
**MT2834BR/MT2834BLR
Intelligent Data/Fax
Rack Mounted Modem**

User Guide



MT2834BR/MT2834BLR User Guide
PN: S000316

Copyright ©2003 by Multi-Tech Systems, Inc.

All rights reserved. This publication may not be reproduced, in whole or in part, without prior written permission from Multi-Tech Systems, Inc.

Multi-Tech Systems, Inc. makes no representations or warranties with respect to the contents hereof and specifically disclaims any implied warranties of merchantability or fitness for any particular purpose. Furthermore, Multi-Tech Systems, Inc. reserves the right to revise this publication and to make changes from time to time in the content hereof without obligation of Multi-Tech Systems, Inc. to notify any person or organization of such revisions or changes.

Revision	Date	Description
A	11/15/2003	Initial release of MT2834BR/MT2834BLR as a combined User Guide.

Trademarks of Multi-Tech Systems, Inc. are as follows: MultiExpress, MultiExpressFax, MultiModem^{II}, Multi-Tech and the Multi-Tech logo. Windows is a registered trademark of Microsoft Corporation.

Technical Support

France	support@multitech.fr	+33 1-64 61 09 81
India	support@multitechindia.com	+91 124 6340778
U.K.	support@multitech.co.uk	+44 118 959 7774
U.S., Canada	support@multitech.com	(800) 972-2439
Rest of World	support@multitech.com	+763 717-5863

World Headquarters

Multi-Tech Systems, Inc.
2205 Woodale Drive
Mounds View, Minnesota 55112 U.S.A.
(763) 785-3500 or (800) 328-9717
U.S. FAX (763) 785-9874
Technical Support (800) 972-2439
www.multitech.com

Contents

Chapter 1 - Introduction	5
1.1 Introduction	6
1.2 Features	6
1.3 How to Use This Manual	7
Chapter 2 - Installation	8
2.1 Preliminaries	9
2.1.1 Card Cage	9
2.1.2 Serial Cable	9
2.1.3 Telephone Line	9
2.2 Installation	10
2.3 PC Board Controls	11
2.3.1 DIP-Switch Settings	12
2.4 OOS (Busy Out) Toggle Switch	14
2.4.1 Out of Service/Test Jumper	15
2.4.2 MI/MIC Option Jumper	15
2.5 Dial-Up and Leased Lines	16
2.6 Modem LED Indicators	17
Chapter 3 - Installation	19
3.1 Introduction	20
3.2 Serial Port Limitations	20
3.2.1 How Can You Identify Your UART Type?	21
3.3 Configuring Your Software	23
3.3.1 Configuring Software for Your Modem	23
3.4 PC Initialization Strings	24
3.4.1 Changing Default Parameters	26
3.5 Macintosh Initialization	26
3.6 Configuring Software for Your Computer	27
3.6.1 Configuring Software for the Remote System	28
3.6.2 Terminal Emulation	28
3.6.3 File Transfer Protocols	29
3.7 When to Disable Data Compression	29
3.7.1 Disabling Error Correction	30
Chapter 4 - Modem Commands	31
4.1 Modem AT Commands	32
4.1.1 Callback Security Commands	43
4.1.2 Remote Configuration	45
4.1.3 Remote Configuration Procedures	45
4.1.4 V.25bis Commands	46

4.2	S-Registers	48
4.3	Result Codes	52
4.3.1	AT Commands and S-Register Summary	55
Chapter 5 - Modem Testing		56
5.1	Local Analog Loopback Test/V.54 Loop 3	57
5.2	Digital Loopback Test/V.54 Loop 2 (Local/Manual)	58
5.3	Digital Loopback Test/V.54 Loop 2 (Remote/Automatic)	60
5.4	Local Analog Loopback Test (Synchronous Mode)	61
5.5	Digital Loopback Test (Local/Manual) (Synchronous Mode)	62
5.6	Digital Loopback Test (Remote/Automatic) (Synchronous Mode)	63
Chapter 6 - Warranty and Service		64
6.1	Introduction	65
6.2	Limited Warranty	65
6.3	Tech Support	66
6.3.1	Recording Modem Information	66
6.3.2	Service	66
6.4	Upgrading the MT2834BR	67
6.4.1	Using FlashPro to Upgrade Modem Firmware	67
6.5	Safety Warnings	68
6.6	Internet	69
Chapter 7 - BAPT Requirements		70
7.1	Compliance with BAPT Requirements	71
7.1.1	European Low Voltage Directive	72
7.1.2	Compliance with BS6305 Clause 6.2, BS6320 Clause 7.2, and BAPT/SITS/82/005S/D	72
7.1.3	Compliance with BS6789: Section 3.1 and Part 2 ...	73
7.1.4	Compliance with BS6328 Part 1	74
Appendices		75
Appendix A		76
FCC Regulations for Telephone Line Interconnection		76
Canadian Limitations Notice		78
Appendix B		79
Technical Specifications		79
Index		84

Chapter 1 - Introduction



1.1 Introduction

Welcome to the world of data communications. You have acquired one of the finest intelligent data/fax modems available today, either the model MT2834BR or MT2834BLR (MT2834), from Multi-Tech Systems. Your MT2834 modem provides data communication at 33,600-14,400 bps (*Enhanced V.34/V.32bis), as well as other prevalent datacomm standards. The MT2834 also includes adaptive protocol enhancing used in typical Unix® batch file transfers and support for IBM's AS/400 (iSeries)™ and System3x™ environment. The MT2834BLR provides support for dial back-up with automatic leased line restoral. This User Guide will help you install, configure, test and use your MT2834 data/fax modem.

*Note enhancements on V.34 code (33.6K/31.2K) is awaiting formal ITU approval; the ITU study group 14 has agreed on the technical side of the proposal, with formal approval expected at the next ITU meeting in Geneva.

1.2 Features

The MT2834 automatically adjusts to line conditions and the capabilities of the modem it connects to, resulting in the highest possible speed, the most accurate error correction, and the most efficient data compression possible for each connection. The MT2834 is designed for data rates as high as 33,600 bps in full-duplex mode over public telephone lines.

MT2834 features include:

- Support of data rates of 33,600, 31,200, 28,800, 26,400, 24,000, 21,600, 19,200, 16,800, 14,400, 12,000, 9600, 7200, 4800, 2400, 1200, 0-300 bps.
- Automatic fallback to slower speeds in noisy line conditions, and fall-forward to faster speeds as conditions improve.
- ITU-T V.42 LAP-M and MNP Classes 3 and 4 error correction.
- Data transfer rates up to 115,200 bps with V.42bis 4-to-1 data compression.

- Automatic disabling of compression when transferring already-compressed files.
- Serial port data rates adjustable to 115.2K bps.
- Autodial, redial, pulse (rotary) and touch-tone dial.
- Dial tone and busy signal detection for reliable call-progress detection.
- Compatibility with the standard AT command set used by most communication programs.
- On-screen help menus.
- Nonvolatile memory for storage of customized modem parameters and ten telephone numbers.
- Sends and receives faxes from your computer at 14,400, 9600, 7200 or 4800 bps.
- Responds to EIA TR.29 Class 2 fax commands.
- Supports UNIX-to-UNIX® UUCP Spoofing.
- Supports IBM's AS/400 (iSeries)[™] and System3x environment.

1.3 *How to Use This Manual*

This chapter begins with a short introduction, a profile on modem features, followed by a guide (which you are now reading) to the use of this manual. This manual includes hardware installation and configuration described in Chapter 2. Chapter 3 covers communication software configuration recommended for the MT2834. Other issues covered include setting up initialization strings, changing default parameters, configuring software for the remote system and file transfer protocols. Chapter 4 covers modem AT commands, Remote Configuration commands, S-Registers and Result Codes. Chapter 5 illustrates the MT2834 diagnostic capabilities, providing Analog and Digital Loopback testing procedures. Chapter 6 explains product warranty and technical support. Appendices A and B respectively describes FCC requirements and regulations and technical specifications.

Chapter 2 - Installation



2.1 Preliminaries

This chapter covers MT2834 installation and connection. In addition to the contents of the MT2834 package, you will need the equipment listed below.

2.1.1 Card Cage

The MT2834 is designed to mount in the Multi-Tech Systems' modem rack (see Section 2.2 for various models available). This rack is an EIA-standard 19-inch wide by 7-inch high rack, and mounts in any standard computer cabinet. The rack has a sixteen modem slot capacity, one power supply source (the CC1600 series card cage has a redundant power supply capability), sixteen 25-pin (female) connectors for RS232C/V.24 interface and sixteen DB9 (female) connectors for phone line (the CC1600 series card cage has RJ11 back-plane connectors for phone line interface).

2.1.2 Serial Cable

You must provide a serial cable to connect each corresponding MT2834 to your computer. The cable must have a DB-25 male interface into the modem rack.

2.1.3 Telephone Line

The MT2834 uses one RJ11 jack per corresponding modem slot to connect to the telephone lines. To connect the modem to the phone lines, plug one end of the RJ11 cable that is provided with the modem into the DB9 (9-pin connector) located on the back plane of the modem rack and the other end into the phone-company-provided RJ11 or RJ11W modular phone jack (CC916, CC1416 or CC2816 racks). To connect the modem to the phone lines using the CC1600 modem rack, plug one end of the RJ11 cable provided with the modem into the rack's RJ11 connector (located on the back plane of the modem rack) and the other end into the phone-company-provided RJ11 or RJ11W modular phone jack.

2.2 Installation

Perform the following procedure to install modem cards in the CC916, CC1416, CC2816 or CC1600 racks*. The installation process involves:

1. Power cord must be unplugged prior to installation of the Power Source(s). Insert Power Source(s) (PS216A or PS1600) into far right of the rack cage.
2. Slide a modem card into one of sixteen available modem slots. Start by inserting a modem into the left-most channel (slot #1) of the rack. The toggle switch should be at the bottom of the card, with the component side of the card facing the right. The modem's gold edge connector is offset so that the modem cannot be inserted incorrectly. Continue installing modem cards as necessary.
3. Plug RS232C Cable into appropriate modem slot (DB25/25-pin connector-female) at rear of rack. **Note:** Any cables connected to the computer must be shielded to reduce interference.
4. If you are connecting your phone line directly to the modem card, plug the phone line cable into the appropriate modem slot (DB9/9-pin connector-female) at the rear of the rack and the other end into the phone-company-provided RJ11 or RJ11W modular phone jack. To connect the modem to the phone lines using an CC1600 modem rack, plug one end of the RJ11 cable provided with the modem into the rack's RJ11 connector (located on the back plane of the modem rack) and the other end into the phone-company-provided RJ11 or RJ11W modular phone jack.
5. Plug in modem rack power cord.
6. Verify remote modem's current configuration settings with your MT2834BR in terms of data compression, error correction, transmission rate, etc. (**ATL5/ATL7** Command - see Chapter 4 on AT commands).
7. Attach MT2834BR to dial-up phone lines and/or leased lines and verify DIP-Switch #10 and #5 settings (Section 2.5).
8. Make sure modem and computer/terminal serial port baud rates are adjusted (Section 2.5).

9. Set both local and remote modems to either Normal (**&E0&W0**) mode or to Reliable (**&E2&W0**) mode.
 10. Verify leased line transmit level (DIP-Switch #3) setting (Section 2.3.1).
 11. Proceed to Chapter 3 of this manual, or to your data communications software manual.
- * All Multi-Tech rack-mounted modem cards (except MT1432/2834) are interchangeable among all types of modem racks. There is, however, slight LED differences. Model #CC216G is a "generic" modem rack for any rack mount modem card. The user affixes LED labels on a per slot basis depending on modem type.

2.3 PC Board Controls

The MT2834 is designed on a single printed circuit board. This board contains sixteen DIP-Switches. There is a two-position "Out of Service" (OOS) toggle switch that extends from the front of the modem circuit card. There is also a two-position MI/MIC berg jumper and TEST/OOS berg jumper.



Figure 8-1. 16-Position DIP Switch

The sixteen DIP-Switches and two berg jumpers control various modem options or set default values for the MT2834 Command mode. There is a difference in how several of the switches operate depending on whether you are in synchronous or asynchronous mode (DIP-Switch #12).

Most communications software packages have installation procedures of their own, which call for certain modem DIP-Switch settings. If you are using a package other than MultiExpress, follow the software's instructions.

2.3.1 DIP-Switch Settings

The vast majority of installations are similar, with the MT2834 being used to dial up a remote installation where the call is automatically answered. The factory default DIP-Switch settings are based on this assumption. The following is a brief description and summary of the MT2834's DIP-Switch options:

Switch	Function	Position	Effect
#1	DTR Forced/ DTR from Interface *	UP* DOWN	DTR forced from computer/terminal
#2	Flow Control &E4* (Async/Dial-Up/Leased Line)	UP* DOWN	Hardware flow control enabled
#2	SDLC*/BSC (Sync)	UP* DOWN	SDLC enabled
#3	Result Codes Enabled* (Async Dial-up)	UP DOWN*	Modem responses are echoed
#3	DbM Transmit -15dB/-11dB* (Async/Sync/Leased Line)	UP DOWN*	Lease Line transmits at -11dB
#4	UUCP Disabled* (Async Dial-Up/Leased Line)	UP* DOWN	UUCP "spoofing" Disabled
#4	AS/400 Mode Disabled* (Sync Dial-Up/Leased Line)	UP* DOWN	AS/400 Mode Disabled
#5	Auto-Answer Enabled* Async/Sync/Dial-Up)	UP* DOWN	Auto-Answer in dial-up mode

* Factory default setting.

Chapter 2 - Installation

Switch	Function	Position	Effect
#5	Answer/Originate* (Async/Sync/Leased Line)	UP*	Originate call in
		DOWN	Lease Line mode
#6	Max-Throughput Enabled* (Async/Dial-Up/Leased)	UP*	Modem set-up to
		DOWN	operate at highest efficiency level
#6	Slave Clock Disabled* (Sync/Dial-Up/Leased)	UP*	Clock controlled
		DOWN	by remote device
#7	RTS/Normal/Forced* (Sync/Async/Dial/Leased)	UP	RTS Forced On
		DOWN*	
#8	Command Mode Enabled* (Sync/AsyncDial/Leased)	UP	Command Mode
		DOWN*	Enabled
#9	Local/Remote LoopBack* (Async/Sync/Dial/Leased)	UP	Remote
		DOWN*	LoopBack Enabled
#10	Dial-Up*/Leased-Line	UP*	Dial-Up Enabled
		DOWN	
#11	"AT"/Multi-Tech Result Codes (Asynchronous)	UP	Multi-Tech Result
		DOWN*	Codes Enabled
#11	Internal*/External Clocking (Synchronous)	UP	Selects Transmit
		DOWN*	Clock Source
#12	Sync/Async Mode*	UP	Async Enabled
		DOWN*	

Dip Switch Settings #13 - 16

Note: A modem baud rate command (e.g., **\$MB33600**) overrides the setting of the speed selection switches (#13 and #14).

Switch	Position	Effect
13/14	UP/UP*	28.8 K bps Operation (Default)
13/14	DOWN/UP	19.2 K bps Operation
13/14	UP/DOWN	14.4 K bps Operation
13/14	DOWN/DOWN	9600 bps Operation
#15	UP*	CD/DSR from Interface
#15	DOWN	CD/DSR Forced On
#16	UP	Used in combination with
#16	DOWN	DIP-Switch #9/Loopback Tests

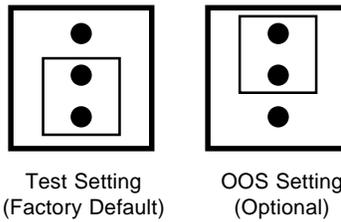
* Factory default setting

2.4 OOS (Busy Out) Toggle Switch

The MT2834 contains a two-position OOS switch on the front panel. This switch can be used to create a "busy out" (OOS) condition for the modem (i.e., take the modem off-hook). To place a modem in the Busy condition, move the OOS toggle switch to the (BUSY) position. The modem then goes off-hook, its OOS and OH LEDs light, and incoming calls to this modem get a busy signal. If you suspect a problem with a particular modem, you can use the BUSY switch to have an optional device (such as a "hunt group") that looks for a non-busy line to perform a "roll over" to the next available modem while you check the status of the Busy modem.

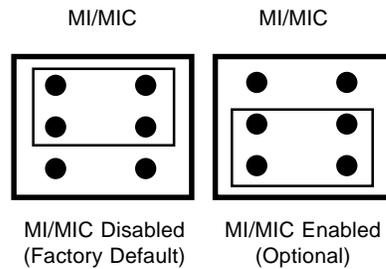
2.4.1 Out of Service/Test Jumper

When the MT2834 is Out Of Service (OOS), it is busy to incoming calls. In the Test (default) setting, the modem drives pin 25 high when the modem is in Test mode. In the OOS (optional) setting, the computer or terminal forces pin 25 high and puts the modem in a busy condition. Note that jumper (shorting) plugs are not shipped with the MT2834, but is provided by Multi-Tech's Tech Support group on request.



2.4.2 MI/MIC Option Jumper

To activate MI/MIC option (Mode Indicate/Mode Indicate Common Interface), you must first move MI/MIC jumper plugs. The **\$MI** command, then controls this function (**AT\$MI1** enables MI/MIC and **AT\$MI0** disables MI/MIC). This option is for applications where the modem's dialing capability is not used, and dialing is done by an external device (such as a 801 dialer, a computer, or a PBX/CBX system dialer).



2.5 Dial-Up and Leased Lines

Connection to the phone system is made via **RJ11** type jacks such as an RJ11C or RJ11W. It can also be connected to an RJ41 or an RJ45S jack, but would not use these jack's dB-level programming features. The MT2834 is designed to transmit at a permissive level of -11dB.

To connect the modem to the phone lines, plug one end of the RJ11 cable that is provided with the modem into the corresponding DB9 or RJ11 connector (dependent upon card cage used) located on the back plane of the modem rack and the other end into the phone-company-provided RJ11 or RJ11W modular phone jack. Make sure that DIP-Switch #10 is in the UP position (default) when in dial-up mode.

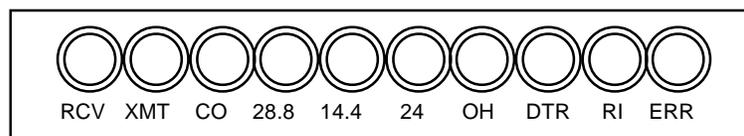
Although the majority of installations involves dial-up lines, the MT2834 also connects to two-wire leased lines (sometimes referred to as dedicated, private, or 3002 lines).

To connect the modem to leased lines, first determine the type of line termination provided by the phone company. Most phone companies provide a terminal block with a pair of screws. Some provide a conventional RJ11 type of connector. If the RJ11 connector is used, you can use the same cable that you use for dial-up connection. If the screw terminal type connector is used, you may need to order the #CA167 cable from Multi-Tech Systems.

Make two DIP-Switch setting changes on the modem's PC board. The first involves placing DIP-Switch #10 in the DOWN position (changes the modem from dial-up to leased line operation). The second DIP-Switch change requires that one of the two modems on the leased line circuit is set to "*originate*", and the other is set to "*answer*". To do this, change the setting of DIP-Switch #5. When you changed the DIP-Switch #10 setting, you also changed the function of DIP-Switch #5. Now the UP position selects answer mode frequencies while the DOWN position selects originate mode frequencies. Place DIP-Switch #5 in the UP position on one of the two modems, and on the other modem, place Switch #5 DOWN. It doesn't matter which is which, just so you have local and remote modems in opposite modes.

2.6 Modem LED Indicators

The MT2834 has ten LED diagnostic indicators.



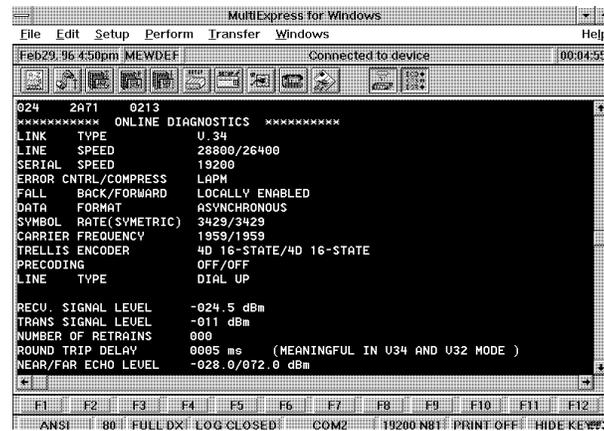
1. Receive Data (**RCV**). This LED blinks when data is being received, on for a space, off for a mark. The state of this RCV LED matches that of the RCV circuit on Pin 3 of the RS232C/V.24 interface.
2. Transmit Data (**XMT**). This LED blinks when data is being transmitted, on for a space, off for a mark. The state of this LED matches that of the XMT circuit on Pin 2 of the RS232C/V.24 interface.
3. Carrier ON (**CO**). This LED lights when a valid carrier tone has been detected.
4. 28,800 bps (**28.8**). This LED is lit when the modem is connected at 28,800 bps.
5. 14,400 bps (**14.4**). This LED is lit when the modem is connected at 14,400 bps. Note that when both 28.8 and 14.4 LEDs light, modem is in 21,600-26,400 bps mode of operation.
6. 2400 bps (**24**). This LED is lit when the modem is connected at 2400 bps.
7. Off Hook (**OH**). This LED is lit when the phone line is "off hook". This occurs when the modem is dialing, on line, or answering a call. The LED also flashes when the modem is pulse dialing in the Command Mode.
8. Data Terminal Ready (**DTR**). When the DTR LED is lit, the modem is permitted to answer an incoming call. When DTR goes off, a connected modem disconnects if dependent on DTR. The state of this DTR LED matches that of the DTR circuit on Pin 20 of the RS232C/V.24 interface.
9. Ring Indicator (**RI**). This LED is lit during the ringing interval as an incoming call is received.

Chapter 2 - Installation

10. Error (**ERR**). When the ERR LED is flashing, the leased line is down and the modem is in self-test mode has failed. When ERR LED is on, this indicates the modem is in an out of service (**OOS**) state. When the modem is out of service, it is busy to incoming calls.

NOTE: To verify Enhanced V.34 mode is engaged:

1. Type **+++AT<CR>** .
2. Type **ATL8** .
3. The modem's current on-line condition is displayed. An example of **L8** listing is shown below.



```
MultiExpress for Windows
File Edit Setup Perform Transfer Windows Help
Feb29, 96 4:50pm MEWDEF Connected to device 00:04:55
***** ONLINE DIAGNOSTICS *****
LINK TYPE U 34
LINE SPEED 28800/26400
SERIAL SPEED 19200
ERROR CNTRL/COMPRESS L0PM
FALL BACK/FORWARD LOCALLY ENABLED
DATA FORMAT ASYNCHRONOUS
SYMBOL RATE(SYMETRIC) 3429/3429
CARRIER FREQUENCY 1959/1959
TRELLIS ENCODER 4D 16-STATE/4D 16-STATE
PRECODING OFF/OFF
LINE TYPE DIAL UP
RECV. SIGNAL LEVEL -024.5 dBm
TRANS SIGNAL LEVEL -011 dBm
NUMBER OF RETRANS 000
ROUND TRIP DELAY 0005 ms (MEANINGFUL IN U34 AND U32 MODE )
NEAR/FAR ECHO LEVEL -028.0/072.0 dBm
F1 F2 F3 F4 F5 F6 F7 F8 F9 F10 F11 F12
ANSI 80 FULL DX LOG CLOSED COM2 19200 N81 PRINT OFF HIDE KEYS
```

Figure 2-2. On-Line Diagnostics



Chapter 3 - Installation



3.1 Introduction

Since your communications software configuration is affected by the capabilities of your computer, this chapter begins with a discussion of the limitations of some serial ports and how to identify them. It then discusses communications configuration in general and recommends settings specifically for the MT2834.

3.2 Serial Port Limitations

When you configure your software, you need to consider how the hardware on both ends of the connection will affect the connection. Some serial ports, particularly those in older PC-compatible computers, may limit the performance of the MT2834. You should know if yours is one of them.

The limiting factor is an integrated circuit called a Universal Asynchronous Receiver/Transmitter, or *UART*. All data from your modem flows through it. The UARTs typically used in PC-compatible computers are types 8250, 8250A, 16450, and 16550AFN. The 8250 is unreliable above 9,600 bps, and the 8250A and 16450 are unreliable above 19,200 bps. If the modem sends data to the UARTs above those speeds, the UARTs may not be able to process the data fast enough to keep from losing some of it. The 16550AFN, however, can safely handle data to 115,200 bps.

When a modem communicates with V.42bis 4-to-1 compression enabled, it sends up to four times as much uncompressed data to the serial port as it receives compressed over the telephone line. Therefore, a modem communicating at 14,400 bps may require a serial port that can reliably transfer data at four times 14,400 bps, or 57,600 bps; at 19,200 bps it may require one that works reliably up to four times 19,200 bps, or 76,800 bps; and at 28,800 and 33,600 bps it may require one that works reliably up to a maximum of 115,200 bps. If your serial port cannot handle these speeds, we recommend that you replace your present serial card with one that has a 16550AFN UART or equivalent.

Macintosh computers do not use UARTs. The Macintosh SE through IIx models use a Zilog Z8530 chip called a Serial Communications Controller, or SCC, that has a maximum speed of 57,600 bps. This speed can be

compromised by other serial communications, including printer transmissions and Appletalk, the networking software that allows Macintoshes to share files. When Appletalk is active it controls all serial communications on the Macintosh. Because it gives priority to network communications, it may lose modem data at higher transmission speeds. Therefore, when Appletalk is active you risk losing data on serial port communications over 2400 bps, though most users can work up to 9600 bps without problems. Other activities that could cause the serial driver to drop bits at high speeds include the floppy disk driver formatting a disk, the CPU paging in or out in virtual memory mode, and the Mac IIci or IIsi running the on-board video in 8-bit mode. Therefore, for maximum communications speed on the Macintosh, we recommend as few concurrent activities as possible. To use V.42bis compression at 19,200 bps or faster, we recommend that you install a high speed serial port card. Newer Macintosh computers, such as the Quadra and Centris models, support serial port speeds up to 115,200 bps.

3.2.1 How Can You Identify Your UART Type?

If you have MS-DOS 6.0 or later, you can find your UART type from a diagnostic program called *MSD*. To use it, type **MSD** at the DOS prompt. After the opening screen, select COM Ports. The last line of the report tells you what type UART you have for each COM port. MSD does not distinguish between the 8250 and the 8250A. However, if you have an IBM AT or newer computer, you likely have an 8250A or 16450 UART installed, both of which are reliable to 19,200 bps. If you would like more detailed information about your UART than MSD can provide, you can download shareware UART identification programs from the IBM Communications Forum.



Figure 3-1. MSD UART Identification, Screen 1

	COM Ports			
	COM1:	COM2:	COM3:	COM4:
Port Address	03F8H	02F8H	N/A	N/A
Baud Rate	1200	2400		
Parity	None	None		
Data Bits	7	8		
Stop Bits	1	1		
Carrier Detect (CD)	No	No		
Ring Indicator (RI)	No	No		
Data Set Ready (DSR)	Yes	No		
Clear To Send (CTS)	No	Yes		
UART Chip Used	16550AF	16550AF		
OK				

Figure 3-2. MSD UART Identification, Screen 2

3.3 Configuring Your Software

Communications software must be configured to work with your modem, your computer, and the remote system it is calling. Fortunately, most communications programs make the process easy by providing a default *initialization string* for your modem as well as defaults for most of the other required parameters.

3.3.1 Configuring Software for Your Modem

Because remote computers may have different connection requirements such as speed, number of bits, parity, log-on sequences, etc., communications software is typically configured by *sessions*, each session having a unique configuration for a given connection (e.g., to a BBS or commercial online service). Most communications programs, however, have a separate modem configuration menu because modem configurations rarely change from session to session.

The most important configuration is the modem *initialization string*. This is a sequence of commands the software uses to configure the modem when the communications software is loaded or when a session begins. Always begin the initialization string with the *Attention* command **AT**, then follow it with the modem reset command, **&F**. Issuing a reset command before other commands ensures that you are starting with a known state.

The rest of the commands in the initialization string depend on the capabilities of the modem and what you want it to do. Some older communications programs require you to create the initialization string by yourself. Most modern communications programs, however, provide you with a ready-made initialization string that is automatically selected when you choose your modem model from a list. It is a poor idea to use an initialization string intended for another modem, especially one from another manufacturer, because modem capabilities and command implementations vary from modem to modem. However, if your MT2834BR does not appear on a modem list, you may use the MultiModemII initialization string.

3.4 PC Initialization Strings

We recommend the following initialization string for a MT2834 connected to a PC-compatible computer:

AT &F X4 S0=0 ^M

This string resets the MT2834 to the factory default settings, selects extended result codes with *NO DIAL TONE* and *BUSY*, and turns off auto-answer. **^M** must end every string sent to the modem from software. It is the ASCII code for the RETURN key on most keyboards, and the default code for the carriage return character in the MT2834 and most communications programs. The carriage return character is defined in the MT2834 in S-register **S3**; if you change it, you must also change the carriage return character code used in your communications software. If you send a command directly to the modem in terminal mode rather than indirectly through communications software, you must end the command string by pressing the RETURN key (<CR>) instead of adding **^M** to the string.

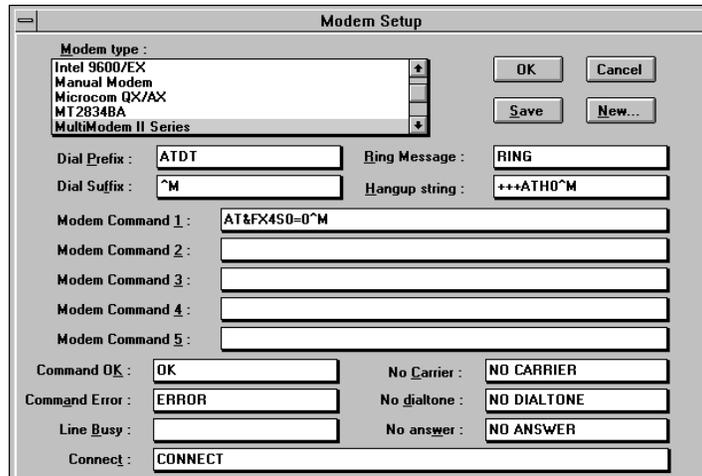


Figure 3-2. The MEW Modem Initialization Setup

* Note that the above and following set up screens are examples found in MultiExpress for Windows (MEW), and that other 3rd party data communication software is similar but different.

3.4.1 Changing Default Parameters

The default values for the other parameters in modem configuration menus rarely need changing. They typically include the dialing prefix (**ATDT** for touch-tone service and **ATDP** for rotary service), the dialing suffix (**^M**), the hang-up string (**+++ATH0^M**), and response messages (*RING*, *NO CARRIER*, *BUSY*, etc.). Communications software with a host mode might also include an auto-answer string (**AT S0=1^M**).

3.5 Macintosh Initialization

Macintosh computers cannot use RTS/CTS hardware flow control without a serial cable wired for hardware control. The Macintosh 128 and 512 models cannot use RTS/CTS flow control at all. For those Macintoshes turn off the default RTS/CTS hardware flow control, turn on XON/XOFF flow control and pacing, and ignore DTR:

AT &F X4 &E5 &E13 &D0 ^M

For hardware flow control, use the following initialization string:

AT &F X4 &E13 &D0 ^M

Add **S0=0** to both strings to disable auto-answer if the MT2834BR is on a voice line.

You can store the initialization string in nonvolatile memory. With your communications software open and connected to the modem's COM port, type the initialization string in the terminal window, substituting a carriage return for **^M**. To store the string, enter

AT &F9 &W0 <CR>.

Now you can initialize your modem with the following simple string:

AT Z ^M

3.6 Configuring Software for Your Computer

Configure the communications software to match the computer's configuration. If the MT2834 is connected to the COM2 serial port, select "COM2" under the Device drop-down menu.

Select the appropriate serial port baud rate. This is the speed the modem communicates with the computer, *not* the speed the modem communicates with another modem.

If V.42bis data compression is enabled, select a serial port baud rate four times the transmission speed of the modem to optimize data compression. If the UART is fast enough, set the serial port baud rate to a *minimum* of four times the top speed of the modem.

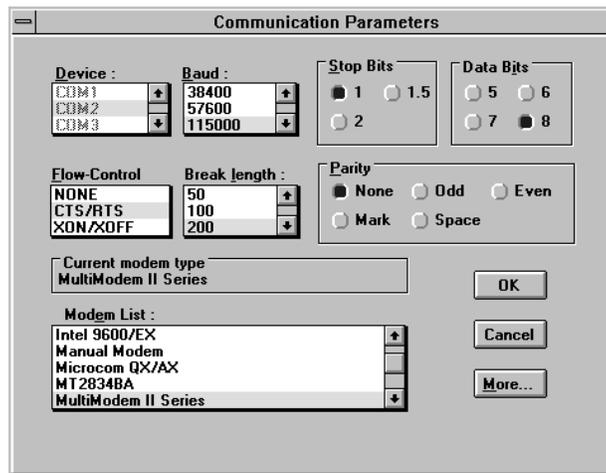


Figure 3-3. MEW Configuration Parameters Screen

For an 8250 UART, the most reliable serial port speed is 9600 bps. For an 8250A or a 16450 UART, try 19,200 bps. For a 16550 UART or equivalent, select a serial port setting of 115,200.

3.6.1 Configuring Software for the Remote System

You must meet the requirements of the remote system for successful communications. Though the MT2834 can automatically synchronize with the speed of the other modem, you must specify parameters such as type of flow control, break length, number of data bits, number of stop bits, and parity. If you set these parameters incorrectly with the remote system, gibberish will appear on your screen.

3.6.2 Terminal Emulation

If you are accessing the remote computer as if from an on-site terminal, the keyboard codes used by your computer may not match the ones used by the remote computer. To be compatible with the remote computer, your software must be able to substitute the appropriate codes in what is known as *terminal emulation*. Most communications programs can emulate the most common mainframe terminals, including the DEC VT100, VT 102, and VT52 terminals, and the basic TTY mode. The following is the MultiExpress for Windows Terminal Emulation screen.

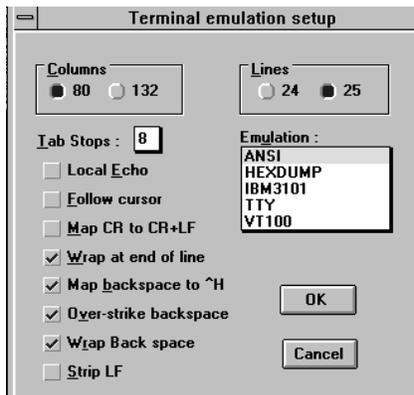


Figure 3-4. MEW Terminal Emulation Setup Screen

3.6.3 File Transfer Protocols

When you upload or download files with your modem, the host computer will ask which file transfer protocol you want to use. Most communications programs allow you to choose a default protocol. Your software's documentation should list the ones it can use (not all communications programs support all protocols). Zmodem is the default protocol in *MultiExpress for Windows*, and we recommend it for most transfers. The following is the *MEW* File Transfer Protocols screen.

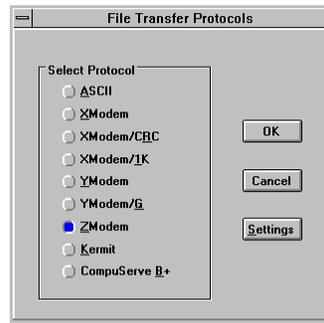


Figure 3-5. MEW File Transfer Protocols Screen

3.7 When to Disable Data Compression

If your serial port cannot keep up because it has an older UART, you may lose data when using data compression. Also, the speed advantage hardware compression gives you is entirely dependent on how much the data being transmitted can be compressed. If the data is already in compressed form—a .ZIP or a .SIT file, for example—trying to compress it more will actually slow the transmission slightly compared to transmitting the same file with compression disabled. This effect will be most noticeable if your modem negotiates MNP 5 compression with the other modem. V.42bis will not try to further compress a compressed file, but MNP 5 will.

The command to disable compression is **AT &E14 <CR>**. If you have an older UART or if you use your modem mostly for downloading long, compressed files from BBSs, you may want to include the **&E14** command in your initialization string as follows:

AT &F S0=0 X4 &E14 ^M

As a general rule, you should try to transmit files in already-compressed form rather than relying on V.42bis hardware compression. Because software compression is more efficient than hardware compression, you will have a higher throughput with the former. Of course, this efficiency does not include the time spent compressing and decompressing .ZIP or .SIT files, but it will save on phone bills. And hardware compression will still be there for those occasions when it is inconvenient to compress a file with software. Note also that when you download files with compression disabled, you can use a slower serial port if you have an older UART.

3.7.1 Disabling Error Correction

By default, the MT2834 is set to auto-reliable mode. In this mode the MT2834 determines during the handshake whether the other modem is using V.42 error correction. If it is, the MT2834 then switches itself to reliable mode and enables error correction. If it is not, the MT2834 remains in non-error correction mode.

Normally, we recommend that you leave the MT2834 set to auto-reliable mode (**&E1**). However, you may encounter some circumstances in which the MT2834 will work better with error correction turned off. For example, it has been reported that on CompuServe error correction will slow file transfers at modem speeds of 9600 bps and under. If this is a problem for you, you can turn off error correction with the command **AT &E0**, or you can include the command in your initialization string as follows:

AT &F S0=0 X4 &E0 ^M

Chapter 4 - Modem Commands



4.1 Modem AT Commands

AT commands are the means by which you, and your communications software, are able to communicate with and configure your modem. They enable you to establish, read, and modify parameters in addition to dialing. The following provides a summary and brief explanation of the AT commands recognized by the MT2834.

COMMAND:	AT
VALUES:	n/a
DEFAULT:	n/a
DESCRIPTION:	Attention Code that precedes most command strings except A/, A: and Escape Codes.
COMMAND:	Return
VALUES:	n/a
DEFAULT:	n/a
DESCRIPTION:	Pressing the RETURN key executes most commands.
COMMAND:	A
VALUES:	n/a
DEFAULT:	n/a
DESCRIPTION:	Answer call, even if no ring present.
COMMAND:	\$
VALUES:	n/a
DEFAULT:	n/a
DESCRIPTION:	This symbol placed in dialing string enables the modem to detect AT&T's "call card" tones to access user's calling card to originate an on-line connection.
COMMAND:	A/
VALUES:	n/a
DEFAULT:	n/a
DESCRIPTION:	Repeat last command. (Do not precede this command with AT. Do not hit RETURN to execute).
COMMAND:	A:
VALUES:	n/a
DEFAULT:	n/a
DESCRIPTION:	Continuous redial (10 redials in DOC units) of last number until answered. (Not used on International Models).

Chapter 4 - Commands

COMMAND:	\$An
VALUES:	n = 0 or 1
DEFAULT:	\$A0
DESCRIPTION:	\$A0 discards data during auto-reliable time period. \$A1 buffers data during auto-reliable time period.
COMMAND:	#An
VALUES:	n = 0 thru 3
DEFAULT:	#A0
DESCRIPTION:	#A0 selects initial handshake at 33600 to 31200 to 28800 to 24000 to 21600 to 19200 to 16800 to 14400 to 12000 to 9600 to 4800 to 2400 to 1200 to 300 bps. #A1 selects initial handshake at 33600 bps only. #A2 selects initial handshake at 33600 to 31200 to 28800 to 24000 to 21600 to 19200 to 16800 to 14400 to 9600 to 4800 bps. #A3 selects initial handshake at 2400 to 1200 to 300 bps.
COMMAND:	Bn
VALUES:	n = 0 or 1
DEFAULT:	B0
DESCRIPTION:	B0 selects V.21 for 300 bps operation. B1 selects for 300 bps operation (not used on International Models).
COMMAND:	&Bn
VALUES:	n = 0 or 1
DEFAULT:	&B0
DESCRIPTION:	&B0 selects normal transmit buffer size. &B1 selects reduced transmit buffer size.
COMMAND:	&BSn
VALUES:	n = 0 or 1
DEFAULT:	&BS1
DESCRIPTION:	&BS0 selects maximum transmit block size of 64 characters. &BS1 selects maximum transmit block size of 256 characters (MNP mode) or 128 characters (LAP-M mode).
COMMAND:	\$BA n
VALUES:	n = 0 or 1
DEFAULT:	\$BA0
DESCRIPTION:	\$BA0 selects speed conversion on. \$BA1 selects speed conversion off.
COMMAND:	&Cn

Chapter 4 - Commands

VALUES:	n = 0, 1, 2 or 4
DEFAULT:	&C1
DESCRIPTION:	&C0 forces Carrier Detect on. &C1 lets Carrier Detect act normally. &C2 lets Carrier Detect drop S24 time on disconnect. &C4 resets modem when Carrier Detect drops.
COMMAND:	&CDn
VALUES:	n = 0 or 1
DEFAULT:	&CD0
DESCRIPTION:	&CD0 execute clear-down on disconnect. &CD1 do not execute clear-down on disconnect.
COMMAND:	Ds
VALUES:	s = phone #
DEFAULT:	n/a
DESCRIPTION:	Dial a telephone number "s", where s may include up to 60 digits or T, P, R, comma and ; characters.
COMMAND:	DsNd
VALUES:	s = phone # and d = 0 thru 9
DEFAULT:	n/a
DESCRIPTION:	Store telephone number. To store, enter phone number "s", followed by N, then Directory Number "d".
COMMAND:	&Dn
VALUES:	n = 0 thru 3
DEFAULT:	&D2
DESCRIPTION:	&D0 means DTR is ignored &D1 means modem returns to command mode. &D2 lets modem react to DTR normally. &D3 resets the modem to default parameters.
COMMAND:	\$Dn
VALUES:	n = 0 or 1
DEFAULT:	\$D0
DESCRIPTION:	\$D0 disables DTR Dialing. \$D1 enables DTR Dialing.
COMMAND:	%DF
VALUES:	n = 0 or 1
DEFAULT:	%DF0
DESCRIPTION:	%DF0 selects V.34 Line Probe Data in Graph Format. %DF1 selects V.34 Line Probe Data in Table Format.
COMMAND:	%DP

Chapter 4 - Commands

VALUES:	n = 0 or 1
DEFAULT:	%DP0
DESCRIPTION:	%DP0 selects do not read Line Probe Information from DSP during handshaking. %DP1 selects read Line Probe Information from DSP during handshaking.
COMMAND:	En
VALUES:	n = 0 or 1
DEFAULT:	E1
DESCRIPTION:	E0 selects do not echo Command mode characters. E1 selects do echo Command mode characters.
COMMAND:	&En
VALUES:	n = 0 thru 15
DEFAULT:	&E1, &E4, &E6, &E10, &E13, &E15
DESCRIPTION:	&E0 selects no error correction. &E1 selects V.42 Auto-reliable Mode. &E2 selects V.42 Reliable Mode. &E3 selects no modem-initiated flow control. &E4 selects CTS modem-initiated flow control. &E5 selects Xon/Xoff modem-initiated flow control. &E6 selects Xon/Xoff not passed through. &E7 selects Xon/Xoff passed through. &E8 selects Enq/Ack pacing off. &E9 selects Enq/Ack pacing on. &E10 selects Normal Mode flow control off. &E11 selects Normal Mode flow control on. &E12 selects Pacing off. &E13 selects Pacing on. E14 selects data compression disabled. &E15 selects data compression enabled.
COMMAND:	%En
VALUES:	n=0 thru 5
DEFAULT:	%E1
DESCRIPTION:	%E0 = Modem Won't Escape. %E1 = +++ Method (default setting). %E2 = Break Method. %E3 = Either +++ or Break Method. %E4 = No "OK" Response to +++ %E5 = "OK" Response to +++
COMMAND:	#Fn

Chapter 4 - Commands

VALUES: n = 0 thru 2
DEFAULT: #F2
DESCRIPTION: #F0 means no fallback when on-line.
#F1 means fallback from 33600 to 4800 bps when on-line (increments of 2400 bps).
#F2 means fallback to 4800 bps from 33.6K bps/fall forward if line improves (increments of 2400 bps).

COMMAND: &Fn
VALUES: n = 0, 8 or 9
DEFAULT: &F8
DESCRIPTION: &F loads factory default values from ROM.
&F8 reads factory default values when &F is issued.
&F9 reads parameters stored in nonvolatile memory when &F is issued.

COMMAND: \$Fn
VALUES: n = 0 or 1
DEFAULT: \$F1
DESCRIPTION: \$F0 means do not fall back to normal connect if CR received.
\$F1 means fall back to normal connect if CR received.

COMMAND: \$FCn
VALUES: n = 0 or 1
DEFAULT: \$FC1
DESCRIPTION: \$FC0 means no transmit of 5 second 2100Hz signal.
\$FC1 transmits 5 second 2100Hz signal.

COMMAND: &Gn
VALUES: n = 0, 1 or 2
DEFAULT: &G0
DESCRIPTION: &G0 turns off CCITT guard tones.
&G1 turns on CCITT 550 Hz guard tone.
&G2 turns on CCITT 1800 Hz guard tone (not used on International models).

COMMAND: Hn
VALUES: n = 0 or 1
DEFAULT: n/a
DESCRIPTION: H0 selects Hang Up (go on hook).
H1 selects Go Off Hook.

COMMAND: \$Hn

Chapter 4 - Commands

VALUES:	n = 1 thru 3
DEFAULT:	Read Only Command
DESCRIPTION:	\$H1 brings up Help Screen #1. \$H2 brings up Help Screen #2. \$H3 brings up Help Screen #3.
COMMAND:	In
VALUES:	n = 0, 1 or 2
DEFAULT:	Read Only Command
DESCRIPTION:	I0 requests modem ID #. I1 requests firmware revision #. I2 for MTS internal use.
COMMAND:	I9
VALUES:	N/A
DEFAULT:	Read Only Command
DESCRIPTION:	The I9 command is a query to display this modem's characteristics when operating within Windows 95. Entering ATI9<cr> invokes BR 28800 FAX CT on your video monitor. (The response to the query reveals that your modem is a BR, 28.8K, FAX and Class Two capable device.)
COMMAND:	L
VALUES:	5, 6, 7, 8, 9, 10 and 11
DEFAULT:	Read Only Command
DESCRIPTION:	Lists all stored telephone numbers in memory. L5 lists all current operating parameters. L6 lists all current S-Register values. L7 lists additional parameters. L8 lists current on-line diagnostics. L9 displays Signal Strength Information. L10 displays Signal to Noise Ratio Information. L11 displays Noise Information.
COMMAND:	#Ln
VALUES:	n = 0 thru 3
DEFAULT:	#L0
DESCRIPTION:	#L0 selects modems negotiate V.42 Mode. #L1 selects MNP on and LAP-M off. #L2 selects LAP-M on and MNP off. #L3 selects no detection phase; go directly to LAP-M mode.
COMMAND:	\$MBn

Chapter 4 - Commands

VALUES:	n = speed
DEFAULT:	\$MB33600 bps
DESCRIPTION:	\$MB75 selects CCITT V.23 mode. \$MB300 selects 300 bps on-line. \$MB1200 selects 1200 bps on-line. \$MB2400 selects 2400 bps on-line. \$MB4800 selects 4800 bps on-line. \$MB9600 selects 9600 bps on-line. \$MB14400 selects 14400 bps on-line. \$MB19200 selects 19200 bps on-line. \$MB28800 selects 28800 bps on-line. \$MB33600 selects 33600 bps on-line.
COMMAND:	Nd
VALUES:	d = 0 thru 9
DEFAULT:	n/a
DESCRIPTION:	Dial stored telephone number "d" (do not include the letter D in this command).
COMMAND:	NdNe
VALUES:	d = 0 thru 9; e = any other number 0 thru 9
DEFAULT:	n/a
DESCRIPTION:	Number Linking. If first number dialed is busy, another stored number may be automatically dialed. For example, if stored number "d" is dialed, and is busy, stored number "e" is then dialed.
COMMAND:	O
VALUES:	n/a
DEFAULT:	n/a
DESCRIPTION:	Exit Command Mode and go into On-Line Mode.
COMMAND:	P
VALUES:	n/a
DEFAULT:	Tone Dial
DESCRIPTION:	Modem will pulse-dial numbers following the P.
COMMAND:	&Pn
VALUES:	n = 0 or 1
DEFAULT:	&P0
DESCRIPTION:	&P0 selects 60-40 pulse ratio. &P1 selects 67-33 pulse ratio.
COMMAND:	Qn

Chapter 4 - Commands

VALUES:	n = 0, 1 or 2
DEFAULT:	Q0
DESCRIPTION:	Q0 selects Result Codes displayed. Q1 selects Result Codes suppressed (quiet). Q2 selects Dumb Answer Mode.
COMMAND:	&Qn
VALUES:	n = 0 or 1
DEFAULT:	&Q0
DESCRIPTION:	&Q0 selects Multi-Tech command set. &Q1 selects AT command set.
COMMAND:	Rn
VALUES:	n = 0 or 1
DEFAULT:	R0
DESCRIPTION:	R0 means modem will not reverse modes. R1 means modem will reverse modes.
COMMAND:	&Rn
VALUES:	n = 0, 1 or 2
DEFAULT:	&R1
DESCRIPTION:	&R0 lets Clear to Send act normally. &R1 forces Clear to Send on. &R2 drops for 1 second on disconnect.
COMMAND:	\$Rn
VALUES:	n = 0 or 1
DEFAULT:	\$R0
DESCRIPTION:	\$R0 selects disconnect after 12 retransmits. \$R1 selects do not disconnect after 12 retransmits.
COMMAND:	&RFn
VALUES:	n = 0 or 1
DEFAULT:	&RF1
DESCRIPTION:	&RF0 selects CTS follows RTS. &RF1 selects CTS to act independently
COMMAND:	Sr=n
VALUES:	r = 0-11, 13, 15-17, 24-26, 29, 30, 32, 34, 36, 37, 48
DEFAULT:	n/a
DESCRIPTION:	Sets value of S-Register "r" to value of "n", where "n" is entered in decimal format.
COMMAND:	Sr?

Chapter 4 - Commands

VALUES:	r = 0-11, 13, 15-17, 24-26, 29, 30, 32, 34, 36, 37, 48
DEFAULT:	n/a
DESCRIPTION:	Reads value of S-Register "r" and displays value in 3-digit decimal format.
COMMAND:	\$SBn
VALUES:	n = speed
DEFAULT:	\$SB115200 bps
DESCRIPTION:	\$SB300 selects 300 bps at serial port. \$SB1200 selects 1200 bps at serial port. \$SB2400 selects 2400 bps at serial port. \$SB4800 selects 4800 bps at serial port. \$SB9600 selects 9600 bps at serial port. \$SB19200 selects 19200 bps at serial port. \$SB38400 selects 38400 bps at serial port. \$SB57600 selects 57600 bps at serial port. \$SB115200 selects 115200 bps at serial port.
COMMAND:	\$SPn
VALUES:	n = 0 or 1
DEFAULT:	\$SP0
DESCRIPTION:	\$SP0 disables UUCP spoofing. \$SP1 enables UUCP spoofing.
COMMAND:	&SFn
VALUES:	n = 0 or 1
DEFAULT:	&SF0
DESCRIPTION:	&SF0 selects DSR follows CD. &SF1 selects DSR independent.
COMMAND:	&Sn
VALUES:	n = 0, 1 or 2
DEFAULT:	&S1
DESCRIPTION:	&S0 forces Data Set Ready On. &S1 lets Data Set Ready act normally. &S2 Data Set Ready drop is regulated by S24 on disconnect.
COMMAND:	T
VALUES:	n/a
DEFAULT:	Tone Dial
DESCRIPTION:	Modem will tone-dial numbers following the T.
COMMAND:	&Tn

Chapter 4 - Commands

VALUES:	n = 4 or 5
DEFAULT:	&T5
DESCRIPTION:	&T4 selects Enable Response to Request for Remote Digital Loopback. &T5 selects Disable Response to Request for Remote Digital Loopback.
COMMAND:	#Tn
VALUES:	n = 0 or 1
DEFAULT:	#T1
DESCRIPTION:	#T0 turns off Trellis Coded Modulation #T1 turns on Trellis Coded Modulation
COMMAND:	Un
VALUES:	n = 0, 1, 2, or 3
DEFAULT:	n/a
DESCRIPTION:	U0 places modem in Analog Loop Originate Mode. U1 places modem in Analog Loop Answer Mode. U2 places modem in Remote Digital Loopback test mode. U3 places modem in Local Digital Loopback Test Mode.
COMMAND:	Vn
VALUES:	n = 0 or 1
DEFAULT:	V1
DESCRIPTION:	V0 means Result Codes sent as digits(terse response). V1 means Result Codes sent as words (verbose response).
COMMAND:	W
VALUES:	n/a
DEFAULT:	n/a
DESCRIPTION:	Wait for new dial-tone.
COMMAND:	&Wn
VALUES:	n = 0 or 1
DEFAULT:	&W1
DESCRIPTION:	&W0 causes modem to store its current parameters in non-volatile RAM, and modem will load these for future sessions instead of reading factory ROM defaults, unless &F command used. &W1 causes modem to not store parameters.
COMMAND:	Xn
VALUES:	n = 0, 1, 2, 3 or 4

Chapter 4 - Commands

DEFAULT:	X0
DESCRIPTION:	X0 selects Basic Result Codes (w/o CONNECT 1200, CONNECT 2400). X1 selects Extended Result Codes (w/CONNECT 1200, CONNECT 2400). X2 selects Standard AT Command set with NO DIAL TONE. X3 selects Standard AT Command set with BUSY. X4 selects Standard AT Command set with NO DIAL TONE and BUSY.
COMMAND:	#Xn
VALUES:	n = 0 or 1
DEFAULT:	#X0
DESCRIPTION:	#X0 selects single XOFF character sent until XON level returns. #X1 selects multiple XOFF characters after buffer level is full.
COMMAND:	Yn
VALUES:	n = 0 or 1
DEFAULT:	Y0
DESCRIPTION:	Y0 disables sending or responding to long space "break". Y1 enables sending or responding to long space "breaks".
COMMAND:	Z
VALUES:	n/a
DEFAULT:	n/a
DESCRIPTION:	All configuration parameters are reset to default values.
COMMAND:	, (Comma)
VALUES:	n/a
DEFAULT:	n/a
DESCRIPTION:	Causes pause during dialing.
COMMAND:	;(Semi-Colon)
VALUES:	n/a
DEFAULT:	n/a
DESCRIPTION:	Causes return to Command Mode after dialing.
COMMAND:	! (Exclamation)
VALUES:	n/a
DEFAULT:	n/a
DESCRIPTION:	Causes modem to flash On-Hook.
COMMAND:	@
VALUES:	n/a

Chapter 4 - Commands

DEFAULT:	n/a
DESCRIPTION:	Causes modem to wait for ringback, then 5 seconds of silence before processing next part of command.
COMMAND:	+++AT<CR>
VALUES:	n/a
DEFAULT:	n/a
DESCRIPTION:	In-band Escape Sequence. Places modem in Command mode while still remaining On-Line. Enter +++ followed by the letters A and T, up to ten command characters, and a RETURN.
COMMAND:	BREAK AT<CR>
VALUES:	n/a
DEFAULT:	n/a
DESCRIPTION:	Out-of-band Escape Sequence. Places modem in Command mode while still remaining On- Line. Not preceded by AT. Enter a BREAK signal, followed by the letters A and T, up to sixty command characters, and hit RETURN.
COMMAND:	*C <Enter>
VALUES:	0, 1, 2
DEFAULT:	0
DESCRIPTION:	Caller ID Reporting the Call Traffic Window displays the phone number and name of the caller (if the caller's phone line supports Caller ID). The call must be answered after the second ring to receive the information. This feature requires a modem hardware upgrade, Caller Id-enabled phone lines, and firmware version greater than 8.07a or 2.07a. The firmware is disabled by default, enabled by the *C command.

4.1.1 Callback Security Commands

COMMAND:	#DBn
VALUES:	n= 0, 1, or 2
DEFAULT:	DB0
DESCRIPTION:	#DB0 disables Callback Security and answering Yes to the prompt turns off Callback Security and erases stored phone numbers and passwords. Answering No to the prompt aborts the command. #DB1 activates remote and local password security. #DB2 activates remote password security.
COMMAND:	#CBNyyxxxxx
VALUES:	n/a

Chapter 4 - Commands

DEFAULT:	n/a
DESCRIPTION:	Callback password with xxxxxx being callback password and yy being the memory location. Callback password xxxxxx must start with a non-numeric character and upper/lower case sensitive. Callback password xxxxxx must be a minimum of 6 and maximum of 10 characters. yy memory locations are from 0 to 29. Must T (tone) dialing in string.
COMMAND:	+ - Dxxxxxx??Nxx
VALUES:	n/a
DEFAULT:	n/a
DESCRIPTION:	Callback Phone Numbers xxxxxx with the + preceding the phone number indicating the callback modem phone number for the corresponding password at the same memory location. The (-) preceding the phone number enables direct entry when the caller uses the correct password without the callback modem having to return the call. The ??? entry at the end of the phone number represents an extension added to the main phone number. The Nxx is the memory location of the callback phone number and password.
COMMAND:	#Pn
VALUES:	n= 0, 1, or 2
DEFAULT:	#P0
DESCRIPTION:	Parity of the prompt messages sent by the callback modem. #P0 is no parity. #P1 is odd parity. #P2 is even parity.
COMMAND:	#RCBNxx
VALUES:	n/a
DEFAULT:	n/a
DESCRIPTION:	Erases the callback password stored at memory location xx. Memory locations are 0 to 29.
COMMAND:	#RDNxx
VALUES:	n/a
DEFAULT:	n/a
DESCRIPTION:	Erases the callback phone number stored at memory location xx. Memory locations are 0 to 29.

4.1.2 Remote Configuration

The Remote Configuration feature is a network management tool that allows you to configure modems remotely. This means you could configure modems anywhere in your network from one location without having to visit the sites or rely on remote users to follow your instructions. With Remote Configuration, which is protected by two level security, you can downline load new parameters, program new V.42 capabilities and implement new features. Remote Configuration also makes troubleshooting a remote location a lot easier.

The way Remote Configuration works is that S-Register S13 has been set-up to contain the special Remote Configuration escape code. When calling a Remote Configuration equipped modem, you enter the proper Remote Escape code to enable entering your Set-up Password. After entering it, you can then execute AT commands as if you were connected locally. If you set S-Register S13 to zero, Remote Configuration is disabled.

4.1.3 Remote Configuration Procedures

The procedures for using the Remote Configuration features are the same whether or not a call originates from the remote modem. Once the modem is on-line, perform the procedure below.

1. Remote Escape Configuration requires %%%<CR> to be sent if the default value in S-Register S13 has not been changed. The modem responds with:
 1. - *DATA Mode*
 2. - *COMMAND Mode*
2. You then select 1 or 2. With 1, the modem goes back into data mode and with 2, the modem responds with the following:
Password>
3. Enter your Set-up Password, and if the code is correct the modem responds with:
OK

Chapter 4 - Commands

You can now use any AT commands of the modem being remotely configured as if they were being entered locally. You cannot change the Set-up of the LOGIN Password until you enter the proper LOGIN Password.

4. When you are done entering AT commands and you want to exit, type **ATO** and hit RETURN. The modem responds with:
 1. *DATA Mode*
 2. *COMMAND Mode*
5. Enter a 1 to go back on-line with your computer, or enter 2 and the correct password to talk to your modem.

Password Commands

COMMAND: #lxxxxxxxxx
VALUES: n/a
DEFAULT: #IMULTITECH
DESCRIPTION: Login Password is any keyboard characters (x) (upper/lower case sensitive), minimum 6 and maximum 10 characters. The default Login Password is MULTI-TECH.

COMMAND: #Syyyyyyyyyy
VALUES: n/a
DEFAULT: #SMODEMSETUP
DESCRIPTION: Set-up Password is any keyboard characters (y) (upper/lower case sensitive), minimum 6 and maximum 10 characters. The default Set-up Password is MODEMSETUP.

4.1.4 V.25bis Commands

COMMAND: \$Vn
VALUES: n= 0, 1, 2, 5, or 6
DEFAULT: \$V0
DESCRIPTION: \$V0 returns modem to AT command mode when in V.25bis mode.
\$V1 enables V.25bis mode of operation.
\$V2 allows modem to receive one V.25bis command while in AT command mode without leaving AT command mode.
\$V5 DSR follows DTR in V.25bis mode.
\$V6 DSR does not follow DTR in V.25bis mode.

Chapter 4 - Commands

COMMAND:	CSPs
VALUES:	n/a
DEFAULT:	n/a
DESCRIPTION:	The CSP command will change the serial baud rate of your modem by entering CSPsssss where sssss can equal: CSP0300 - 300 bps CSP1200 - 1200 bps CSP2400 - 2400 bps CSP4800 - 4800 bps CSP9600 - 9600 bps CSP19200 - 19200 bps CSP38400 - 38400 bps CSP57600 - 57600 bps CSP115200 - 115200 bps
COMMAND:	CRNdd
VALUES:	n/a
DEFAULT:	n/a
DESCRIPTION:	Dials phone number dd where dd can be up to 20 characters (0 through 9, *, #, P, T and :). Phone number is checked against the Delayed and Forbidden Number lists before dialed.
COMMAND:	CRldd;nn
VALUES:	n/a
DEFAULT:	n/a
DESCRIPTION:	Dials dd same as CRN Command and ignores nn identification string.
COMMAND:	DIC or CIC
VALUES:	n/a
DEFAULT:	n/a
DESCRIPTION:	The disregard or connect to incoming calls commands are used for auto-answer operations. DIC stops the modem from answering incoming calls. CIC causes the modem to answer incoming calls.

4.2 S-Registers

Certain Command Mode configurations are stored in memory registers called, S-Registers. The S command is used to assign a value to, and to read the current value of an S-Register.

To assign a value to an S-Register, enter the letter S, followed by the S-Register number and an equals sign (=), and then a decimal response to the message "ENTER THE NEW VALUE IN DECIMAL FORMAT".

To read an S-Register value, enter the letter S followed by the S-Register number and a question mark (?), then hit RETURN. To verify that the S-Register value was entered correctly, enter for example, **ATS8?** and hit RETURN. You should receive a response of the assigned value given to that S-Register.

S0

Number of Rings Until Modem Answers

Unit: 1 ring
Range: 0-255
Default: 1
Description: Sets the number of rings before the modem answers.

S1

Rings Which Have Occurred

Unit: 1 ring
Range: 0-255
Default: 0
Description: Counts the number of rings that have occurred.

S2

Escape Code Character

Unit: ASCII Character
Range: 0-127
Default: 43 (+ sign)
Description: Defines the escape code character.

S3

Return Character

Unit: ASCII Character
Range: 0-127
Default: 13
Description: Defines the character recognized as Carriage Return (RETURN) or "Enter".

S4

Line Feed Character

Unit: ASCII Character
Range: 0-127
Default: 10
Description: Defines the character recognized as LINE FEED.

S5

Backspace Character

Unit: ASCII Character
Range: 0-127
Default: 8
Description: Defines the character recognized as BACKSPACE.

S6

Wait Time for Dial Tone

Unit: 1 second
Range: 2-255, 4-255**
Default: 2, 4**
Description: Sets the time the modem waits after the RETURN key is pressed before executing a dial command.

S7

Time for Carrier (Abort Timer)

Unit: 1 second
Range: 1-255, 1-45*
Default: 45
Description: Defines the Abort Timer (lack of carrier) delay time.

S8

Pause Time for Comma

Unit: 1 second
Range: 0-255, 4-255**
Default: 2, 4**
Description: Sets the length of the pause caused by a comma inserted in a dialing commarnational and DOC units

S9

Carrier Detect Response Time

Unit: 100 mSec.
Range: 1-255
Default: 6
Description: Sets the time delay for when the modem first detects a valid incoming carrier signal and when the modem turns on its Carrier Detect circuit.

** Value for International Units only

S10

Carrier Loss Disconnect Delay Time

Unit: 100 mSec.
Range: 0-255
Default: 7
Description: Sets the time a carrier signal must be lost before the modem disconnects.

S11

Tone Dialing: Tone Spacing and Duration

Unit: 1 mSec.
Range: 1-255, 80-255*
Default: 70, 80*
Description: Sets the time duration of spacing between tone in tone-dialing.

S13

Remote Configuration Escape Character

Unit: ASCII Character
Range: 0-127
Default: 37 (% sign)
Description: Defines the remote configuration escape character.

S16

Callback Attempts

Unit: 1 Attempt
Range: 1-255
Default: 4
Description: S16 defines the number of attempts allowed after initial passwords have been exchanged between modems.

S17

Changing Break Time

Unit: 10 mSec.
Range: 0-2.5 sec
Default: 250
Description: S17 defines the break time (space) to local PC.

S24

PBX/CBX Disconnect Drop Time for DSR/CTS/CD

Unit: 50 mSec.
Range: 0-255
Default: 20
Description: Defines DSR/CTS/CD dropout time. The default of 20 equals one second.

S25

DTR Dropout Time

Unit: 100 mSec.
Range: 0, 1 through 255
Default: 0
Description: Defines DTR dropout time. 0 default equals 50ms.

S26

Failed Password Attempts

Unit: 1 failed attempt
Range: 0-255
Default: 0
Description: Counts the number of times there has been a failed password attempt.

S29

Local Inactivity Timer

Unit: minutes
Range: 1-255
Default: 20
Description: Defines the amount of idle time that can elapse between AT commands after the SETUP password has been entered.

S30

Inactivity Timer

Unit: 1 minute
Range: 0-255
Default: 0
Description: Inactivity timer used to disconnect the modem.

S32

Time Elapse for Escape Sequence

Unit: 1 second
Range: 0-255
Default: 20
Description: Sets the duration in which modem waits for a <CR> to be entered during escape sequence execution.

S34

Buffer Length of Command Mode...After On-line Escape Sequence

Unit: ASCII Character
Range: 0-60
Default: 10
Description: Sets buffer length of command mode after on-line escape sequence.

S36

Time Between DTR Inactive and Modem Off-Hook

Unit: 1 Second
Range: 0-255 seconds
Default: 0
Description: Sets the time between DTR inactive (low) and the modem going *off-hook*. The DTR Busy-out feature is disabled with S36=0.

S37

Time Between DTR Active and Modem On-Hook

Unit: 1 Second
Range: 0-255 seconds
Default: 5
Description: Sets the time between DTR being active and the modem going *on-hook* (not busy).

S48

Program V34 Connect Speeds

Unit: N/A
Range: 33, 31, 28, 26, 24, 21,19,16,14,12, 96 and 48
Default: 0
Description: Defines which speed modem connects within Enhanced V.34 mode scope (e.g., S48 = 21 means maximum connect speed is 21.6K). This register is when line conditions will not support higher Enhanced V.34 speeds (e.g., 33.6K, 31.2K, 28K, 26.4K, 24K...) The modem default is a value of 0, which indicates a connection attempt of 33.6K.

4.3 Result Codes

The MT2834BR Command mode provides you with several responses, or "Result Codes", that can aid you in Command mode operation. These Result Codes are displayed on your video monitor.

AT&Q0 Selects Multi-Tech responses with Reliable/Compression modifiers. The terse result code for *CONNECT 2400* is 9.

AT&Q1 selects Standard AT command set responses. The terse result code for *CONNECT 2400* is 10.

Table 4-1: &Q0 "Multi-Tech" Result Codes

<u>TERSE</u>	<u>VERBOSE</u>
0	OK
1	CONNECT
2	RING
3	NO CARRIER
4	ERROR
5 *	CONNECT 1200
6	NO DIALTONE
7	BUSY
8	NO ANSWER
9 *	CONNECT 2400
11 *	CONNECT 4800
12 *	CONNECT 9600
13 *	CONNECT 14400
19 *	CONNECT 19200
21 *	CONNECT 21600
24 *	CONNECT 24000
26 *	CONNECT 26400
28 *	CONNECT 28800
31 *	CONNECT 31200
33 *	CONNECT 33600

* With MNP error correction on, RELIABLE (or R) is added to these result codes.
With LAP-M error correction on, LAP-M (or L) is added to these result codes.
With data compression on, COMPRESSED (or C) is added. (Note these "Extended" Result Codes are displayed when your modem is set-up to do so with an X1, X2, X3, or X4 command.)

Table 4-2: &Q1 "Standard AT" Result Codes

<u>TERSE</u>	<u>VERBOSE</u>
0	OK
1	CONNECT
2	RING
3	NO CARRIER
4	ERROR
5	CONNECT 1200
6	NO DIAL TONE
7	BUSY
8	NO ANSWER
10	CONNECT 2400
11	CONNECT 4800
12	CONNECT 9600
13	CONNECT 14400
19	CONNECT 19200
21	CONNECT 21600
24	CONNECT 24000
26	CONNECT 26400
28	CONNECT 28800
31	CONNECT 31200
33	CONNECT 33600

* Error Correction/Data Compressed modifiers are not displayed with Standard AT Result Codes.

4.3.1 AT Commands and S-Register Summary

The vast majority of installations are similar, with the MT2834 being used to dial up a remote installation where the call is automatically answered. Your MT2834 has a default configuration to dial another 33,600 bps modem that support error correction, data compression and flow control. If the answering modem is not compatible, the MT2834 can match protocols, provided the protocols are industry standard (i.e., ITU-T or Bell) and not proprietary.

The **&W** command, used in conjunction with specific other AT commands and S-Registers, can reconfigure the MT2834 to conform to a specific application. The MT2834 can store its configuration parameters and S-Register values in its nonvolatile memory.

The command **AT&W0** (or **AT&W**) causes the modem to store its current parameters in its nonvolatile RAM. The command also sets the modem upon power up, or when it is reset with an **ATZ** command, the modem reads all its configuration and S-Register parameters from RAM, and not from the factory settings in ROM (note you may recall factory installed defaults by entering **AT&F8&W0**). The **&W** command changes the configuration parameters stored in RAM that you specifically intend to alter. All other default parameters remain unchanged.

The **AT&W1** command sets the modem so that it does not store its parameters in RAM, and on power up or when an **ATZ** command is issued, parameters are read from the factory default settings in ROM.

Before using the **&W** command, you may want to view the modem's current operating parameters. Use the **ATL5**, **ATL6** and **ATL7** commands to display the current modem configuration.



Chapter 5 - Modem Testing



5.1 Local Analog Loopback Test/V.54 Loop 3

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. See Figure 5-1.

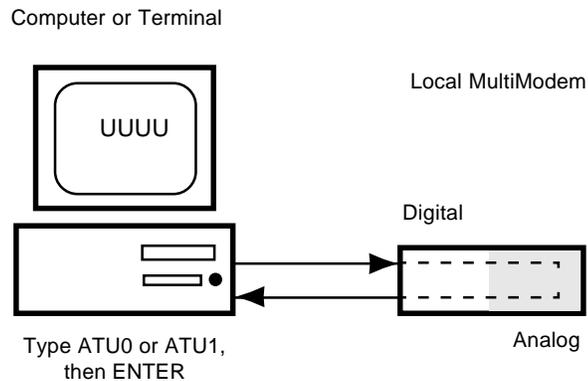


Figure 5-1. Local Analog Loopback Test

The test procedure is as follows:

1. Connect the modem to your computer. With your communication software, set the desired baud rate.
2. Type **ATU0 (or ATU)** and hit ENTER. This places your modem in Analog Loopback mode, in the Originate mode. The modem is now out of the Command mode and in a pseudo On-Line mode.
3. Once you receive a connect message (if responses are enabled), enter data from your keyboard. For this test, typing multiple upper case "U" characters is a good way to send an alternating test pattern of ones and zeros.
4. For a more complete test, you should also test the modem in Answer mode. To do this, you must "escape" from Originate mode by entering an Escape Sequence (**+++AT<CR>** or **<BREAK>AT<CR>**) . Then type

Chapter 5 - Testing the Modem

ATU1 and hit ENTER to place the modem in Analog Loopback mode, in the Answer mode. Then repeat step 3.

5. When testing is completed, you may exit Answer mode by entering an Escape Sequence (**+++AT<CR>** or **<BREAK>AT<CR>**), which returns the modem to Command mode.
6. Your modem passes this test if the data entered from your keyboard are the same as the data received on your monitor. If different data is appearing on your monitor, your modem is probably causing the problem, although it could also be your computer. If your modem passes this test, but you are receiving errors while On-line, the remote modem or the phone line could be at fault.

5.2 Digital Loopback Test/V.54 Loop 2 (Local/Manual)

The Digital Loopback Test is an on-line test that loops data sent from one modem across the phone line to another modem, then back to the first modem. See Figure 5-2.

There are two ways to put a modem into Digital Loopback mode.

1. Locally or Manually, described here in section 5.2.
2. Remotely or Automatically, see section 5.3.

Note: Loopback tests operate at all speeds except 300 bps. Disable error correction (&E0&W0<CR>) before engaging in loopback tests.

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.

The test procedure is as follows:

1. Go into Terminal mode. Type **AT** and hit ENTER; you should get an **OK** message.

Chapter 5 - Testing the Modem

2. Dial the remote modem by entering the Dial command and the phone number, to establish On-line mode.
3. Type the Escape Sequence (**+++AT<CR>** or **<BREAK>AT<CR>**) which brings your modem into Command mode, while still maintaining the pseudo On-line mode with the remote modem.
4. Type **ATU3** from the local PC and hit ENTER. Once you receive an *OK* message from your modem (if responses are enabled), the local modem is placed in Digital Loopback mode.
5. Data is typed from the remote keyboard. For this test, typing multiple upper case "U" characters is a good way to send an alternating test pattern of ones and zeros. The data received by the local modem will enter its analog receiver, be converted to digital data, be reconverted into analog, and then looped through its transmitter back to the remote modem. Your modem passes this test if the data entered from the remote keyboard is the same as the data received on the remote monitor.

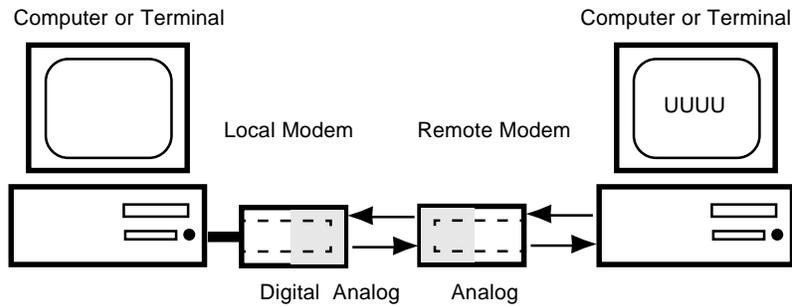


Figure 5-2. Digital Loopback Test (local / manual)

6. When testing is complete, you may end the test by typing an Escape Sequence (**+++AT<CR>** or **<BREAK>AT<CR>**) to bring your modem into Command mode. The modem should respond with an *OK* message. If you wish to stay On-line with the remote modem for normal data transmission, type **ATO** and hit ENTER. If you wish to terminate the call, type **ATH** and hit ENTER to hang up.

5.3 Digital Loopback Test/V.54 Loop 2 (Remote/Automatic)

In this test, your modem must be On-line with another modem set up to respond to a request for Digital Loopback. The test is as follows:

1. Enter Terminal mode. Type **AT** and hit ENTER. An *OK* message displays.
2. Dial the remote modem by entering the Dial command and the phone number, to establish On-line mode.

Note: Set the **&T4** command on the remote modem prior to running test.

3. Type the Escape Sequence (**+++AT<CR>** or **<BREAK>AT<CR>**) to enter Command mode, maintaining the remote modem connection.
4. Type **ATU2** and hit ENTER. The local modem transmits an unscrambled marking signal. The remote modem enters Digital Loopback mode. The local modem exits Command mode and enters pseudo On-line mode.
5. Type multiple uppercase **"U"** characters to send an alternating test pattern of ones and zeros. The data received by the remote modem enters the analog receiver and is converted to digital data. The data is reconverted into analog, then looped through the transmitter back to the local modem. If the data entered from the keyboard is the same as the data received on the monitor, the modem has passed the test.

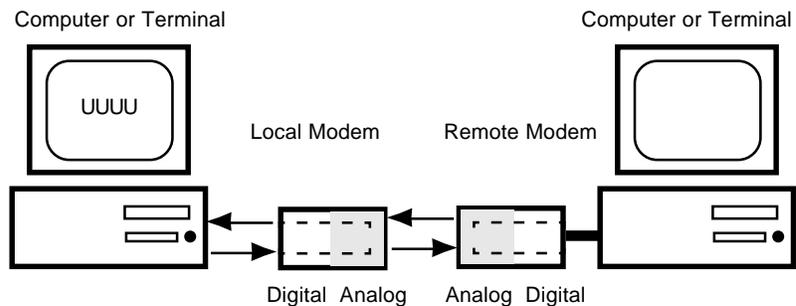


Figure 5-3. Digital Loopback Test (remote / automatic)

5.4 Local Analog Loopback Test (Synchronous Mode)

To initiate the Local Analog Loopback Test, with the modem in Synchronous mode:

1. Enter **AT&M1U**. This first switches your modem from asynchronous to synchronous mode, and places it into the Analog Loopback/Originate mode. The modem is now out of the Command mode and in the pseudo On-Line mode.
2. Once you receive a connect message (if responses are enabled), enter data from your keyboard. For this test, typing multiple upper case "U" characters is a good way to send an alternating test pattern of ones and zeros.
3. For a more complete test, you should also test the modem in Answer mode. To do this, pull out and then reinsert modem card in rack cage. Then type **AT&M1U1** and hit ENTER to place the modem in Analog Loopback mode, in the Answer mode. Then repeat step 2.

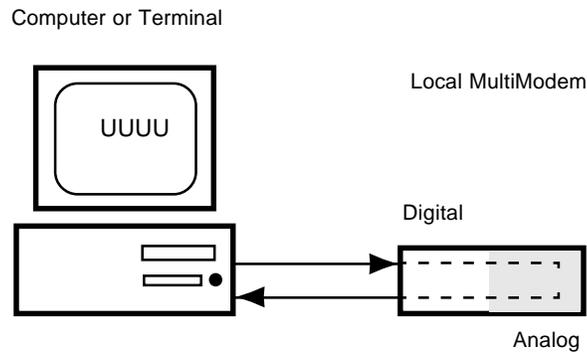
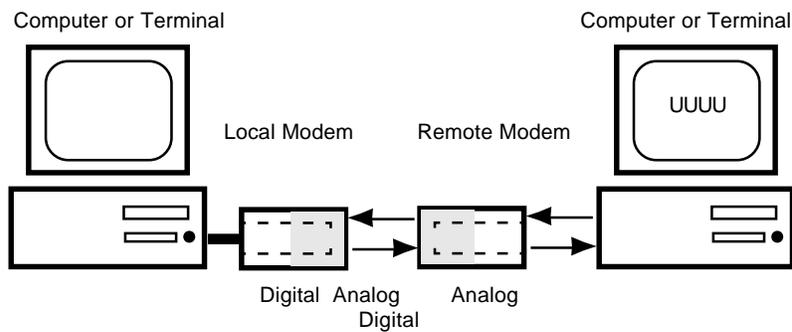


Figure 5-4. Local Analog Loopback Test (Synchronous Mode)

**5.5 Digital Loopback Test (Local/Manual)
(Synchronous Mode)**

This test must be run when you have a data connection with another modem. To initiate the Digital Loopback Test (local/manual), DIP-Switch #9 must be in the UP position, then place DIP-Switch #16 in the opposite position it is currently (the modem requires a state of change in Switch #16 to activate Loopback tests). Once you receive an *OK* message from your modem (if responses are enabled), the local modem is placed in Digital Loopback mode.

To exit the Digital Loopback Test (local/manual), pull out and then reinsert modem card into modem card cage.



**Figure 5-5. Digital Loopback Test
(local / manual) (Synchronous)**

5.6 Digital Loopback Test (Remote/Automatic) (Synchronous Mode)

This test must be run when you have a data connection with another modem. To initiate the Digital Loopback Test (remote/automatic), DIP-Switch #9 must be in the DOWN position, then place DIP-Switch #16 in the opposite position it is currently (the modem requires a state of change in Switch #16 to activate Loopback tests). Once you receive an *OK* message from your modem (if responses are enabled), the local modem is placed in Digital Loopback mode.

To exit the Digital Loopback Test (remote/automatic), pull out and then reinsert modem card into modem card cage.

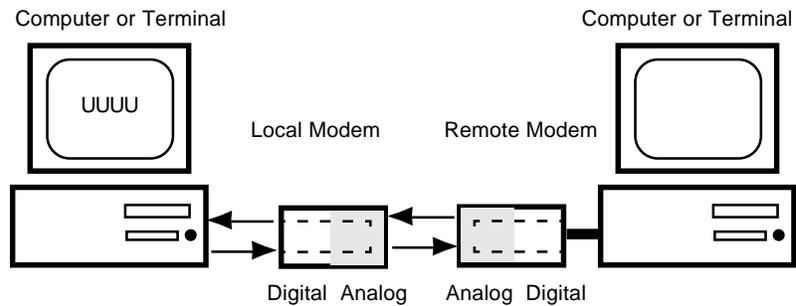


Figure 5-6. Digital Loopack Test
(remote / automatic) (Synchronous)

Chapter 6 - Warranty and Service



6.1 Introduction

This chapter starts out with statements about your modem's 2-year warranty. The next section, Tech Support, should be read carefully if you have questions or problems with your modem. It includes the technical support telephone numbers, space for recording your modem information, and an explanation of how to send in your modem should you require service. The final five sections explain how to use our Bulletin Board Service (*BBS*), upgrading the MT2834BR via Flash PROM, a Safety Warnings notice, a brief section on the CompuServe/Internet Forums and information on Multi-Tech's Fax-Back service.

6.2 Limited Warranty

Multi-Tech Systems, Inc. ("*MTS*") warrants that its products will be free from defects in material or workmanship for a period of two years from the date of purchase, or if proof of purchase is not provided, two years from date of shipment. MTS MAKES NO OTHER WARRANTY, EXPRESSED 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 the 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 PURCHASE PRICE FOR DEFECTIVE PRODUCTS.

6.3 Tech Support

Multi-Tech 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 unit, call 1-800-972-2439. Please fill out the modem information (below), and have it available when you call. If your modem requires service, the tech support specialist will guide you on how to send in your modem (see Section 6.3.2).

6.3.1 Recording Modem Information

Please fill in the following information on your Multi-Tech modem. This will help tech support in answering your questions.

Modem Model No.: _____
Modem Serial No.: _____
Modem Firmware Version: _____
COM Port#: _____
FAX Software Type and Version: _____
DataComm Software Type and Version: _____

The modem model and serial numbers are silkscreened on the bottom of your modem. The software version is printed on the System CD label. Type **ATI1** to display the modem firmware version.

Please note the status of your modem before calling tech support. This status can include LED indicators, screen messages, diagnostic test results, problems with a specific application, etc..

6.3.2 Service

If your tech support specialist decides that service is required, modems may be sent (freight prepaid) to our factory. Return shipping charges will be paid by Multi-Tech Systems.

Include the following with your modem:

- a description of the problem.
- return billing and return shipping addresses.
- contact name and phone number.

Chapter 6 - Warranty and Service

- check or purchase order number for payment if the modem is out of warranty. (Check with your technical support specialist for current charges.)
- if possible, note the name of the technical support specialist with whom you spoke.

If you need to inquire about the status of the returned product, be prepared to provide the **serial number** of the product sent (see Section 6.3.1).

Send modems to this address:

MULTI-TECH SYSTEMS, INC.
2205 WOODALE DRIVE
MOUNDS VIEW, MINNESOTA 55112
ATTN: SERVICE OR REPAIRS

6.4 *Upgrading the MT2834BR*

The MT2834BR has a Flash PROM which contains firmware code for the hardware and DSP code for the digital signal processor chips. At various times, Multi-Tech may add enhancements and/or fixes to the firmware. The flash technology used in the MT2834BR lets you load these upgrades into the PROM or DSP chips through the modem's serial port.

6.4.1 *Using FlashPro to Upgrade Modem Firmware*

1. Download FLASHPRO.ZIP and a new .HEX file from the Multi-Tech BBS.
2. Unzip the FLASHPRO.ZIP file. Place this unzipped file and the .HEX file in the same directory.
3. Run FlashPro by typing FLASHPRO, a space, -M and hitting ENTER at the DOS prompt.
4. Highlight the "Configure" option in the MAIN MENU and hit ENTER. Highlight "Active Port" and select the COM port to which you have your modem attached. Highlight "Baud Rate"

Chapter 6 - Warranty and Service

and select the rate you want to program at. Hit ESC when finished.

5. Highlight the "Select File to Program" option in the MAIN MENU. Highlight the .HEX file. Hit ESC when finished.
6. Highlight "Program Firmware" option in the MAIN MENU. When you are prompted to confirm the file to program, press "Y".
7. If you need more assistance programming FLASHPRO, then contact our tech support department.

6.5 Safety Warnings

1. Never install telephone wiring during a lightning storm.
2. Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
3. Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
4. Use caution when installing or modifying telephone lines.
5. Avoid using a telephone (other than a cordless type) during an electrical storm. There may be a remote risk of electrical shock from lightning.
6. Do not use the telephone to report a gas leak in the vicinity of the leak.
7. Ports which are connecting to other apparatus are defined as SELV. To ensure conformity with EN 41003, ensure that these ports are only connected to the same type on other apparatus.

6.6 Internet

Multi-Tech is a commercial provider on the Internet, and we retrieve e-mail messages from the following mailboxes on a periodic basis:

<i>tsupport@multitech.com</i>	Technical Support
<i>mtsmktg@multitech.com</i>	Marketing Dept.
<i>mtssales@multitech.com</i>	Sales Dept.
<i>international@multitech.com</i>	International Sales Dept.
<i>writers@multitech.com</i>	Publications Dept.

Multi-Tech's presence includes a Web site at:
www.multitech.com

Chapter 7 - BABT Requirements



7.1 Compliance with BABT Requirements

Approved for connection to telecommunications system specified in the instructions for use subject to the conditions set out in them.

Warning: *Interconnection directly, or by way of other apparatus, of ports marked "SAFETY WARNING see instructions for use" with ports marked or not so marked may produce hazardous conditions on the network. Advice should be obtained from a competent engineer before such a connection is made.*

This apparatus has been approved for the use of the following facilities:

- Auto-calling
- Loop disconnect and MF dialing
- Phone number storage and retrieval by a predetermined code
- Operation in the absence of proceed indication
- Automatic storage of last number dialed
- Tone detection-busy
- Auto clear from the originating end
- DTR dialing
- Modem
- PBX timed break register recall

7.1.1 European Low Voltage Directive

When correctly installed and maintained, the modem will present no hazard to the user. When correctly installed the modem will be connected to the PSTN or a PW and to a Data Terminal Equipment (DTE), whose modem connections comply with CCITT recommendation V28. The DTE connections are therefore taken to be safe voltages (less than ± 30 volts).

The main power source shall be installed near to the equipment and shall be easily accessible. The plug that connect to the apparatus to the main power supply must be fitted with a 5A fuse that complies with BSI1362.

Ports which are capable of connecting to other apparatus are defined as SELV. To ensure conformity with EN 41003, ensure that these ports are only connected to ports of the same type on other apparatus.

7.1.2 Compliance with BS6305 Clause 6.2, BS6320 Clause 7.2, and BABT/SITS/82/005S/D

- a. The modem is suitable for connection to the Public Switched Telephone Network (PSTN) provided by British Telecommunications plc or Kingston Communications (Hull) plc. Circuit supply by British Communications, Mercury Communication, or Hull City Council. Only direct exchange lines may be used, not shared service.
- b. The modem is suitable for household, office, and similar general indoor use. It is not suitable for use as an extension to a payphone.
- c. BT lines supplied must support either loop disconnect or multifrequency tone signalling.
- d. REN (Ringer Equivalence Number).

The REN value of a unit is calculated from $3/n$ where n is the total number of units which can be connected in parallel which will still cause the standard bell (as defined in BS6305 Appendix D) to ring.

REN values of less than 0.3 cannot be assigned.

$$\text{REN} = 1$$

If a telephone or other device is connected in parallel with the modem, the combined REN must not exceed 4. A BT supplied telephone may be assumed to have REN of 1.0 unless otherwise noted.

The approval of this modem for connection to the British Telecom public switched telephone network is INVALIDATED if the apparatus is subject to any modification in any material way not authorized by BABT or if it is used with or connected to:

- i. internal software that has not been formally accepted BABT.
- ii. external control software or external control apparatus which cause the operation of the modem associated call set-up equipment to contravene the requirements of the standard set out in BABT/SITS/82/005S/D.

All other apparatus connected to this modem and thereby connected directly or indirectly to the British Telecom public switched telephone network must be approved apparatus as defined in Section 22 of the British Telecommunications Act 1984.

The REN number for this apparatus = 1

7.1.3 Compliance with BS6789: Section 3.1 and Part 2

- a. The modem is not capable of allowing Auto Call using '999' or other PABX emergency numbers.
- b. Modes other than modes 1, 2, or 3 should not be used on the BT PSTN. This modem is a mode 1 device.
- c. Users are advised to check the numbers entered during the Auto Call set up phase prior to dialing.
- d. The user should not issue any sequence of commands to the modem which would cause the modem to exceed the maximum allowable pause of 8 seconds from the time the modem goes off hook until dialing begins.
- e. For correct operation of the call progress monitor, the power has to be properly connected and switched on.

7.1.4 Compliance with BS6328 Part 1

- a. The modem is not suitable for use on circuits with British Telecommunications signaling at a normal frequency of 2280 Hz.
- b. The modem does not require signaling or otherwise employ the frequency range dc to 200 Hz.
- c. The modem may be connected to a point to point two-wire or four-wire Private Circuit.
- d. The modem does not require dc from the Private Circuit for correct operation. The modem may be damaged if connected, in a private circuit mode, to a circuit supplying dc current (the maximum permissible direct current is zero amps).



Appendices



Appendix A

FCC Regulations for Telephone Line Interconnection

1. This equipment complies with Part 68 of the Federal Communications Commission (FCC) rules. On the outside surface of this equipment is a label that contains, among other information, the FCC registration number and ringer equivalence number (REN). If requested, this information must be provided to the telephone company.
2. As indicated below, the suitable jack (Universal Service Order Code connecting arrangement) for this equipment is shown. If applicable, the facility interface codes (FIC) and service order codes (SOC) are shown.

An FCC-compliant telephone cord and modular plug is provided with this equipment. This equipment is designed to be connected to the telephone network or premises wiring using a compatible modular jack which is Part 68 compliant. See installation instructions for details.

3. The ringer equivalence number (REN) is used to determine the quantity of devices which may be connected to the telephone line. Excessive REN's on the telephone line may result in the devices not ringing in response to an incoming call. In most, but not all areas, the sum of the REN's should not exceed five (5.0). To be certain of the number of devices that may be connected to the line, as determined by the total REN's, contact the telephone company to determine the maximum REN for the calling area.
4. 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 isn't practical, the telephone company will notify the customer 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.

Appendix A

5. 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.
6. 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 equipment is causing harm to the telephone network, the telephone company may request you remove the equipment from the network until the problem is resolved.
7. 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.
8. This equipment cannot be used on public coin service provided by the telephone company. Connection to Party Line Service is subject to state tariffs. (Contact the state public utility commission, public service commission or corporation commission for information.)
9. If so required, this equipment is hearing-aid compatible.

Manufacturer: Multi-Tech Systems, Inc.
Model Number: MT2834BR
FCC Registration #: AU7USA-20673-MM-E
Ringer Equivalence: 0.3B
Modular Jack (USOC) RJ11C or RJ11W (single line)

Service Center in US: Multi-Tech Systems Inc.
2205 Woodale Drive
Mounds View, MN 55112
Voice (763) 785-3500
FAX (763) 785-9874

Canadian Limitations Notice

Notice: The ringer equivalence number (REN) assigned to each terminal device provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination of an interface may consist of any combination of devices subject only to the requirement that the sum of the ringer equivalence numbers of all the devices does not exceed 5.

Notice: The Industry Canada label identifies certificated equipment. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements. The Industry Canada 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. 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 designated by the 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 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.

Appendix B
Technical Specifications

Your MT2834BR/BRL data/fax modem meets the specifications listed below:

Model Numbers	MT2834BR, MT2834BRI, MT2834BR-MAC
Data Rates (modem)	33600, 31200, 28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800, 2400, 1200, 0-300 bps
Data Rates (fax)	14400, 9600, 7200, 4800 bps
Data Format	Serial, binary, asynchronous at 0-300, 1200, 2400, 4800, 7200, 9600, 14400, 16800, 19200, 21600, 24000, 26400, 28800, 31200, 33600 bps; synchronous at 1200, 2400, 4800, 7200, 9600, 14400, 16800, 19200, 21600, 24000, 26400, 28800, 31200, 33600 bps
Compatibility	ITU V.42 <i>bis</i> , V.42, Pending ITU Enhanced V.34 approval, V.34, ITU V.32 <i>bis</i> , V.32, V.21*, V.22 <i>bis</i> , V.22, V.23*, V.25 <i>bis</i> , Bell 212A and 103/113, ITU V.17, Group 3 T.4, T.30 and EIA TR-29 Class 2 (*V.21/V.23 Int'l models only)
Error Correction	V.42 (LAP-M or MNP 3 & 4) error correction
Data Compression	V.42 <i>bis</i> , (4:1 throughput) or MNP 5 (2:1 throughput) data compression
Speed Conversion	Serial port data rates adjustable to 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200 bps

Flow Control Options	Xon/Xoff, Hardware RTS/CTS, ENQ/ACK, Unix-to-Unix Copy Protocol (<i>UUCP</i>) " <i>Spoofing</i> "
Mode of Operation	Full duplex over both dial-up lines and 2-wire leased lines; automatic or manual dialing, automatic or manual answer
Intelligent Features	Fully " <i>AT command</i> " compatible, micro-processor controlled remote configuration, EIA extended Automode, adaptive line probing, automatic symbol rate and carrier frequency during start-up, retrain and rate renegotiation, autodial, redial, repeat dial, dial linking, pulse or tone dial, dial pauses, call status display, auto-parity and data rate selection, keyboard-controlled modem options, non-volatile memory and on-screen displays for modem option parameters and up to ten telephone numbers/ command lines of up to 60 digits each, help menus
Command Buffer	60 characters
Modulation	Trellis Coded Modulation (<i>TCM</i>) at 33600, 31200, 28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000 and 9600 bps, Quadrature Amplitude Modulation (<i>QAM</i>) at 9600 (non-trellis), 4800 and 2400 bps, PSK at 1200 bps, FSK at 300 bps
Fax Modulations	V.21CH2 FSK at 300 bps V.27ter DPSK at 4800 and 2400 bps V.29 QAM at 9600 and 7200 bps V.17 TCM at 14400, 12000, 9600, and 7200 bps
Fax Carrier	V.21CH2 (Half Duplex)

Frequencies	1650Hz Mark, 1850Hz Space for Transmit Originate; 1650Hz Mark, 1850Hz Space for Transmit Answer; V.27ter 1800Hz Originate/Answer; V.29 QAM 1700Hz Originate/Answer; V.17 TCM 1800Hz Originate/Answer
Carrier Frequencies	1800 Hz V.32/V.32bis/V.32terbo/V.34/Enhanced V.34--33.6K/31.2K/28.8K/26.4K/24K/21.6K/19.2K/16.8K/14.4K/12K/9.6K/7.2K/4.8K
Carrier Frequencies 2400 & 1200 bps (V.22bis/V.22 or Bell 212A Standard)	Transmit Originate: 1200 Hz Transmit Answer: 2400 Hz Receive Originate: 2400 Hz Receive Answer: 1200 Hz
Carrier Frequencies, 300 bps (Bell Standard)	1270 Hz Mark, 1070 Hz Space for Transmit Originate; 2225 Hz Mark, 2025 Hz Space for Receive Originate; 2225 Hz Mark, 2025 Hz Space for Transmit Answer; 1270 Hz Mark, 1070 Hz Space for Receive Answer
Carrier Frequencies V.21	980 Hz Mark, 1180 Hz Space for Transmit Originate; 1650 Hz Mark, 1850 Hz Space for Transmit Answer; 1650 Hz Mark, 1850 Hz Space for Receive Originate; 980 Hz Mark, 1180 Hz Space for Receive Answer
V.23	390 Hz Mark, 450 Hz Space for Transmit Originate; 1300 Hz Mark, 2100 Hz Space for Transmit Answer; 1300 Hz Mark, 2100 Hz Space for Receive Originate; 390 Hz Mark, 450 Hz Space for Receive Answer
Transmit Level	-11dBm (dial-up), -15 dBm (leased-line); dBm level selectable with DIP-Switch #3 in leased line setting

Appendix B

Frequency Stability	±0.01%
Receiver Sensitivity	-43 dBm under worst case conditions
AGC Dynamic Range	43 dB
Interface	EIA RS232C/ITU-TSS V.24
Connectors	Sixteen DB25 RS232C connectors; sixteen DB9 connectors for phone line (CC216/916/1432/2834 Rack Modem Cabinet) or sixteen RJ11 connectors for phone line (CC1600 Rack Modem Cabinet).
Diagnostics	Power-on Self Test, Local Analog Loop, Local Digital Loop, Remote Digital Loop.
Indicators	LEDs for Transmit Data, Receive Data, Carrier Detect, various speed indicators, Off Hook, Terminal Ready, Ring Indicator, and Out of Service (<i>Busy</i>)
Controls	Toggle switch for Out of Service (OOS). On-board DIP-Switches and jumpers for various modem options.
Operating Temperature	0° to 50° C (32° to 120° F)
Power Requirements	115 Volts AC, 60Hz, 0.3amp.
Power Consumption	Approximately 6 watts
Dimensions	10-1/2" long x 5-1/2" wide
Weight	1.5 pounds



Index



Index

Symbols

&E0 1-32
 &E1 1-32
 &E14 1-31, 1-32
 1.1 Technical Specifications 1-81

A

Abort Timer
 S7 1-51
 AGC Dynamic Range 1-84
 ASCII code 1-26
 AT 1-25
 AT command set 1-41
 AT Commands and S-Register
 Summary 1-57
 AT&T's "call card"
 tones 1-34
 Auto-answer 1-26, 1-28

B

Backspace Character 1-51
 S5 1-51
 Baud rate
 Serial port 1-29
 Bell/V.21 answer tone selection 1-35
 British Telecom 1-75

British Telecommunications
 pic 1-74
 Buffer Length of Command
 Mode...After On-line
 Esca 1-53
 S34 1-53
 Bulletin board systems 1-25, 1-32
 Busy Out 1-16

C

Callback Attempts 1-52
 Callback Security Commands 1-45
 Callback Security/Remote
 Configuration Commands 1-45
 Canadian Limitations Notice 1-80
 Card Cage 1-11
 Carrier Detect 1-36
 Carrier Detect Response
 Time 1-51
 S9 1-51
 Carrier Frequencies 1-83
 Carrier Frequencies (Data) 1-83
 Carrier Loss Disconnect Delay
 Time 1-52
 S10 1-52
 Carrier ON 1-19
 Changing Break Time 1-52
 S17 1-52
 Changing Default Parameters 1-28

Clear to Send 1-41
cleardown on disconnect 1-36
COM ports
 COM2 1-29
Command Buffer 1-82
Command mode characters control 1-37
Command string 1-26
Commands
 Attention code 1-25
 Auto-Reliable mode 1-32
 Data compression 1-31, 1-32
 Modem reset 1-25
 Non-Error Correction mode 1-32
 Reliable mode 1-32
Compatibility 1-81
Compliance with BAPT Requirements 1-73
CompuServe 1-32
Configuration Parameters 1-29
Configuring Software 1-29
Configuring Your Software 1-25
Connectors 1-84
Controls 1-84
CTS flow control 1-37
CTS follows RTS 1-41
CTS signal 1-28

D

Data Compression 1-31, 1-81
data compression enabled/disabled 1-37
Data Format 1-81
Data Rates 1-81
Data Rates (fax) 1-81
Data Rates (modem) 1-81
Data Set Ready 1-42

-
- Data Terminal Ready 1-19
 - Datacomm software 1-22, 1-25, 1-26, 1-29, 1-30, 1-31
 - Configuration 1-25, 1-29, 1-30
 - Diagnostics 1-84
 - Dial-Up and Leased Lines 1-18
 - Dial-Up Lines 1-18
 - Dialing a stored telephone 1-40
 - Dialing/On-Line/Answering 1-22
 - Digital Loopback Test (Synchronous) 1-65
 - Digital Loopback Test (Remote/Automatic) 1-65
 - Digital Loopback Test (Synchronous Mode) 1-65
 - Dimensions 1-84
 - DIP Switches and Jumper Settings 1-12
 - DIP-Switch options 1-14
 - DIP-Switch Settings 1-11
 - DSR follows CD 1-42
 - DTR Control 1-36
 - DTR Dialing 1-36
 - DTR Dropout Time 1-53
 - S25 1-53
 - DTR signal 1-28
- E**
- Enq/Ack pacing 1-37
 - Error 1-20
 - Error Correction 1-32, 1-81
 - Error correction 1-32
 - error correction selection 1-37
 - Escape Code Character 1-50
 - S2 1-50
 - Escape modes selection 1-37
 - European Low Voltage Directive 1-74
- F**
- factory default values 1-38
 - Fax Carrier Frequencies 1-83
 - Fax Modulations 1-82
 - FCC Regulations for Telephone Line Interconnection 1-78
 - Features 1-8
 - File Transfer Protocols 1-31
 - File transfer protocols 1-31
 - flash On-Hook 1-44
 - FlashPro to Upgrade Modem Firmware 1-69
 - Flow Control 1-82
 - Flow control 1-28
 - flow control selection 1-37
 - Frequency Stability 1-84
- G**
- guard tones 1-38
- H**
- Help Screen selection 1-39
 - How to Use This Manual 1-9
- I**
- In-band Escape Sequence 1-45

Inactivity Timer 1-53
 S30 1-53
Indicators 1-84
Initialization strings 1-25, 1-28, 1-32
 Macintosh 1-28
 PC-compatible 1-26
Installation 1-12
Intelligent Features 1-82
Interface 1-84
Introduction 1-8
ists operating parameters 1-39

K

Kingston Communications (Hull)
 pic 1-74

L

Lease Line Restoral 1-83
Limited Warranty 1-67
Line Feed Character 1-51
 S4 1-51
Line Probe 1-37
Login Password 1-48
long space "break 1-44
Loopback Test Enabled 1-43

M

Macintosh computer 1-23, 1-28
Macintosh Initialization 1-28
maximum transmit block size
 selection 1-35

MNP 5 1-31
Mode of Operation 1-82
Model Numbers 1-81
Modem AT Commands 1-34
 modem baud selection 1-39
 modem ID 1-39
Modem Initialization Setup 1-27
Modem LED Indicators 1-19
Modulation 1-82
MSD.EXE 1-23
Multi-Tech command set 1-41
Multi-Tech responses 1-54
"Multi-Tech" Result Codes 1-55

N

negotiate V.42 Mode 1-39
Noise Information 1-39
Number of Rings Until Modem
 Answers
 S0 1-54

O

Off Hook 1-19
Off Hook control 1-38
OOS (Busy Out) Toggle
 Switch 1-16
Operating Temperature 1-84
Out of Service 1-17

P

Pacing 1-28
Parameters 1-25, 1-28

-
- Changing defaults 1-28
 - Parity 1-25
 - pause during dialing 1-44
 - Pause Time for Comma 1-51
 - S8 1-51
 - PBX/CBX Disconnect Drop
 - Time for DSR/CTS/CD 1-52
 - S24 1-52
 - PC Board Controls 1-13
 - PC Initialization Strings 1-26
 - Phone Line Connection 1-13
 - Power 1-84
 - Power Consumption 1-84
 - Power Requirements 1-84
 - Preliminaries 1-11
 - Program V34 Connect
 - Speeds 1-54
 - Protocols 1-31
 - pulse ratio 1-40
 - pulse-dial 1-40
- R**
- Receive Data 1-19
 - Receiver Sensitivity 1-84
 - Recording Modem Information 1-68
 - Remote Configuration 1-47
 - Remote Configuration Escape
 - Character 1-52
 - S13 1-52
 - Remote Configuration Procedures 1-47
 - Remote Digital Loopback 1-43
 - Remote System Configuration 1-30
 - reset default values 1-44
 - Result Codes 1-41, 1-44, 1-54
 - Result codes 1-26
 - Result Codes Terse/Verbose selection 1-43
 - retransmit 1-41
 - Return Character 1-50
 - S3 1-50
 - Return character 1-26
 - return to Command Mode after dialing 1-44
 - Ring Indicator 1-19
 - Ringer Equivalence Number 1-74
 - Rings Which Have Occurred
 - S1 1-50
 - RTS signal 1-28
- S**
- S-Registers 1-50
 - S3 1-26
 - Safety Warnings 1-70
 - SCC 1-23
 - Serial Cable 1-11
 - Serial cable 1-28
 - Serial port 1-22, 1-23, 1-29, 1-31
 - serial port commands 1-42
 - Serial Port Limitations 1-22
 - Service 1-68
 - Sessions 1-25
 - Set-up Password 1-48
 - Signal Strength Information 1-

-
- 39
 - Signal to Noise Ratio Information 1-39
 - SIT files 1-31
 - Speed Conversion 1-81
 - speed conversion 1-35
 - Standard AT command set responses 1-54
 - "Standard AT" Result Codes 1-56
- I**
- Tech Support 1-68
 - Technical Specifications 1-81
 - Telephone Line 1-11
 - Terminal Emulation 1-30
 - Terminal emulation 1-30
 - Terminal Emulation Setup 1-30
 - TERSE VERBOSE 1-55
 - Time Elapse for Escape Sequence 1-53
 - S32 1-53
 - Time for Carrier S7 1-51
 - Time for Carrier (Abort Timer) 1-51
 - Tone Dialing: Tone Spacing and Duration 1-52
 - S11 1-52
 - Transmission speed 1-23, 1-29
 - transmit buffer size 1-35
 - Transmit Data 1-19
 - Transmit Level 1-83
- Trellis Coded Modulation selection 1-43
- U**
- UART 1-23
 - UARTs 1-22, 1-23, 1-29, 1-31, 1-32
 - 16450 1-22, 1-23, 1-29
 - 16550 1-22, 1-29
 - 8250 1-22, 1-23, 1-29
 - 8250A 1-22, 1-23, 1-29
 - Identifying 1-23
 - Upgrading the MT2834BA 1-69
 - Upgrading the MT2834BL 1-69
 - Upgrading the MT2834PCS 1-69
 - UUCP spoofing 1-42
- V**
- V.25bis Commands 1-48
 - V.34 Line Probe 1-36
 - V.42 1-32
 - V.42bis 1-22, 1-23, 1-29, 1-31, 1-32
- W**
- wait for ringback 1-45
 - Wait Time for Dial Tone S6 1-51
 - Warranty 1-67
 - Weight 1-84
- X**
- XON/XOFF 1-28
 - Xon/Xoff flow control 1-37



S000316