Chapter 4 provides troubleshooting procedures.

❖   Chapter 5 lists the modem's specifications.

Contact Information

For more information about Telenetics' MOT202TSA and MOT202TRM modems, or other Telenetics solutions, please contact us using any of the following methods.

Voice Calls
We welcome your calls at **(949) 455-4000** Monday through Friday, from 8:00 am to 5:00 pm Pacific Time.

Fax Number
You can also send your requests for information to our 24-hour fax number: **(949) 455-4010**.

E-mail
If you prefer, you can send information requests to our 24-hour e-mail address: **sales@telenetics.com**.

Website
Our website contains valuable information about our products. We encourage you to visit us online at **www.telenetics.com**.

Introduction

Chapter 2
Installing the Modem

This chapter describes how to install the modem.

Site Preparation

The location where you install your modem should be:

- Within six feet of a 115 or 230 VAC grounded outlet not controlled by a wall switch

- No more than 50 feet from the data terminal equipment

- Away from extremes of temperature, humidity, and appreciable shock.

Note: Be sure that there is a 4-inch minimum space at the back of the modem for signal line and interface cable clearance.

Unpacking Your Hardware

Your package should include at least one MOT202TSA or MOT202TRM modem, one RJ-45 jack-to-4 wire leased line cable, and this Installation 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:

❖ *All users*: an RS-232 cable to connect a data terminal. The cable must conform to the pin assignments shown on page 29.

❖ *Standalone modem users*: a two- or four-wire transmission line or leased line and power supply.

❖ *Rack-mount modem users*: a modem rack and an available slot in the rack for installing the modem.

Hardware Overview

Figures 2-1 and 2-2 show the front and back modem panels.

Figure 2-1. Front Panel

Figure 2-2. Back Panel

On the front panel of the modem, there are:

❖ One Power LED and six status LEDs (see page 21)

❖ A rotary test switch (see page 22)

On the back panel of the MOT202TSA modem, there are:

❖ A power cord or power input connector

❖ A power switch for turning the modem on and off

❖ A fuse, 3/8 amp, 250 Volt, slow-blow

❖ A DB25 female connector for accommodating a DTE device

❖ An RJ-45 connector for connecting to a communications line

Configuring the Modem

The modem obtains some operating characteristics from jumper settings. The default jumper settings are for common 4-wire full-duplex applications. To reconfigure the modem for 2-wire half-duplex and special applications, you must change the default jumper settings.

To change jumper settings, push the two tabs on the back of the modem to open the modem cover and gain access to the jumper settings on the printed circuit board (see Figure 2-3). Then set the jumpers to the desired settings and replace the cover.
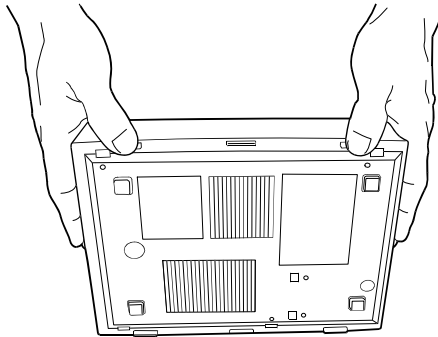
Figure 2-3. Gaining Access to the Modem Jumpers

Figure 2-4 on the next page shows the location of the modem jumpers. Table 2-1 on page 13 summarizes the jumper settings (default settings are **bold**).

Installation
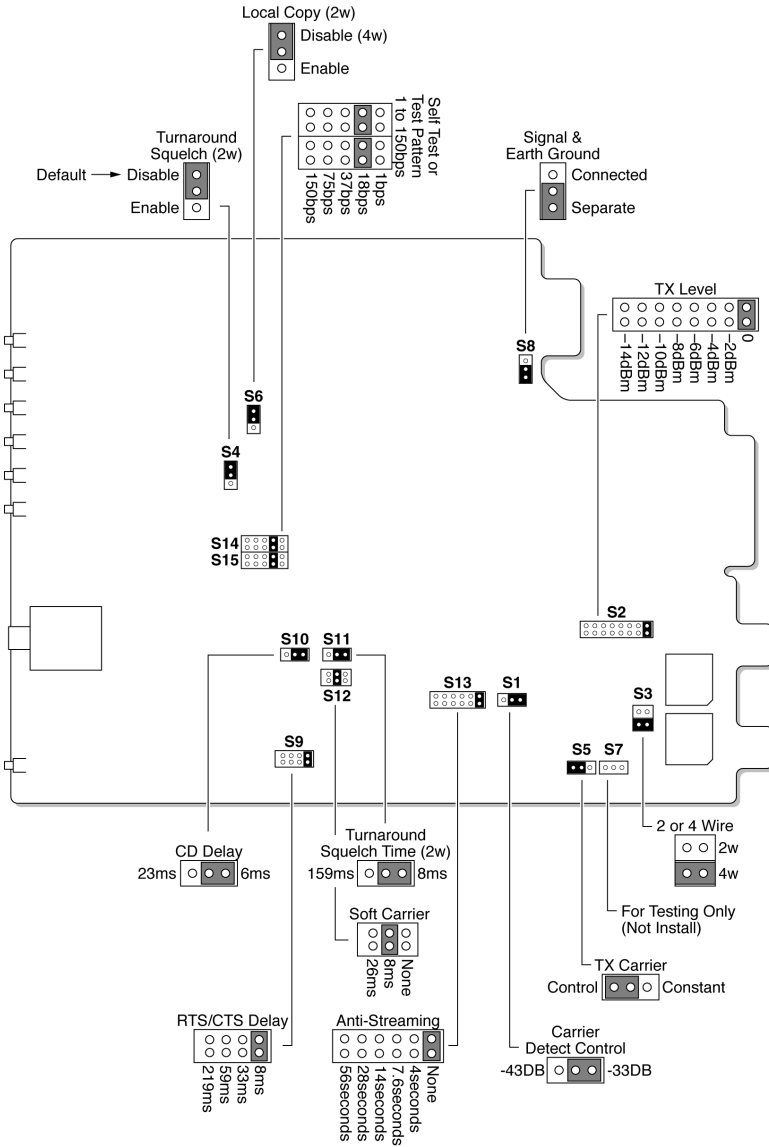
Figure 2-4. Modem Jumper Locations

Table 2-1. Jumper Settings

Jumper	Function	Settings	See Page…
S1	Carrier Detect control	**-33 dBm** **-**43 dBm	14
S2	Transmit level	**0dBm** -2 dBm -4 dBm -6 dBm -8 dBm -10 dBm -12 dBm -14 dBm	14
S3	2-wire/4-wire mode	2-wire **4-wire**	15
S4	Call turnaround squelch	Enabled **Disabled**	15
S5	Transmit carrier	**Control** Constant	16
S6	Local copy	Enabled **Disabled**	16
S8	Signal and Earth ground	Connected **Separate**	16
S9	RTS-CTS delay	**8 ms** 33 ms 59 ms 219 ms	17
S10	Carrier Detect delay	**6 ms** 23 ms	17
S11	Turnaround squelch time (Enabled by jumper **S4**)	**8 ms** 159 ms	17
S12	Soft Carrier turn off	None **8 ms** 26 ms	18
S13	Anti-streaming	**None** 4 seconds 7.6 seconds 14 seconds 28 seconds 56 seconds	18
S14 and **S15**	Self Test or test pattern (Tx and Rx pattern speed)	1 bps **18 bps** 37 bps 75 bps 150 bps	19

Note: The jumper positions in the following sections reflect the position of the jumpers on the modem board when you face the board as indicated in Figure 2-4 on page 12.

Jumper S1 – Carrier Detect Control
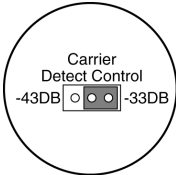
Settings: -33 dBm (*default*)
-43 dBm

Jumper **S1** configures the dynamic range of the modem receiver. The selections are either –33 dBm or –43 dBm. If the incoming signal is above –24 dBm, use the default –33 dBm setting. If the modem is operated on the network, use the –43 dBm setting.

Jumper S2 – Transmit Level
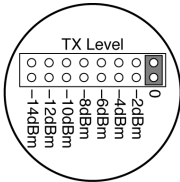
Settings: 0 dBm (*default*)
-2 dBm
-4 dBm
-6 dBm
-8 dBm
-10 dBm
-12 dBm
-14 dBm

Jumper **S2** adjusts the modem's transmit level. There are eight transmit level settings you can choose. By default, the modem uses a transmit level of 0 dBm.

Jumper S3 – 2-wire/4-wire Mode

Settings: 2-wire
4-wire (*default*)

2 or 4 Wire
○ ○ 2w
○ ○ 4w

Jumper **S3** configures the modem for 2-wire or 4-wire operation.

❖ When configured for 4-wire full-duplex operation, jumper **S5** can be strapped to maintain constant carrier from the master modem to all slave modems at all times after the initial training. This enables the master modem to transmit data to the slave modems, with no RTS-to-CTS delay. This is the preferred operating mode when minimum turnaround is desired.

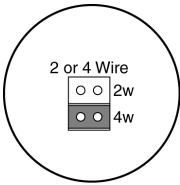❖ When configured for 2-wire half-duplex operation, the modem encounters an RTS-to-CTS delay when transmitting to slave modems, increasing the turnaround time. Set jumper **S5** to controlled carrier for 2-wire half-duplex operation.

Jumper S4 – Call Turnaround Squelch

Settings: Enabled
Disabled (*default*)

Turnaround
Squelch (2w)
Default → Disable ○
○
Enable ○

Jumper **S4** configures the modem's Call Turnaround Squelch setting. For 2-wire, half-duplex communications, set this strap to the Enabled position. In this position, the receiver is inhibited for a period of time after the local transmitter is turned OFF. This guards against echoes caused by the transmission just completed. The time is determined by the turnaround squelch time option (jumper **S11**).

For 4-wire, full-duplex communications, keep the jumper set to the default position of Disabled.

Installation

Jumper S5 – Transmit Carrier
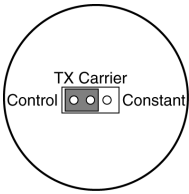
Settings: Control (*default*)
                                Constant

Jumper **S5** places the transmitter under terminal control (default) or turns on the transmitter continuously in a 2-wire half duplex system.

Jumper S6 – Local Copy
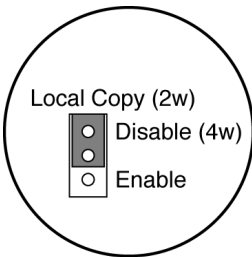
Settings: Enabled
                                Disabled (*default*)

Jumper **S6** must be left is the default position of Disabled when operating on a 4-wire network. It is also normally left in the default Disabled position when operating on a 2-wire network. Strapping this jumper as Disabled inhibits the local receiver from receiving the transmission of the local transmitter.

Jumper S8 – Signal and Earth Ground
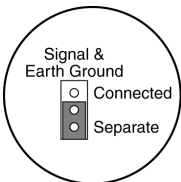
Settings: Connected
                                Separate (*default*)

Jumper **S8** allows Earth GND to be tied to the modem system GND.

Jumper S9 – RTS-CTS Delay
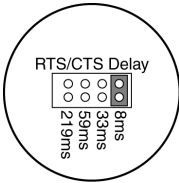
Settings: 8 ms (*default*)
33 ms
59 ms
219 ms

Jumper **S9** configures the modem's RTS-CTS delay. Four choices for selecting an RTS-CTS delay are available.

Jumper S10 – Carrier Detect Delay
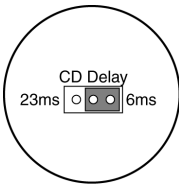
Settings: 6 ms (*default*)
23 ms

Jumper **S10** configures the modem's Carrier Detect turn on Delay timing. The delay chosen must be consistent with the Clear To Send delay selection of the transmitting modem and must be less than the CTS delay. The available delays are 6 ms (default) and 23 ms. The carrier detect drop out is less than 6 ms.

Jumper S11 – Turnaround Squelch Time
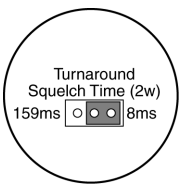
Settings: 8 ms (*default*)
159 ms

Jumper **S11** is used with the call turnaround squelch option (jumper **S4**). The available times are 8 ms (default) and 159 ms.

Jumper S12 – Soft Carrier Turn Off

Soft Carrier
None
8ms
26ms
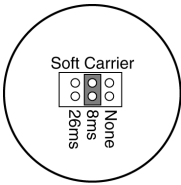
Settings: None
8 ms (*default*)
26 ms

Jumper **S12** configures the modem to either turn off the transmitter immediately upon release of Request To Send, or send a Soft Carrier Turn Off signal of 900 Hz for 8 or 26 ms at the end of each transmission.

Jumper S13 – Anti-Streaming

Anti-Streaming
None
4seconds
7.6seconds
14seconds
28seconds
56seconds
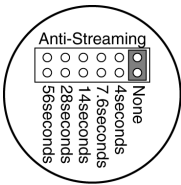
Settings: None (*default*)
4 seconds
7.6 seconds
14 seconds
28 seconds
56 seconds

Jumper **S13** lets you select an anti-streaming time or use no anti-streaming at all. Anti-streaming is typically used in multi-point applications to prevent a malfunctioning slave from occupying the line indefinitely.

When anti-streaming is active, the modem can only transmit data for up to 56 seconds. Thereafter, the modem's transmitter is automatically turned off. The modem then looks for an ON-to-OFF transition of Request To Send (RTS) before proceeding with normal operation.

Jumpers S14 and S15 – Self Test or Test Pattern
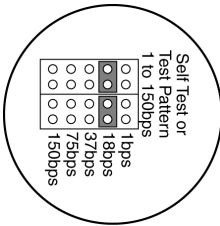
Settings: 1 bps
18 bps (*default*)
37 bps
75 bps
150 bps

Jumpers **S14** and **S15** configures the modem for Self Test or Test Pattern. When the modem is in local Self Test or Test Pattern mode, it generates a dot test pattern. The supported baud rates are 1 bps, 18 bps, 37 bps, 75 bps, or 150 bps.

Connecting a DTE

The modem back panel provides a standard, 25-pin port labeled **DTE**, which connects to an RS-232 device. The connectors for this port conform to the pin assignments shown under "DTE Connector – EIA RS-232-C" on page 29.

The DTE should have a cable no longer than 50 feet, with a Cinch or Cannon plug per DB-19604-432 plus a DB-51225-1 hood or equivalent.

Connecting to a Private Line Communication Circuit

The modem back panel provides an 8-pin RJ-45 connector labeled **TELCO**, which connects to a private line communication circuit. The connectors for this port conform to the pin assignments shown under "Telco Connector" on page 29.

Connecting to an AC Power Source

The modem back panel provides an AC line cord. If the chassis ground is connected through the third prong of the AC power plug, a separate chassis ground wire is required.

Installation

Powering-on the Modem

To supply power to the modem, place the POWER ON switch on the modem back panel to the ON position. The **PWR** LED on the front panel goes ON.

Powering-off the Modem

To turn off power to the modem, place the POWER ON switch on the modem back panel to the OFF position. The **PWR** LED on the front panel goes OFF.

Chapter 3
LEDs and Controls

T his chapter describes the LEDs and controls on the modem.

Front Panel LEDs

Table 3-1 describes the LEDs on the modem front panel.

Table 3-1. Front Panel LEDs

LED	Status
PWR	ON = power is being supplied to the modem.
TM	ON = the rotary switch is turned to Analog or Digital Loopback, or the switch is in the Test Pattern transmit mode or Self Test mode and no error is detected.
CD	ON = the modem is detecting a valid carrier.
RD	ON = data is being received or receive data line is in a space condition.
RS	ON = the Request-to-Send line from the DTE is ON.
CS	ON = the Clear-to-Send line from the modem is ON.
TD	ON = data to be transmitted is being furnished to the modem.

Front Panel Test Switch

The modem front panel has a five-position rotary switch that lets you select the modem's operating mode. The five switch positions are:

❖ **DATA** — use this position for normal data transmissions.

❖ **AL** (Analog Loopback) — this position prepares the modem for testing by the local terminal device. The transmitter output of the modem is disconnected from the output coupling transformer and connected to the modem receiver input. See Figure 3-1.

❖ **DL** (Digital Loopback) — this position configures the modem to loop back received data to the transmitter and transmit the data to the remote end. The RS-232-C interface to the terminal is not active during this test. See Figure 3-2.

❖ **ST** (Self Test) — this position inhibits the modem from transmitting and receiving data on the COMM LINE. The RS-232-C interface to the terminal is not active during this test. See Figure 3-3.

The test pattern (dot pattern) passes through the transmitter, loops back into the receiver, is demodulated, and is checked for errors. If errors occur, the **TM** LED turns OFF and remains OFF for a period of time that depends on the pattern generator baud rate.

In Analog Loopback and Self Test modes, the received analog data is buffered, amplified by 16 dB (if output level is set to 0 dB), and routed out on the transmit analog pair.

❖ **TTP** (Transmit Test Pattern) — this setting forces the transmitter on and transmits data from the test generator to the COMM LINE. The RS-232-C interface lines (RTS, CTS, and Transmit Data) to the transmitter are not active. See Figure 3-4.

The **TM** LED goes ON when the receive data is good. If there are errors, or if the received data does not compare with the transmitted data, the **TM** LED goes off. The RS-232-C interface lines to the receiver are active during this mode.

Figure 3-1. Analog Loopback Test

Local Modem
Analog LoopBack Mode

Remote Modem
Data Mode

DTE

RXD
RECEIVER

PAD

Amplifier

TRANSMITTER

TXD
TRANSMITTER

RECEIVER

DTE

4-Wire Telephone Line

Local Modem
Local Digital LoopBack Mode

Remote Modem
Data Mode

DTE

RECEIVER

TRANSMITTER

TRANSMITTER

RECEIVER

DTE

4-Wire Telephone Line
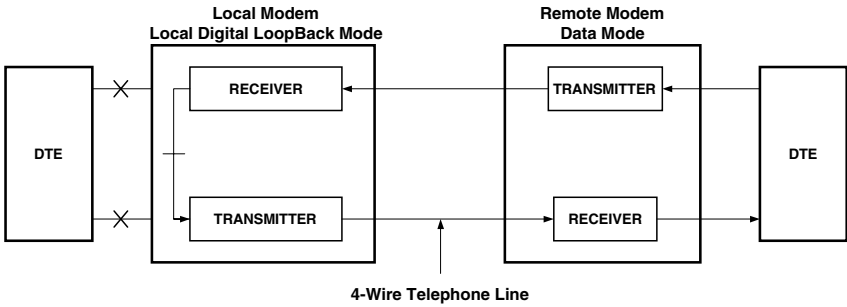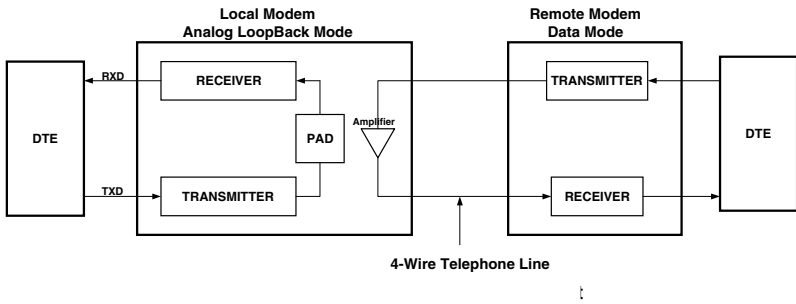
Figure 3-2. Digital Loopback Test

Troubleshooting

Modem
Self Test Mode

DTE

TEST PATTERN → TRANSMITTER

PAD

Amplifier

TX

ERROR CHECK ← RECEIVER

RX

TM

4-Wire Telephone Line

Figure 3-3. Self Test

Local Modem
Send Test Pattern Mode

Remote Modem
Receive Test Pattern Mode

TM

DTE

SPEED SELECT

TEST PATTERN → TRANSMITTER

RECEIVER → ERROR CHECK

DTE

2-Wire Telephone Line
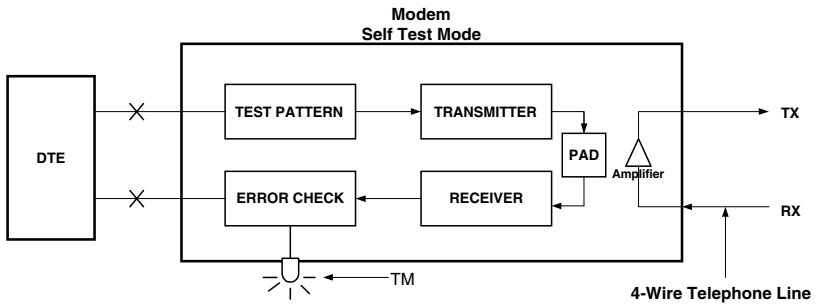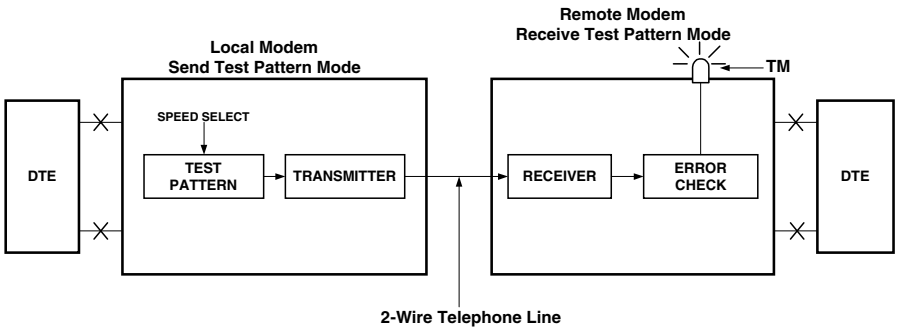
Figure 3-4. Transmit Test Pattern

Chapter 4
Troubleshooting

T his chapter describes troubleshooting procedures you can use in the unlikely event you encounter a problem with your modem.

Local Modem Test

The local modem test verifies the local modem's transmitter, receiver, and connection to the locally attached DTE. This test can be run either by generating a data pattern from the locally attached DTE or by having the modem generate a test pattern.

The following procedure describes how to run the local modem test using a locally attached DTE to generate a data pattern.

1. Using the front panel test switch, place the modem in Analog Loopback mode.

2. Turn on the Request To Send line.

3. Use the locally attached DTE to transmit the data pattern and check for data errors on the Receive Data line.

The following procedure describes how to run the local modem test using the modem test pattern instead of a data pattern originated by the local DTE.

1. Using the front panel test switch, place the modem in Self Test mode.

2. The **TM** indicator should turn ON. If the indicator turns OFF or flashes, errors are occurring.

Line and Modem Test

The line and modem test verifies the local modem, the remote modem, and the communications line between them. With this test, the local modem loops back received data to the transmitter and transmits the data to the remote modem. These characters can originate either from a locally attached DTE or by having the modem generate a test pattern.

The following procedure describes how to run the line and modem test using a locally attached DTE to generate a data pattern.

1. Place the remote modem in Digital Loopback mode.

2. Place the local modem in Data mode and transmit a data pattern. Check for data errors on the Receive Data line

The following procedure describes how to run the line and modem test using the modem test pattern instead of a data pattern originated by the local DTE.

1. Place the remote modem in Remote Test mode.

2. Place the local modem in Remote Self Test mode. The **TM** LED should turn ON and remain ON if the data is error free.

Chapter 5
Specifications

T his chapter lists the specifications for the modem.

General

Operation:	2-wire half-duplex or 4-wire full-duplex private line operation.
Data rate:	0-1200 bps asynchronous on worst case line. 0-1800 asynchronous on C2 conditioned line
Modulation:	Phase coherent. Frequency Shift Keyed (FSK)
Carrier frequencies:	Mark 1200 Hz ±1% Space 2200 Hz ±1%
Line impedance:	600 ohms ±10% transformer coupled and transient protected.
Transmitter output level:	Selectable from 0 to –14 dBm, in 2 dB steps.
RTS-CTS delay:	8, 33, 59, or 219 ms
Carrier Detect delay:	6 or 23 ms OFF-to-ON, 6 On-to-OFF
Digital interface:	EIA RS-232-C and CCITT V.24.
Package:	Standalone, UL approved.
Turnaround squelch:	8 ms or 159 ms
Anti-streaming:	Option to turn transmitter OFF after selected time, even if RTS is ON

Specifications

Test features:	Self Test, Analog Loopback, Digital Loopback, and Test Pattern Transmit

Dimensions and Weight

Width:	7.00 inches (17.8 cm)
Length:	9.60 inches (24.4 cm)
Height:	2.25 inches (5.7 cm)

Temperature Range

Operating:	-40 to +85 degrees Celsius
Storage:	-40 to +85 degrees Celsius
Humidity range:	95% relative, non-condensing

Power Requirements

❖ 115 VAC + or – 10%: 50/60 Hz

❖ 230 VAC + or – 10%: 50/60 Hz

❖ 12 to 60 VDC

For applicable models.

Interface Pin Assignments

DTE Connector - EIA RS-232-C

Pin	RS-232C Circuit	CCITT V.24 Circuit	Function
1	AA	101	Protective Ground
2	BA	103	Transmitter Data
3	BB	104	Receive Data
4	CA	105	Request to Send
5	CB	106	Clear to Send
6	CC	107	Data Set Ready
7	AB	102	Signal Ground
8	CF	109	Data Carrier Detect
9	—	—	+12 Volts Test Only
10	—	—	-12 Volts Test Only
25	—	—	Analog Loopback

Note: All interfaces on the RS-232-C digital connector conform to the requirements of EIA-RS-232-C.

Telco Connector

Pin	Description
4, 5	2-wire mode: transmit/receive pair. 4-wire mode: transmit pair.
3, 6	Receive pair for 4-wire mode.
Polarity of transmit pair or receive pair is not significant. Remaining pins are not used.	

Specifications

Appendix A
Compliances

FCC Rule

This device complies with Part 15A of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15A of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

❖ Reorient or relocate the receiving antenna.

❖ Increase the separation between the equipment and the receiver.

❖ Connect the equipment to an outlet on a circuit other than the one to which the receiver is connected.

❖ Consult the dealer or an experienced radio/TV technician for help.

If none of these actions resolves the problem, consult your distributor or an experienced radio/television technician for additional suggestions.

Additionally, Section 15.838, paragraph d), of the FCC Rules and Regulations states: "Where special accessories, such as shielded cables, are required in order to meet FCC regulations, shielded cables must be used with this equipment. Operation with non-approved equipment or unshielded cables is likely to result in interference to radio and TV reception. The user is cautioned that changes and modifications to this equipment without the approval of the manufacturer could void the user's authority to operate this equipment.

Compliances

Department of Canada Statement

This Class A digital apparatus meets all requirements of the Canadian
Interference-Causing Equipment Regulations.

Cet appareil numerique de la classe A respecte toutes les exigences du
Reglement sur le materiel brouilleur du Canada.

Appendix B
Limited Product
Warranty

Telenetics warrants that the Product sold will be free from defects in material and workmanship and perform to Telenetics' applicable published specifications for a period of 18 months from the date of delivery to Customer or 12 months from placement into service, whichever occurs first. The liability of Telenetics hereunder shall be limited to replacing or repairing, at its option, any defective Products which are returned F.O.B., Telenetics' facility, Lake Forest, California (or, at Telenetics' option refunding the purchase price of such products). In no case are Products to be returned without first obtaining permission and a customer return order number from Telenetics. In no event shall Telenetics be liable for any consequential or incidental damages.

Products which have been subject to abuse, misuse, accident, alteration, neglect, unauthorized repair or installation are not covered by the warranty. Telenetics shall make the final determination as to the existence and cause of any alleged defect. No liability is assumed for expendable items such as lamps and fuses. No warranty is made with respect to custom products or Products produced to Customer's specifications except as specifically stated in writing by Telenetics in the agreement for such custom products.

This warranty is the only warranty made by Telenetics with respect to the goods delivered hereunder, and may be modified or amended only by a written instrument signed by a duly authorized officer or Telenetics and accepted by Customer.

This warranty and limitation extends to customer and to users of the product and is in lieu of all warranties with respect to the product whether express, implied, or statutory, including without limitation the implied warranties of merchantability and fitness for a particular purpose.

Limited Product Warranty