

Model MT202TD

1200 BPS Leased Line Modem

User Guide



User Guide
MT202TD
P/N 82096501 Revision B

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Revision	Date	Description
B	3/30/01	DIP Switch settings updated. Moved connections into separate section.

PATENTS

This device is covered by one or more of the following patents:

6,031,867; 6,012,113; 6,009,082; 5,905,794; 5,864,560; 5,815,567; 5,815,503; 5,812,534; 5,809,068; 5,790,532; 5,764,628; 5,764,627; 5,754,589; D394,250; 5,724,356; 5,673,268; 5,673,257; 5,644,594; 5,628,030; 5,619,508; 5,617,423; 5,600,649; 5,592,586; 5,577,041; 5,574,725; D374,222; 5,559,793; 5,546,448; 5,546,395; 5,535,204; 5,500,859; 5,471,470; 5,463,616; 5,453,986; 5,452,289; 5,450,425; D361,764; D355,658; D355,653; D353,598; D353,144; 5,355,365; 5,309,562; 5,301,274. Other Patents Pending

TRADEMARKS

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Chapter 1 - Introduction and Description

Introduction

This manual provides instruction for installing, cabling, operating, and troubleshooting Multi-Tech System's model MT202TD 1200 bps modem.

Description

The MT202TD is a low speed asynchronous modem which employs Frequency Shift Keyed (FSK) modulation and works in full duplex over four-wire or in half-duplex over two-wire leased line networks.

The MT202TD is compatible with all Western Electric series 202 leased line data sets, except those with reverse channel. The MT202TD is compatible with Western Electric 202 and 202T data sets as well as older 202-C, 202-D, 202-E, and 202-R models.

Technical Specifications

Your MT202TD modem meets the specifications listed below:

Model Number	MT202TD
Data Rate	0–1200 bps
Compatibility	Western Electric 202 and 202T Data Sets, 202C, 202D, 202E, 202R models
Mode of Operation	2-wire half duplex or 4-wire full duplex
Line Requirements	2- or 4-wire leased line unconditioned
Modulation	Frequency Shift Keyed (FSK)
Carrier Frequencies	Mark: 1200Hz; Space: 2200Hz; Soft Carrier: 900Hz
Transmit Level	-0 dBm Adjustable to -9 dBm via Dip switch
Frequency Stability	±0.01% (crystal controlled)
Receiver Sensitivity	-40 dBm under worst case conditions
Timing	Request to Send/ Clear to Send: 180 ms Carrier Detect: Turn on 30 ms Turn off 10 ms Receiver Squelch: Default 156 ms Soft Carrier: Default 25 ms Minimum 10 ms

Interface	EIA RS-232C / ITU-T V.24
Connectors	One DB-25 RS-232 C connector (25-pin female connector), external power transformer, RJ11 line jack
Diagnostics	Analog loopback and digital loopback
Indicators	LEDs for Transmit Data, Receive Data, Carrier Detect, Clear to Send, Request to Send, Data Set Ready, and Test Mode
Controls	Switches for analog loopback and digital loopback tests, DIP switch for 2- or 4-wire leased line selection, Local Copy, 0 or -9dBm transmit level selection, Request to Send, and Receiver Squelch
Operating Temperature	0° to 50° C (32° to 120° F)
Power Requirements	117 VAC, 60Hz, .1 amp
Dimensions MT202TD	10.8 cm wide x 14.8 cm long x 2.9 cm high (4.25 inches wide x 5.8 inches long x 1.15 inches high)
Weight	224 g (8 oz.)
Limited Warranty	Two years

Chapter 2 - Installation and Connection

Introduction

The installation of the MT202TD consists of setting DIP switches to the appropriate settings and then making the serial, phone line, and electrical power connections.

Power

Power is supplied to model MT202TD through an AC power transformer. The transformer supplies low voltage DC to the modem and plugs into any conventional 117 VAC, 60 Hz, power outlet.

Warning: Use only the power transformer supplied with the modem. Use of any other transformer could cause damage to the modem.

Safety Warnings

- Never install telephone wiring during a lightning storm.
- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
- This product is to be used with UL- and CUL-listed computers.
- Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines.
- Avoid using a telephone (other than a cordless type) during an electrical storm. There is a remote risk of electrical shock from lightning.
- Do not use the telephone to report a gas leak in the vicinity of the leak.
- To reduce the risk of fire, use only 26 AWG or larger telecommunication line cord.

Unpacking the Modem

Remove all items from the box.

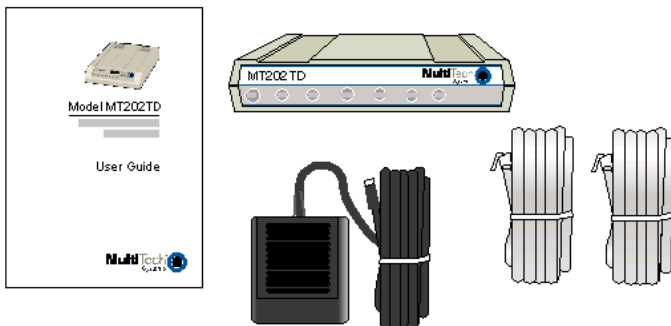


Figure 2-1. Unpacking the MT202TD

The packing box contains the following items:

- One MT202TD modem
- One MT202TD User Guide
- One power transformer
- One RJ11/RJ11 cable
- One RJ11/RJ48 cable

If any of these items are missing, please contact Multi-Tech Systems or your dealer/distributor.

Modem LED Indicators

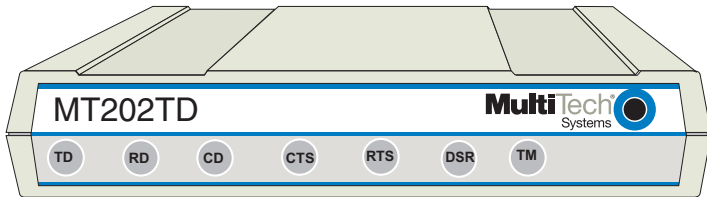


Figure 2-2. LED Display

The MT202TD has seven diagnostic LED indicators. They are:

- TD Transmit Data** - This LED blinks when data is being transmitted: on for a space; off for a mark. The state of this LED matches the TD circuit on Pin 2 of the RS-232C/V.24 interface.
- RD Receive Data** - This LED blinks when data is being received: on for a space; off for a mark. The state of this LED matches that of the RD circuit on Pin 3 of the RS-232C/V.24 interface.
- CD Carrier Detect** - This LED lights when a valid carrier tone has been detected.
- CTS Clear to Send** - This LED lights when the modem responds to a Request to Send signal after a fixed delay. The terminal equipment may start transmitting data after this signal is on (high).
- RTS Request to Send** - This LED lights when the Request to Send signal from the DTE is on.
- DSR Data Set Ready** - This LED lights when the modem is powered on.
- TM Test Mode** - This LED lights when the modem is in Test Mode.

Controls on PC Board

The MT202TD circuitry is on a single printed circuit (PC) board. This board contains one 8-position DIP switch (numbered 1-8), an analog loopback test switch, and a digital loopback test switch. The factory default setting is for 4-wire, full-duplex operation in normal mode. If you are using the modem in a 2-wire configuration or using one of the test modes, you must change the switch positions. Refer to page 19 for switch setting and function information.

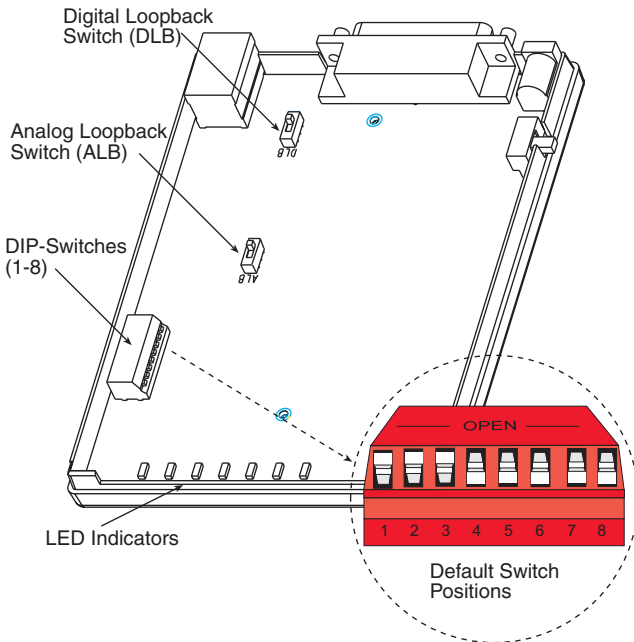


Figure 2-3. PC Board Controls

Computer or Terminal Connections

Your computer or terminal is connected to the MT202TD via the modem's EIA RS-232C / ITU-T V.24 interface connector. This connector is a standard interface, with a 25-socket female connection. Therefore, your computer or terminal requires a standard RS-232C / V.24 cable with a male connector on the modem end, and a male or female connector at the computer or terminal end, depending upon the computer or terminal connector.

Plug the RS-232C / V.24 cable into the RS-232C / V.24 connector on the modem. If screws were provided with your cable, insert and tighten the screws to secure the connection.

Although the RS-232C / V.24 interface connector is designed for 25 signal paths, only eight of these signals are used by the MT202TD.

If your computer or terminal did not come with an RS-232C / V.24 cable, you may purchase a standard "straight-through" RS-232C / V.24 cable from your local computer retailer.

MT202TD RS-232 Signal Descriptions

Pin	MTS Name	Circuits		Function	Signal Source
		EIA	ITU-T		
2	SD	BA	103	Transmitted Data	DTE
3	RD	BB	104	Received Data	DCE
4	RTS	CA	105	Request to Send	DTE
5	CTS	CB	106	Clear to Send	DCE
6	DSR	CC	107	Data Set Ready	DCE
7	SG	AB	102	Signal Ground	-----
8	CD	CF	109	Data Carrier Detector	DCE
9	+V	+V	-----	Test Voltage	DCE

DTE= Data Terminal Equipment (terminal or computer)

DCE= Data Communications Equipment (the modem)

Modem and Phone Line Connection

This section describes how to install and connect the MT202TD.

Installation Steps:

1. Verify that the remote modem is set for Bell 202- or 202T-compatibility.
2. Connect the modem to the leased line jack using one of the two RJ11 cables provided with the modem.
3. Remove the case (see the next page). Verify leased-line transmit level (DIP switch #5) setting is at either 0 dBm (down) or -9 dBm (up). Refer to the following page for more information on DIP switch settings.
4. Attach the MT202TD to your PC or terminal with an RS-232 (or V.24) cable.
5. Connect the power transformer to the modem and an AC outlet.

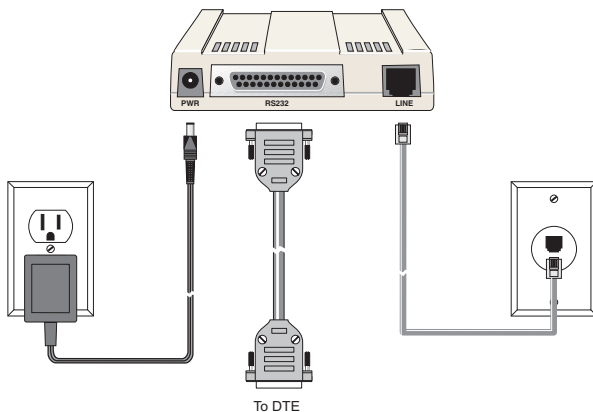


Figure 2-4. Back Panel Connectors

DIP Switch Settings

DIP switches are located on the MT202TD circuit board as shown in Figure 2-3. For information about DIP switch settings and functions, refer to the chart on page 19.

To access the switches, remove the modem's cover.

To remove the cover:

1. Unplug the power transformer from the wall socket.
2. Unplug the phone line.
3. Turn the modem upside down.
4. Remove the two screws.
5. Place the modem right side up.
6. Remove the cover to expose the DIP switches.
7. After completing the necessary DIP switch changes, replace the modem cover and screws before re-connecting the phone and power lines.

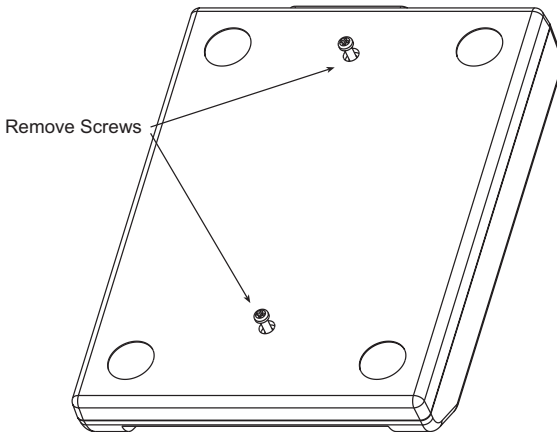


Figure 2-5. Removing Screws

DIP Switch and Switch Settings & Functions

(See Figure 2–3.)

Switch	Function	Position
1	Local Copy Enable	UP*
	Local Copy Suppress	DOWN
2	Two-Wire Lease Line	DOWN
	Four-Wire Lease Line	UP*
3	Two-Wire Lease Line	DOWN
	Four-Wire Lease Line	UP*
4	Two-Wire Lease Line	UP
	Four-Wire Lease Line	DOWN*
5	Transmit 0 dBm	DOWN*
	Transmit -9 dBm	UP
6	Request to Send Forced On	DOWN*
	Request to Send Controlled by DTE on Pin 4	UP
7	Receiver Squelch Enable	DOWN*
	Receiver Squelch Disable	UP

NOTE: UP equals OPEN
DOWN equals CLOSED

ALB	Analog Loopback Test Mode	ALB
	Normal Mode	Normal*
DLB	Digital Loopback Test Mode	DLB
	Normal Mode	Normal*

* Indicates default position

Leased Line Connections

The MT202TD modem operates on leased lines and may be configured in two ways: two-wire or four-wire. In a leased-line application, the line is continuously connected to the modem. In two-wire leased-line applications, only one modem may transmit at a time (this is known as half-duplex). In a four-wire configuration, one pair of wires should connect to the transmitter of the local modem and the receiver of the remote modem. The other pair of wires should connect to the remote modem's transmitter.

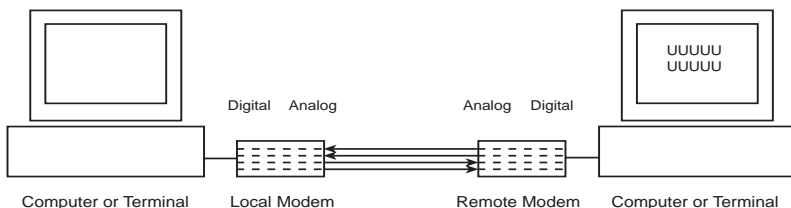


Figure 3-1. Four-Wire Leased Line Connection

In multi-point leased line configurations, the user must arrange to have the phone company install the multi-point network using a four-wire configuration. The following illustration shows a typical bridged multi-point configuration.

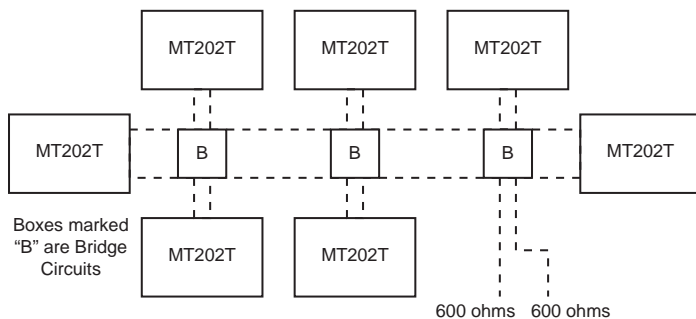


Figure 3-2. Four-Wire Multi-Point Connection

Chapter 3 - Modem Testing

Introduction

The MT202TD has two diagnostic tests: Local analog loopback and digital loopback.

A loopback test involves entering data from your PC and looping that data through the circuits of your modem and/or a remote modem. When the loop has been completed, the data received on the monitor should match the data entered on the keyboard.

The local analog loopback test allows you to verify that the modem's transmit and receive circuits are functioning properly. Refer to the *Local Analog Loopback* section on the following page for more details.

The digital loopback test allows you to verify that the local computer or terminal, the two modems, and the transmission line between the devices are functioning properly. See the *Digital Loopback Test* section in this chapter for more information.

Local Analog Loopback Test

The analog loopback test is performed by placing the analog loopback (ALB) switch in the ALB position (see Figure 2-3 in Chapter 2 of this user guide). When the switch is set to the ALB position, the CD, CTS, RTS, DSR, and TM indicators should light.

In this test, data from your computer or terminal is sent to your modem's transmitter, converted into analog form, looped back to the receiver, converted into digital form, and then received back at your monitor for verification. No connection to the phone line is required. The TD and RD indicators blink as keys are pressed. If your modem is configured for two-wire operation, the Local Copy DIP switch must be enabled (see Chapter

2 for DIP switch setting information).

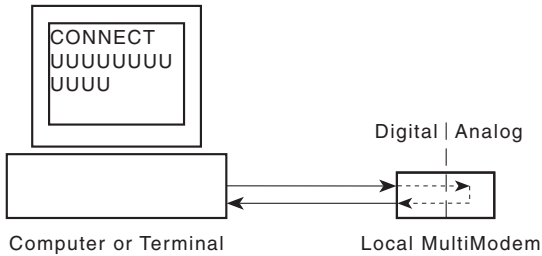


Figure 3-3. Local Analog Loopback Test

Digital Loopback Test

The digital loopback test is an on-line test that loops data sent from one modem across the phone line to another modem, and then back to the first modem. This test checks the phone line and modem integrity.

This digital loopback test is used on modems configured for four-wire leased lines. To perform this test, the DLB switch on the modem's circuit board must be set to the DLB position (see Figure 2-3 in Chapter 2).

In this test the local modem is placed in digital loopback mode. Data is entered and transmitted from the remote modem (which is not in digital loopback mode), sent across the phone line to the local modem, and looped back to the remote modem.

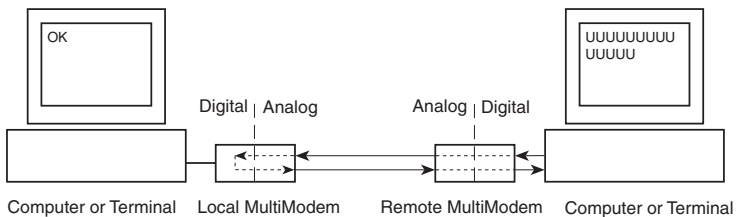


Figure 3-4. Digital Loopback Test

Chapter 4 - Warranty, Service, and Technical Support

Limited Warranty

Multi-Tech Systems, Inc., (hereafter MTS) warrants that this product will be free from defects in material or workmanship for a period of two years from date of purchase, or if proof of purchase is not provided, two years from date of shipment.

MTS MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED.

This warranty does not apply to any products which have been damaged by lightning storms, water, or power surges or which have been neglected, altered, abused, used for a purpose other than the one for which they were manufactured, repaired by Customer or any party without MTS's written authorization, or used in any manner inconsistent with MTS's instructions.

MTS's entire obligation under this warranty shall be limited (at MTS's option) to repair or replacement of any products which prove to be defective within the warranty period or, at MTS's option, issuance of a refund of the purchase price. Defective products must be returned by Customer to MTS's factory — transportation prepaid.

MTS WILL NOT BE LIABLE FOR CONSEQUENTIAL DAMAGES, AND UNDER NO CIRCUMSTANCES WILL ITS LIABILITY EXCEED THE PRICE FOR DEFECTIVE PRODUCTS.

Online Warranty Registration

To register your modem online, go to:

<http://www.multitech.com/register>

Service

In the event that service is required, products may be shipped, freight prepaid, to our Mounds View, Minnesota, factory. Please send modems that require repairs to the following address:

Multi-Tech Systems, Inc.
2205 Woodale Drive
Mounds View, MN 55112
Attn: Repairs, Serial #_____

A Returned Materials Authorization (RMA) is not required. Return shipping charges (surface) will be paid by MTS. Please include inside the shipping box a description of the problem, a return shipping address (must have street address, not P.O. Box), a telephone number, and if the product is out of warranty, a check or purchase order for repair charges.

Extended two-year overnight replacement agreements are available for selected products. Please refer to our Overnight Replacement Agreement at:

<http://www.multitech.com/PROGRAMS/orc/>
for details on rates and coverages.

Please direct your questions regarding technical matters, product configuration, verification that the product is defective, etc., to our Technical Support department at 800-972-2439.

Please direct your questions regarding repair expediting, receiving, shipping, billing, etc., to our Repair Accounting department at 800-328-9717 or 763-785-3500.

Repairs for damages caused by lightning storms, water, power surges, incorrect installation, physical abuse, or user-caused damages are billed on a time-plus-materials basis.

Technical Support

Multi-Tech Systems has an excellent staff of technical support personnel available to help you get the most out of your Multi-Tech product. If you have any questions about the operation of this modem, please contact us at:

Email:

support@multitech.com

Phone:

(800) 972-2439 or
(763) 785-3500 (local)

Internet Sites

Multi-Tech is a commercial provider on the Internet.

The Multi-Tech Web site is:

<http://www.multitech.com>

The ftp site is:

<ftp://ftp.multitech.com>

Recording Modem Information

Please complete the following information about your Multi-Tech modem before calling Technical Support.

Modem Model No.: _____

Modem Serial No.: _____

The modem model and serial numbers are printed on the bottom of your modem.

Please note the status of your modem before calling tech support. The status includes information about LED indicators, screen messages, diagnostic test results, problems with a specific application, etc.

Appendix - Regulatory Compliance

FCC Part 15 – Class A Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This device complies with part 15 of the FCC Rules.

Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference.
- (2) This device must accept any interference that may cause undesired operation.

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

Industry Canada

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

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement Canadien sur le matériel brouilleur.

FCC Part 68 Telecom

1. This equipment complies with part 68 of the Federal Communications Commission Rules. On the outside surface of this equipment is a label that contains, among other information, the FCC registration number. This information must be provided to the telephone company.
2. The suitable USOC jack (Universal Service Order Code connecting arrangement) for this equipment is shown below. If applicable, the facility interface codes (FIC) and service order codes (SOC) are shown.
3. An FCC-compliant telephone cord and modular plug are provided with this equipment. This equipment is designed to be connected to the telephone network or premises wiring using a compatible modular jack that is Part 68 compliant. See installation instructions for details.
4. The ringer equivalence number (REN) is used to determine the number of devices that may be connected to the telephone line. Excessive RENs on the telephone line may result in the device not ringing in response to an incoming call. In most, but not all, areas the sum of the RENs should not exceed 5.0. To be certain of the number of devices that may be connected to the line, as determined by the total RENs, contact the local telephone company.
5. If this equipment causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. But if advance notice is not practical, the telephone company will notify you as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

6. The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the operation of the equipment. If this happens, the telephone company will provide advance notice in order for you to make necessary modifications in order to maintain uninterrupted service.
7. If trouble is experienced with this equipment (the model of which is indicated below) please contact Multi-Tech Systems, Inc. at the address shown below for details of how to have repairs made. If the trouble is causing harm to the telephone network, the telephone company may request you remove the equipment from the network until the problem is resolved.
8. No repairs are to be made by you. Repairs are to be made only by Multi-Tech Systems or its licensees. Unauthorized repairs void registration and warranty.
9. This equipment should not be used on party lines or coin lines.
10. If so required, this equipment is hearing-aid compatible.

Manufacturer:	Multi-Tech Systems, Inc.
Model Number:	MT202TD
FCC Registration No:	AU7-USA-46016-DM-N
Modular Jack (USOC):	RJ11C
Service Center in USA:	Multi-Tech Systems, Inc. 2205 Woodale Drive Mounds View, MN 55112 (763) 785-3500 (763) 785-9874 Fax

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