

**GRID**<sup>®</sup>

# Internal Modem

User's Guide

# Internal Modem User's Guide

August 1990

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Manual Name: Internal Modem User's Guide  
Order Number: 965800-00  
Issue date: August 1990  
Revision: F

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## ABOUT THIS BOOK

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This manual describes how to operate the MNP/FAX modem, the MNP 2400 bps modem, and the UK MNP 2400 bps modem for GRiD<sup>®</sup> Systems computers. These modems are all internal modems. The modems available for each GRiD computer are listed below.

GRiD Computer	MNP/FAX (Option #)	MNP 2400 Bps (Option #)	UK MNP 2400 Bps (Option #)
GRiDCASE <sup>®</sup> 1520/1530/1535 EXP	335 <sup>1</sup>	332	333
GRiDLITE XL <sup>™</sup>	N/A	232	N/A
GRiD 1450sx <sup>™</sup>	N/A	1451, 1453, 1457 <sup>2</sup>	G20-0450
GRiDCASE 1550sx <sup>™</sup>	535 <sup>1</sup>	532	N/A
GRiD 1810	G20-0335	G20-0332	G20-0850
GRiDPAD <sup>™</sup>	935 <sup>1</sup>	902	903

This manual provides regulatory information on each modem and shows you how to use the command sets for each modem.

To begin using your internal modem, first consult the user's guide that comes with your computer to set up and connect the modem (see the manuals listed in the section Related Publications). Then read Chapter 1 of this manual.

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1 The MNP/FAX modems will be available for shipments on these computers in early 1991.

2 These computer model numbers include an MNP 2400 bps modem.

## Manual Organization

This manual is organized into four chapters. Chapter 1 gives a general introduction about using the AT command set. Chapters 2, 3, and 4 are set up as stand-alone chapters, meaning that each of these chapters can be used as a separate manual coupled with Chapter 1. For example, if your computer is equipped with an MNP 2400 bps modem, you will need to reference only Chapters 1 and 3.

**Chapter 1, INTRODUCTION**, discusses the AT command set and factory settings. Read this chapter first.

**Chapter 2, MNP/FAX MODEM**, describes the warranty, FCC information, and command set for the MNP/FAX modem.

**Chapter 3, MNP 2400 BPS MODEM**, describes the warranty, FCC information, and command set for the MNP modem.

**Chapter 4, UK MNP 2400 BPS MODEM**, describes the warranty, BAPT information, and command set for the UK MNP modem.

A postage paid Customer Response Card is provided at the end of this section. Owners and users in the United States are encouraged to use the card to comment on the usefulness and readability of the manual.

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## Related Publications

For further information on using one of the internal modems, you may want to refer to the user's guide supplied with your computer and to the *MS-DOS User's Guide and Reference*. Following is a partial list of these publications.

*GRiDCASE 1500 Series Owner's Guide* (Order Number: 001500-40), for information on connecting and setting up the internal modem on a GRiDCASE 1500 Series computer.

*GRiDCASE 1535 EXP User's Guide* (Order Number: 001535-40), for information on connecting and setting up the internal modem on a GRiDCASE 1535 EXP computer.

*GRiD 1450sx User's Guide* (Order Number: 001450-40), for information on connecting and setting up the internal modem on a GRiD 1450sx computer.

*GRiDLITE XL User's Guide* (Order Number: 001044-40), for information on connecting and setting up the internal modem on a GRiDLITE XL computer.

*GRiDCASE 1550sx User's Guide* (Order Number: 001550-40), for information on connecting and setting up the internal modem on a GRiDCASE 1550sx computer.

*GRiD 1810 User's Guide* (Order Number: 001810-40), for information on connecting and setting up the internal modem on a GRiD 1810 computer.

*GRiDPAD Computer User's Guide* (Order Number: 001900-40), for information on connecting and setting up the internal modem on a GRiDPAD computer.

*MS-DOS Release 3.3 User's Guide and Reference* (Order Number: 965801-00 for MS-DOS 3.3 or 965802-00 for MS-DOS 4.01), for reference information on using MS-DOS **mode** command options.



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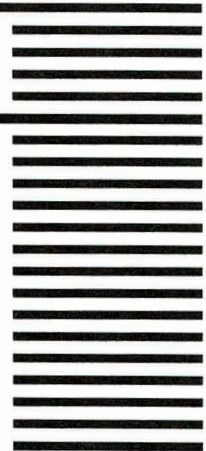
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# CHAPTER 1: INTRODUCTION

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This chapter provides general information about using the internal modem installed on your computer. Three internal modem options are available. These options are the MNP/FAX modem, the MNP 2400 bps modem, and the UK MNP 2400 bps modem. (See the section ABOUT THIS BOOK at the beginning of this user's guide for a list of modem options available for each GRiD computer.) Each modem transmits and receives data through the telephone system and resides inside the computer, providing greater convenience when you are traveling or moving your equipment. The MNP modems have Microcom Networking Protocol classes 1-5 for error detection, correction, and data compression.

The de facto Hayes standard AT command set is used to configure the modem's operating parameters and to initiate and terminate communication. These commands can be issued directly from the keyboard or may be sent to the modem through communications software. The modem may return result codes indicating the responses to the instructions it receives.

For information on setting up and connecting your internal modem, see the respective user's guide for the computer you are using.

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## AT Command Set

The AT commands described in this manual are available to you whenever the computer is in the terminal mode and the modem is in the command state, regardless of what communications software you are running.

You will require a communications software package, such as CrossTalk<sup>®</sup>, to put your computer in terminal mode. Most commercially available communications packages not only put the computer in terminal mode, but also take direct control of the modem. Therefore, in most cases, you will not need to learn the modem

command set. Instead, you learn to use your own communications software and let the software command the modem. The AT command set is nevertheless documented here for special cases when you may need to control the modem directly.

## Putting the Modem in the Command State

When the computer is in terminal mode, and your communications software is running, the software intercepts your keyboard entries. To issue commands directly to the modem, you must be in the command state. To put the modem in the command state from the on-line state, enter the escape command. The escape command consists of three plus signs (+++). The first + must be separated from any previous keystroke by at least one second, and the last + must be separated from any following keystroke by at least one second.

## Issuing Modem Commands

Instructions to the modem are issued according to a simple command syntax. Once the computer is in the command state, you issue a command to the modem by typing the appropriate command characters on a single line and then pressing **Return**. All commands are prefixed by the letters, *AT* or *at*, which *get the modem's attention*. The escape sequence (+++) and the repeat previous command (*A*) are the only exceptions. They are sent without the AT prefix and **Return** key, and must appear on a line by themselves. Modem command characters can be entered as all uppercase letters or all lowercase letters. Spaces between characters are ignored. If you make a mistake while typing, press the **BkSp** (Backspace) key and enter the correct character.

**NOTE:** When a value is missing from the command, it is understood to be 0. For example, ATM is equivalent to ATM0.

## Command Line

A command line can contain up to 40 characters and may be used to send one or more commands to the modem. The AT prefix and the carriage return at the end of the command line are not counted as part of the 40 characters.

## On-Line State

The modem goes on-line after making a connection with a remote system. When the modem is on-line, data can be transmitted and received.

---

## Factory Configuration

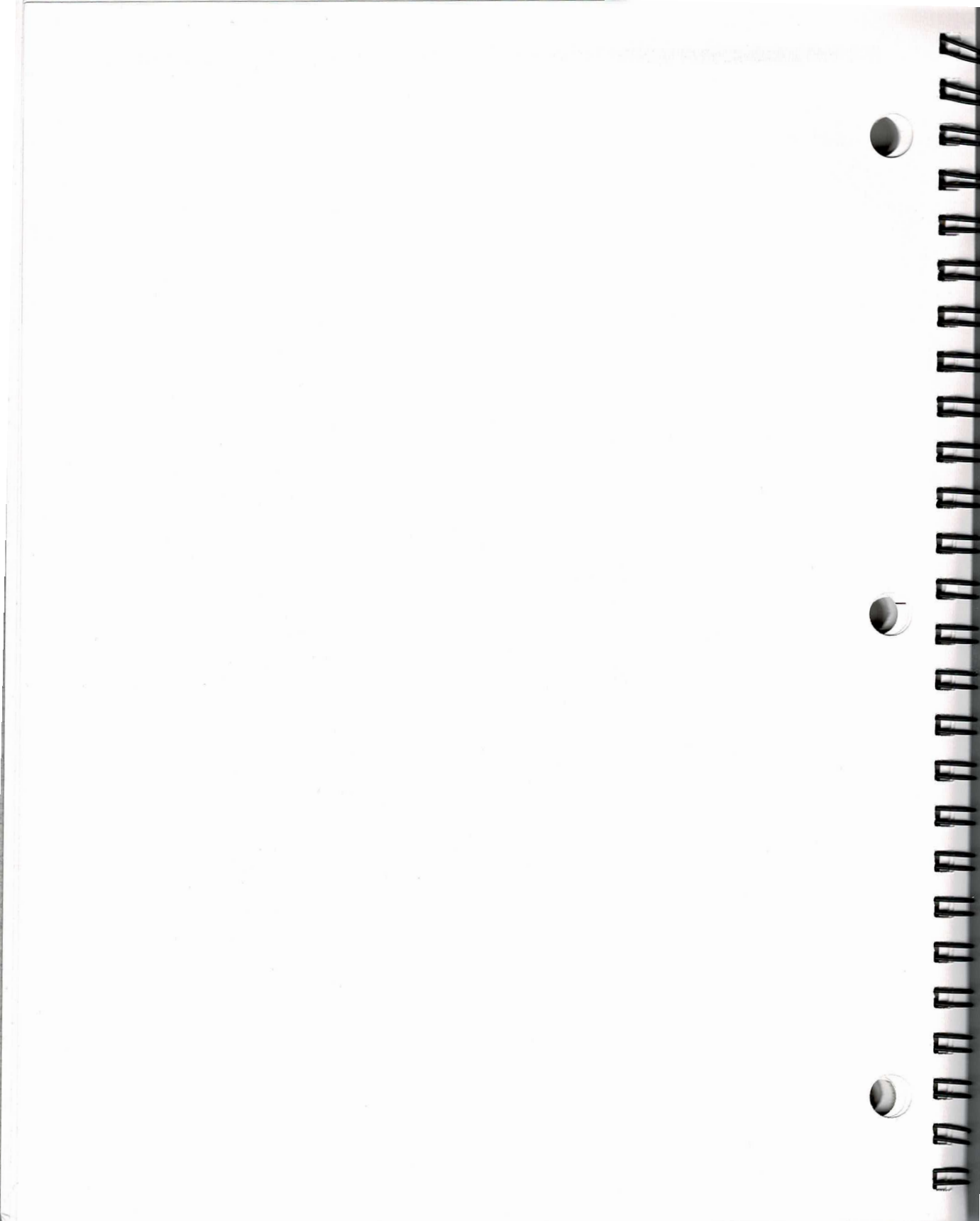
Modem configuration is maintained as a collection of parameter values that are defined with AT commands and S-registers. These parameters are accessed from three areas: factory configuration, active configuration, and user profiles. The factory configuration reflects the settings appropriate for most communication needs. These factory settings (sometimes called default settings) can be reconfigured for specific operating conditions. The majority of parameters can be saved to nonvolatile memory. Some, however, are nonstorable and must be reconfigured individually following each reset.

The command settings and S-register values installed at the factory are stored in the modem's firmware memory (ROM). Any of these values can be modified using the AT commands, but the factory-set configuration remains fixed in ROM. When power is first applied to the modem, the modem is configured using this collection of parameter values, which are referred to in this guide as the *factory settings*.

---



**CHAPTER 2:  
MNP/FAX MODEM**



## Limited Warranty and Limitation of Liability

**You should carefully read the following terms and conditions. You will be deemed to have accepted these terms and conditions if you have not returned the product with your proof of purchase to your GRiD representative, within five days of the date of payment.**

The term "Products," as used herein, means hardware, hardware parts, and documentation sold by GRiD.

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You are responsible for removing any data or programs or keeping backup copies prior to returning Products to GRiD. GRiD shall not be liable for loss of data contained in any returned equipment.

This warranty is not valid if the products have been misused, altered, neglected, or if repairs are attempted by unauthorized personnel. **Except as provided above, GRiD makes no warranties, expressed or implied, including any warranty of merchantability or fitness for a particular purpose.**



## 2. Limitation of Liability

**In no event will GRiD be liable for special, incidental, or consequential damages, however caused. GRiD's liability under or for breach of this agreement shall be limited to refund of the purchase price.**

## 3. General

You shall not assign this Agreement nor any rights hereunder without the prior written consent of GRiD. GRiD reserves the right to withhold such consent for any reason whatsoever. Subject to the foregoing, this Agreement shall bind and inure to the benefit of the respective parties hereto and their heirs, personal representatives, successors, and assigns.

The Terms and Conditions of this Limited Warranty and Limitation of Liability and of the Class A Software License Agreement represent the entire Agreement between GRiD and you relating to Product purchases and software licensing and may only be modified in writing, signed by both parties.

**By reading this agreement, you acknowledge that you understand it, and agree to be bound by its terms and conditions.**

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## CHAPTER 2: MNP/FAX MODEM

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This chapter describes the command set for the MNP/FAX modem. It also provides FCC information that may be required from your local telephone company, as described in the following section. (The section ABOUT THIS BOOK in the beginning of this user's guide provides a list of computers for which this modem option is available.)

---

### FCC Regulations

The local telephone company may ask that you contact them before using telephone lines to transmit data and may request the following information:

- FCC registration number: EVZUSA-61114-MD-E
- Ringer equivalence: 0.4B

The Ringer equivalence number (REN) is used to determine the quantity of devices you can connect to your telephone line and still have all of those devices ring when your number is called. In most areas, the sum of the RENs of all devices connected to one telephone line cannot exceed five. Check with your telephone company to determine the maximum REN for your calling area.

The internal modem complies with Part 68 of the FCC rules. In compliance with these rules, the FCC requires that you be aware of the following restrictions on the use of the internal modem:

- The internal modem may not be connected to a coin telephone or party line.
- If the modem malfunctions, it may harm the telephone network. You should disconnect the internal modem from the telephone line until the problem is repaired. If you don't disconnect the modem, the telephone company may temporarily discontinue your service, though they must notify you as soon as possible.
- The telephone company must notify you in advance if it makes changes that could affect the operation of the internal modem.

If the modem malfunctions, do not attempt to repair it yourself. Contact the GRiD Resource Center at 1-800-654-GRID (4743).

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## Canadian Department of Communications (DOC) Notice

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

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

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telephone 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.

### **Load Number**

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

The MNP/FAX modem has been assigned a load number of 29.

---

## Command Set

This section describes the AT command set for the MNP/FAX modem. This modem provides the de facto Hayes standard AT command set for auto dialing, Microcom Networking Protocol (MNP) AT command subset, and Class 1 (EIA-578) command set.

### **AT (attention command)**

Unless otherwise noted, all modem commands must begin with the characters AT. (The AT prefix must be either all uppercase or all lowercase.) These characters stand for *attention*, and they tell the modem that subsequent characters constitute a command to the modem rather than data to be transmitted. The AT command set allows you to combine commands on a line. After you press **Return**, the modem executes the commands in the order they appear.

Example: *AT command characters*

## Automatic Dialing Commands

### **D (dial command)**

Instructs the modem to dial the number specified by subsequent digits. Spaces, hyphens, and parentheses can be omitted; if present, they are ignored. Valid dial string characters are 0-9, #, \*, A, B, C, and D. The following options can be used with the Dial command and are explained in the following paragraphs: P T , ; " ! W @ R S=n

Example: *ATD4085551212*

### **P (pulse dialing command)**

Instructs the modem to use pulse dialing. Can be used alone or with a dial command. Pulse dialing is the default when power is first supplied to the modem.

Example: *ATP*

Example: *ATDP4085551212*

**T (Touch-Tone dialing command)**

Instructs the modem to use Touch-Tone dialing. Can be used alone or with a dial command.

Example: `ATT`

Example: `ATDT4085551212`

**, (pause command)**

Each comma inserted in a dial command causes a two-second delay (or the value of register S8) at that point in the dialing sequence. Delays are necessary when you need to dial part of a number, wait for dial tone or signal of some sort, and then resume dialing. In the example, a four-second delay is inserted after dialing 9 to get an outside line.

Example: `ATD9,,4085551212`

**; (return to command state after dialing)**

Causes the modem to dial the specified number and then return to the command state (the OK prompt) without hanging up. Ordinarily, the modem goes on-line as soon as it makes a connection. When the modem is on-line, you cannot issue any modem commands except the escape command. When you end a dial command with a semicolon (;), the modem dials the number, but does not go on-line when the connection is made.

Example: `ATD4085551212;`

**! (flash switch hook command)**

Causes the modem to “depress” the switch hook<sup>1</sup> for half a second, then “release” the switch hook for half a second before continuing to dial. On some telephone systems, you can use this command to transfer an incoming call to another line. The example below transfers a call and then hangs up (the H command is discussed in the following section).

Example: `ATD!1507;H`

<sup>1</sup> The term “switch hook” refers to whatever mechanism your telephone uses to distinguish between a raised and a lowered receiver. On the most common types of telephone, the two buttons on which the handset rests constitute the switch hook. On a wall-mounted phone, the switch hook is the bracket from which the receiver hangs when the phone is not in use.

**W (wait for second dial tone command)**

Causes the modem to wait for a second dial tone at this point in the dial command before proceeding to dial any remaining digits. Use this command when you access a telecommunications service that requires you to dial an access number, wait for a dial tone, and then dial another number or enter a code. You can use the W command only when the result code command currently in effect is X3 or higher. The W command can be used more than once in a single dial command.

Example:

```
ATD9501022W04085551212W86455478853064
```

**@ (wait for answer command)**

Causes the modem to wait for five seconds of silence at the other end of a completed call before proceeding to dial. This is useful if you need to wait for a recorded message to complete before entering digits in response to that message. To use the @ command, set the result code command X3 or higher. The @ command can be used more than once in a single dial command. In the example below, assume that the @ command corresponds to a recorded message asking you to enter your access code. The dialing operation stops while the message is played. Five seconds after the message completes, the digits of the access code are dialed.

Example: 

```
ATD4085553825@32863
```

**R (reverse frequency command)**

Reverses the modem's originate and answer frequencies. This is necessary when you want to call an originate-only modem. The R command can immediately precede or follow the number to be dialed.

Example: 

```
ATDR4085551212
```

Example: 

```
ATD4085551212R
```



**DS=*n*** (dial stored number)

Dials the stored number, where *n* is location 0-3. See **&Zn=x** command for information on storing a number.

Example: ATDS=2

**A/** (repeat last command)

Causes the modem to repeat whatever command was last entered. This command is **not** preceded by the AT (attention command), and it is not terminated with the **Return** key. Just type A/ and the modem performs **one** repetition of the last command entered. In the example, A/ is used to redial a busy phone number.

Example: ATD4085551212  
NO CARRIER  
A/

Any key

While the modem is dialing, pressing any character key causes the modem to cancel the call.

## Modem Operation Commands

**+++** (escape command)

Use this command to take the modem to the command state. The escape command is **not** preceded by the AT (attention) command, and it is not terminated with the **Return** key. The first + must be separated from any previous keystroke by at least one second, and the last + must be separated from any following keystroke by at least one second. Otherwise, the modem interprets the three + signs as part of the data stream instead of the escape command. The + signs must be entered with less than one second between each one. Use the ATO command to go back to the on-line state.

Example: *data keystrokes* [1 sec. pause]+++  
[1 sec. pause] *command keystrokes*

**A (answer manually)**

Forces the modem to go off hook in answer mode. Use this command to answer a call manually. This command must be the last one on a command line.

**Bn (CCITT/Bell mode)**

Selects either CCITT or Bell standard for 1200 bps operation. At 0-300 bps, Bell 103 is automatically selected. At 2400 bps, CCITT V.22bis is selected. At 1200 bps, either standard can be chosen to match the standard used by the remote system.

ATB0        Selects CCITT V.22 standard.

ATB1        Selects Bell 212A standard (factory setting).

**C1 (normal transmit carrier switching)**

The C command is used in some modems to control the transmit carrier. The C0 option is not valid for the MNP/FAX modem.

**En (command-state echo command)**

Turns local echo off or on for modem commands.

ATE0        Turns local echo off. In this state, commands you type at the keyboard are not echoed to your screen.

ATE1        Turns local echo on (factory setting).

**F1 (on-line state echo command)**

The F command is used in some modems to disable character echo in the on-line state. The F0 option is not valid for the MNP/FAX modem.

**Hn (on/off hook command)**

Causes modem to go on hook or off hook.

ATH0 Causes the modem to hang up or go on hook (factory setting).

ATH1 Causes the modem to go off hook (same as picking up the receiver of a telephone).

**In (identification command)**

In is used to identify the modem code and status of the ROM.

ATI0 Displays the product ID code, which is 249 (factory setting).

ATI1 Performs checksum on ROM and displays result.

ATI2 Performs checksum on ROM and displays status, either OK or ERROR.

**Ln (speaker volume)**

Sets the speaker volume. If your computer is equipped with a voice-quality speaker, you can set three different speaker volumes. Otherwise, the speaker volume is medium.

ATL0, ATL1 Low speaker volume.

ATL2 Medium speaker volume (factory setting).

ATL3 High speaker volume.

**Mn (speaker control command)**

The number you enter to replace *n* determines when the modem's built-in speaker is on and when it is off. The four possible values are shown below.

- ATM0      Speaker OFF.
- ATM1      ON through dialing and carrier detect; OFF at connection (factory setting).
- ATM2      ON continuously, even during data transmission.
- ATM3      ON after last digit dialed, until carrier detect; OFF at connection.

**On (on-line command)**

Switches modem from command state to on-line state.

- ATO0      Takes the modem from the command state back to the on-line state when a connection is still open.
- ATO1      Also returns modem to on-line state and initiates equalizer retrain sequence (at speeds of 2400 bps).

**Qn (quiet command)**

This command determines whether or not result codes are displayed on the screen.

- ATQ0      Causes the codes to be displayed (factory setting).
- ATQ1      Causes the codes to be suppressed.

**Sr=n (register command)**

Sets register *r* to value *n*. You can use this command if you need to change the values stored in any of the modem's registers. (It is unlikely that you will need to do this—do not change register values unless you are sure of what you are doing.) The general form of the register command is shown below. In an actual command, you would replace *r* with the register number and *n* with the value to be set (from 0-255). The registers and their values are listed in Table 2-1.

ATS*r* = *n*

Table 2-1. Modem Registers and Values

Register Number	Function	Default Value
0	Sets number of rings before automatic answering.	0
1	Counts and stores number of times the phone rings. Reverts to 0 if no ring occurs for 8 seconds.	0
2	Sets ASCII value of escape code sequence character. A value greater than 127 disables escape sequence.	43 (+)
3	Sets ASCII value of carriage return <CR> character.	13
4	Sets ASCII value of line feed character.	10
5	Sets ASCII value of backspace character.	8
6	Sets number of seconds modem waits for dial tone. Used when X0, X1, or X3 commands are in effect.	2
7	Sets number of seconds modem waits for carrier tone.	30
8	Sets duration of delay generated by comma (,) dial modifier.	2

Register Number	Function	Default Value
9	Sets length of time, in tenths of a second, carrier signal must be present for modem to recognize signal and turn on DCD (data carrier detect). Prevents ring or busy signal from being mistaken as carrier.	6
10	Sets duration, in tenths of a second, that modem waits after loss of carrier before hanging up.	14
11	Sets duration, in milliseconds, of spacing between touch-tones during dialing.	95
12	<i>Reserved</i>	
13	<i>Reserved</i>	
14	<i>Reserved</i>	
15	<i>Reserved</i>	
16	<i>Reserved</i>	
17	<i>Reserved</i>	
18	Sets duration, in seconds, of modem diagnostic tests. When a test is active for this length of time, modem automatically terminates the test. 0 disables the timer. The range is 0-255.	0
19	<i>Reserved</i>	
20	<i>Reserved</i>	
21	<i>Reserved</i>	
22	<i>Reserved</i>	

Register Number	Function	Default Value
23	<i>Reserved</i>	
24	<i>Reserved</i>	
25	Delay to DTR (in 100ths of a second). A change in state (ON or OFF) of DTR that persists for less than this value is ignored by the modem while it is online. The range is 0-255.	5
26	<i>Reserved</i>	
27	<i>Reserved</i>	
65	FAX protocol	0
	0 = No FAX mode 2 = V.29 4800 bps 3 = V.29 7200 bps 4 = V.29 9600 bps 5 = V.27 2400 bps 6 = V.27 4800 bps	

*Sr?*

To display the value stored in register *r*, use the command *ATSr?*, where *r* is the register number that you want to query.

Example: *ATS8?*

**Vn (verbose command)**

Determines whether result codes are displayed as numbers or text.

**ATV0** Causes codes to display as numbers.

**ATV1** Causes codes to display as text. See Table 2-2 for codes and messages (factory setting).

**Xn (result code command)**

Every operation the modem performs has one of several possible results. The modem reports the actual result of each operation in the form of a result code from 0 to 10. Each result code has an associated text message. Whether or not a particular result code appears on the screen depends on the result code command (see Table 2-3). Your choice of a result code set also determines whether or not certain modem functions are enabled, as explained later in this section. The factory setting is X4.

The result codes and their associated messages are shown in Table 2-2.



Table 2-2. Result Codes

Code	Message	Connection Indicated
0	OK	Command executed
1	CONNECT	Connection at 300/1200/2400 bps
2	RING	Ring signal detected
3	NO CARRIER	Carrier signal not detected, or lost
4	ERROR	Invalid command, checksum, error in command line, or command line exceeds 40 characters
5	CONNECT 1200	Connection at 1200 bps
6	NO DIAL TONE	No dial tone detected
7	BUSY	Busy signal detected
8	NO ANSWER	No silence detected when dialing a system not providing a dial tone (Replaces NO CARRIER if an @ is present in the dial string)
10	CONNECT 2400	Connection at 2400 bps
20	CONNECT/REL	Reliable connection at 300 bps
22	CONNECT 1200/REL	Reliable connection at 1200 bps
23	CONNECT 2400/REL	Reliable connection at 2400 bps

Table 2-3 lists the result code commands and indicates which result codes are reported according to which command is in effect.

Table 2-3. Result Code Commands

Command	Codes Reported												
	0	1	2	3	4	5	6	7	8	10	20	22	23
X0	.	.	.	.	.						.		
X1	.	.	.	.	.	.				.		.	.
X2	.	.	.	.	.	.	.			.		.	.
X3	.	.	.	.	.	.		.		.		.	.
X4	.	.	.	.	.	.	.	.	.	.		.	.

If you do not enter a result code command, X0 is assumed by default.

Whether reported codes appear on the screen as numbers or as messages depends on what V command is in effect, as explained earlier in this section.

Example: ATX3

#### Y (long-space disconnect)

Controls long-space disconnect.

ATY0 Disables long-space disconnect (factory setting).

ATY1 Enables long-space disconnect.

#### Zn (reset command)

Resets the modem and recalls a user profile.

ATZ0 Recalls user profile 0.

ATZ1 Recalls user profile 1.

**&Cn (data carrier detect)**

Controls the Data Carrier Detect (DCD) signal on the serial port. The modem can be programmed to keep the DCD interchange circuit on at all times, ignoring data carrier presence or absence, or it can be programmed to turn on the DCD when a data carrier is detected. Use this command if your computer or terminal requires DCD to be OFF at certain times.

**AT&C0** DCD always ON; assumes data carrier always present (factory setting).

**AT&C1** DCD tracks presence of data carrier from the remote modem; DCD is on when data carrier is detected.

**&Dn (DTR control)**

Controls DTR transition. Positive transitions of DTR (OFF-to-ON) that occur within five seconds after disconnect are ignored. When AT&D2 or AT&D3 is set, DTR must be ON to autoanswer.

**AT&D0** Ignores DTR signal; DTR is not needed for autoanswer (factory setting).

**AT&D1** Enters command state when an ON-to-OFF transition of DTR is detected.

**AT&D2** Hangs up and enters command state when an ON-to-OFF transition of DTR is detected.

**AT&D3** Hangs up and resets when an ON-to-OFF transition of DTR is detected.

**&F (restore factory settings)**

Restores the factory settings as the active configuration. The factory settings are as follows:

B1, E1, H0, I0, L2, M1, Q0, V1, X4, &C0, &D0, &G0, &J0, &P0, &T4, &Y0, %A0, %B2400, %C1, \C0, \G0, \H0, \J1, \N0, \Q0, \T0, \V0

**&Gn (guard tone)**

Sets the guard tone. Calls within the United States do not require guard tones.

AT&G0      Disables guard tone (factory setting).

AT&G1      Sets guard tone on the answering modem to 550 Hz.

AT&G2      Sets guard tone to 1800 Hz.

**&Jn (phone jack type)**

Designates the type of jack with which the modem is connected to the telephone line.

AT&J0      RJ11, RJ41S, or RJ45S type phone jack (factory setting).

AT&J1      RJ12 or RJ13 type phone jack.

**&L0 (Dial-up line operation)**

The **&L** command is used in some modems to set the dial-up line operation mode. Any value other than **&L0** or **&L1** is not valid for the MNP/FAX modem.

**&M0 (asynchronous mode)**

The **&M** command is used in some modems to set the communication mode. Any value other than **&M0** is not valid for the MNP/FAX modem.

**&Pn (pulse dial ratio)**

Controls the ratio of the off-hook (make) to on-hook (break) interval that the modem uses for pulse dialing.

**AT&P0** Pulse dial make/break ratio = 39/61 for use in the United States (factory setting).

**AT&P1** Pulse dial make/break ratio = 33/67 for use in the United Kingdom.

**&Q0 (asynchronous mode)**

The **&Q** command is used in some modems to set the communication mode. Any value other than **&Q0** is not valid for the MNP/FAX modem.

**&Sn (assume DSR signal)**

The **&S** command is used in some modems to indicate when the modem is connected to a communication channel and ready. Any value other than **&S0** is not valid for the MNP/FAX modem.

**&Tn (diagnostic test)**

This is the modem's diagnostic and test facility.

- AT&T0      Ends a test in progress and returns the local and remote modems to normal operation.
- AT&T1      Initiates local analog loopback. The modem should display the characters on your screen exactly as you type them.
- AT&T3      Allows a remote modem that does not support the CCITT V.54 standard to perform a local digital loopback test with the modem.
- AT&T4      Allows the modem to respond to a remote caller's request to enter remote digital loopback mode (factory setting).
- AT&T5      Prevents the modem from responding to a remote digital loopback request.
- AT&T6      Instructs the remote modem to initiate remote digital loopback.
- AT&T7      Instructs the remote modem to initiate a remote digital loopback with self-test.
- AT&T8      Initiates remote analog loopback with self-test. The modem sends itself the CCITT V.54 test pattern and verifies these characters to make sure they are received correctly. It reports errors upon completion of the test.

**&V (view configuration and profiles)**

Displays the active configuration, user profiles, and stored telephone numbers. This command should not be issued in conjunction with other commands. It should be issued on a line by itself.

**&W<sub>n</sub> (store current configuration)**

Saves the storable parameters of the active configuration in memory as one of two user-defined profiles. (The &V command displays the storable parameters.)

AT&W0      Saves storable parameters of active configuration as user profile 0.

AT&W1      Saves storable parameters of active configuration as user profile 1.

**&Y<sub>n</sub> (recall user profile)**

Specifies which profile is recalled on power-up. Either user profile can be designated as the default to recall when the modem is powered up.

AT&Y0      Recalls user profile 0 at power-up (factory setting).

AT&Y1      Recalls user profile 1 at power-up.

**&Z<sub>n</sub>=*x* (store phone number)**

Stores dial string (phone number) *x* in location *n*, where *n* is a decimal integer (0 to 3) and *x* is a string of up to 32 characters. Valid dial string characters are 0-9, dial modifiers, and (for tone dialing) A, B, C, D, #, \*. The modem ignores invalid characters.

## Error Detection, Correction, And Data Compression Commands

### **%An (autoreliable fallback character)**

Sets the ASCII character recognized as the autoreliable fallback character on the answering modem, where *n* is a decimal integer between 0 and 127. (The factory setting is 0, meaning the autoreliable fallback character is disabled.)

In autoreliable mode, when the MNP/FAX modem encounters an incoming reliable fallback character from the remote system, it automatically switches to normal mode and passes the character to the serial port. Autoreliable fallback character recognition stops if the modem receives a SYN character (ASCII 22). The modem ignores the autoreliable fallback character parity bit. Note that with this command, both AT\N3 and AT\C2 must also be set.

### **%Bn (modem port bps rate)**

When issued locally, sets the maximum modem port bps rate, where *n* = 300, 1200, or 2400. An AT <RETURN> command issued locally causes the modem port speed to match the serial port speed, regardless of any previous AT%B setting. The factory setting is 2400.

### **\Cn (autoreliable buffer)**

Determines if the answering modem buffers the data that it receives from the remote modem during the 3-second interval in which it attempts to establish a reliable connection. Use this command when the answering modem is in autoreliable mode.

When AT\C1 or AT\C2 is set, reliable and normal connections may result independent of bps rate adjust. When AT\C0 is set, however, bps rate adjust affects the type of connection as follows: reliable and direct connections may result when bps rate adjust is on (AT\J1); reliable and normal connections may result when bps rate adjust is off (AT\J0).



- AT\C0** Does not buffer data during link negotiation. Switches to normal or direct mode if SYN not detected in 3 seconds (factory setting).
- AT\C1** Buffers all data on the answering modem until either 200 non-SYN characters are received or a SYN character is detected within 3 seconds. If 200 non-SYN characters are received, the modem switches to normal mode and passes the data through to the serial port. If a SYN character is detected within 3 seconds, the modem attempts to establish a reliable connection. Otherwise, the modem switches to normal mode. If the buffer fills, the modem switches to normal mode.
- AT\C2** Does not buffer data on the answering modem. Switches to normal mode upon receipt of a character defined by the AT%A command and passes that character to the serial port.
- When the modem is set to autoanswer and receives calls from modems that both support and do not support MNP, use autoreliable mode and set AT\C2. This allows the modem to switch to normal mode as soon as it detects a logon character (defined by the AT%A command) from a non-MNP caller, thereby eliminating the 3-second wait.

**%Cn (compression control)**

Determines whether the modem attempts to use data compression during reliable connections. Both modems must have this command set to AT%C1 at the time the reliable connection is established. For the most efficient results, also set the bps rate adjust off (AT\J0).

AT%C0      Disables data compression.

AT%C1      Enables MNP Class 5 data compression only (factory setting).

**\Gn (modem port flow control)**

Sets the flow control method used to pace data sent from the remote modem to this modem during a normal mode connection.

**NOTE:** The reliable link has its own method of flow control and ignores the AT\G setting. However, the serial port flow control settings (AT\Qn) remain active during a reliable link.

AT\G0      Disables modem port flow control (factory setting).

AT\G1      Sets modem port flow control to XON\XOFF (the modem sends an XOFF character to stop received data and sends an XON character to resume receiving data).

**\Hn (HP ENQ/ACK support)**

Allows the modem to emulate the Hewlett-Packard ENQ/ACK protocol when an MNP reliable link is established. Flow control may be used in addition to the ENQ/ACK protocol. Data blocks should not exceed 250 characters each.

AT\H0      Disables HP ENQ/ACK protocol (factory setting).

AT\H1      Enables HP ENQ/ACK protocol during MNP reliable link. Modem emulates terminal.

AT\H2      Enables HP ENQ/ACK protocol during MNP reliable link. Modem emulates host.

Use the HP ENQ/ACK protocol as follows:

1. Set the modem at the host to AT\H1.
2. Set the modem at the terminal to AT\H2.
3. Enable either XON/XOFF (AT\Q1) or hardware (AT\Q3) flow control on the serial port on both modems to prevent data loss.
4. Establish an MNP reliable link.

**\Jn (bps rate adjust)**

Controls the bps rate adjust feature. To retain the highest throughput, disable the bps rate adjust when data compression is used.

- ATJ0** Disables the bps rate adjust feature. The serial port is independent of the rate of the connection.
- ATJ1** Enables the bps rate adjust feature (factory setting). After a connection is made, the modem adjusts the speed of the serial port to match the speed of the connection. The serial port remains at the adjusted bps rate after the connection terminates. If your computer or terminal does not automatically change to the adjusted bps rate, you must manually change the bps rate to the new setting.

**\Nn (operating mode)**

Selects the operating mode the modem uses while in the connect state. The operating mode determines how the modem communicates with the remote system.

- ATN0** Sets normal mode; no error correction (factory setting). In normal mode, when bps rate adjust is OFF, the serial and modem ports can operate at different speeds during a connection. Flow control should be used to avoid data loss.
- ATN1** Sets direct mode; responds with OK; same effect as \N0. The modem does not buffer data, and flow control is ignored. Upon connection, the serial port always adjusts to the speed of the connection, regardless of the setting of bps rate adjust command. The escape code sequence is disabled in direct mode if ATJ0 is set.

**AT\N2**

Sets reliable mode. Uses the MNP reliable link to provide error detection and automatic retransmission of data if an error occurs. This ensures that communications between your system and the remote system are error-free. The remote system must also be equipped to handle an MNP reliable link. The modem attempts to establish a reliable link immediately after making a connection. If the attempt fails, the modem disconnects.

During an MNP reliable link, you should use flow control on the modem's serial port. When the modem detects a transmission error, it holds data from the serial port in a buffer while correcting the transmission error. The remote system should also support flow control.

**NOTE:** Certain other protocols may not be timed to work with MNP and can interfere with its effectiveness.

**AT\N3**

Sets autoreliable mode. This mode is designed to allow a modem to communicate with remote systems that both support and do not support the MNP reliable link. The answering modem looks for incoming MNP protocol characters from the remote modem. If it detects them within approximately three seconds, it tries to establish a reliable link connection.

When the modem is set to autoanswer, you can shorten this period by using the **AT%A** command with the **AT\C2** command. You must set **AT\C2** so

that the modem recognizes an incoming autoreliable fallback character. When the modem encounters this character from a remote modem, it stops waiting for an MNP protocol character and falls back to a normal connection.

**NOTE:** If both modems are set to autoreliable mode, a normal connection or no connection could result due to noise on the telephone line.

If the modem does not detect incoming MNP characters, and bps rate adjust is ON (ATV1) and autoreliable buffer is OFF (AT\C0), the modem establishes a direct connection instead. If bps rate adjust is OFF (ATV0), the modem falls back to a normal connection and uses flow control if it is enabled.

**\Qn (serial port flow control)**

Sets the type of flow control used on the serial port. If the serial port speed is faster than the modem port speed, data from your computer or terminal enters the modem faster than it is sent out. The modem holds characters in a buffer and sends them out at the slower modem port bps rate. When the buffer is full, flow control instructs your computer or terminal to stop transmitting data to the modem; the modem continues to send out the characters and empty the buffer. When there is room in the buffer, flow control instructs your computer or terminal to resume transmitting data to the modem.

For reliable connections, retransmission can reduce the effective modem port speed. If this occurs, flow control prevents buffer overflow.

Flow control is not used during direct mode connections, and the modem ignores the setting of this command.

- AT\Q0 Disables flow control (factory setting).
- AT\Q1 Enables bidirectional XON/XOFF flow control. Transmission is stopped by sending an XOFF character and is restarted by sending an XON character. The modem generates XON and XOFF characters at the same parity as used on the serial port. The serial port also responds to XON and XOFF characters sent to it from the local computer or terminal in the same way.
- AT\Q2 Enables unidirectional hardware flow control. The modem turns CTS OFF to stop the local computer or terminal from transmitting data, and turns CTS ON to allow the local computer or terminal to resume transmitting data.
- AT\Q3 Enables bidirectional hardware flow control using the CTS and RTS signals. The modem uses the CTS signal to start and stop data transmission from the local computer or terminal. When RTS is OFF, the modem stops transmitting data to the local computer or terminal. When RTS is ON, the modem resumes sending data.
- AT\Q4 Enables unidirectional XON/XOFF flow control. The modem serial port generates, but does not respond to, XON/XOFF flow control characters. This setting allows for computers to transmit data that has XON/XOFF data characters. The computer can still be set to respond to XON/XOFF flow control characters sent to it from the modem during serial port flow control.

	<b>AT\Q5</b>	Enables unidirectional hardware flow control, but also keeps CTS OFF until a connection is established.
	<b>AT\Q6</b>	Enables bidirectional hardware flow control, but also keeps CTS OFF until a connection is established.
<b>\Tn (inactivity timer)</b>		Specifies the number of minutes the modem waits before automatically hanging up when data is not sent or received. The range for <i>n</i> is 0-90 with a factory setting of 0. AT\T0 disables the inactivity timer. The inactivity timer is only available during normal and reliable link connections. It is ignored when the modem is in direct mode.
<b>\Vn (MNP result code form)</b>		Determines whether result codes indicate that a reliable link connection is in effect.
	<b>AT\V0</b>	Disables modified MNP result codes. The modem uses the results codes listed with the ATV command. Use AT\V0 when the communications software you are using does not expect to see a reliable link result code, even if a reliable connection is made (factory setting).
	<b>AT\V1</b>	Enables modified MNP result codes. Use this setting when your software supports MNP result codes.
<b>%V (display modem firmware version)</b>		Displays the modem firmware version.
<b>\Z (switch to normal mode)</b>		Causes the local and remote modems to switch to normal mode during a reliable link. Switching to normal mode erases all data that may be in the buffer. <b>This command is for advanced use only.</b>
		If AT\J1 and AT\C0 are set, this command forces the modem to direct mode rather than to normal mode.



## Class 1 (EIA-578) Command Set

<b>+FCLASS? (Service Class Indication)</b>	Displays the current Class setting. The setting will be: 0 indicates a data modem 1 indicates a Class 1 fax modem
<b>+FCLASS=? (Service Class Capabilities)</b>	Displays the Classes available. The response is a list of values separated by commas. The values are those given in FCLASS?. For example, a modem that supported data communication and facsimile Class 1 would respond: "0,1".
<b>+FCLASS=value (Service Class Selection)</b>	Sets the Class to the values given in FCLASS?. To configure a modem for Class 1, use the command: "AT+FCLASS=1".
<b>+FTS=&lt;Time&gt; (Stop transmission and pause)</b>	Causes the modem to stop any transmission. The modem waits for the specified amount of time and sends the OK result code. Time is in 10 ms intervals in the range 0-255.
<b>+FRS=&lt;Time&gt; (Wait for silence)</b>	Causes the modem to listen and to report back an OK result code when silence has been present on the line for the amount of time specified. Time is in 10 ms intervals in the range 0-255.
<b>+FTM=&lt;MOD&gt; (Facsimile Transmit)</b>	Causes the modem to transmit data using the modulation selected in <MOD>, which may have the values shown in Table 2-4).
<b>+FRM=&lt;MOD&gt; (Facsimile Receive)</b>	Causes the modem to enter receive mode using the modulation specified in <MOD>, which may have the values shown in Table 2-4.
<b>+FTH=&lt;MOD&gt; (HDLC Transmit)</b>	Causes the modem to transmit data framed in the HDLC protocol using the modulation mode selected by <MOD>, which may have the values shown in Table 2-4.

**+FRH=<MOD>  
(HDLC Receive)**

Causes the modem to receive HDLC framed data using the modulation mode selected in and deliver the next received frame to the DTE. <MOD> may have the values shown in Table 2-4.

*Table 2-4. <MOD> Parameter Values*

Value	Modulation	Speed
3	V.21 ch.2	300
24	V.27ter	2400
48	V.27ter	4800
72	V.29	7200
96	V.29	9600

**NOTE:** To obtain a copy of the EIA-578 specification, contact the Electronic Industry Association, P.O. Box 57258, Washington, DC 20037-0258; telephone (202) 457-8734.

With the exception of +FCLASS, all Class 1 commands return an ERROR result code if issued when the modem is on-hook.

All Class 1 commands using the <MOD> parameter can be queried for the range of values supported. When the +FCLASS setting is a Class 1 FAX modem (+FCLASS = 1), the query syntax is: +(command) = ?

---

## MNP/FAX Modem Specifications

### Communication Modes

Asynchronous, MNP Classes 1-5, CCITT Group III Facsimile

### Communication Rates and Communicaton Standards Supported

300 bps Bell 103

1200 bps Bell 212A

1200 bps CCITT V.22

2400 bps CCITT V.22bis

2400 bps CCITT V.27

4800 bps CCITT V.29

7200 bps CCITT V.29

9600 bps CCITT V.29

### FAX Compatibility

Group III

### Error Control

Microcom Networking Protocol (MNP) Class 4

### Data Compression

Microcom Networking Protocol (MNP) Class 5

### Command Set

Class 1 (EIA-578) "AT" command set

Hayes "AT" command set

Microcom "AT" command subset

### Operating Modes

Full duplex at 2400 bps and below

Half duplex for Group III Facsimile

### Flow Control

None, RTS/CTS, XON/XOFF (Stop/Start), Transparent XON/XOFF

### Call Progress Monitoring

Dial tone, busy tone, ring detect, answer tone

Dialing Capability

Command-selectable tone or pulse dialing

Command Buffer

40 characters

Receive Levels

-9 to -43 dBm

Transmit Levels

-10 dBm to -9 dBm

Carrier Detection Level

On > -43 dBm and off < -48 dBm

Line Requirements:

Two-wire switched network (standard telephone line)

Ringer Equivalence: 0.4B

Regulatory Approvals:

FCC Part 68

CSA/DOC

Registration and Approvals:

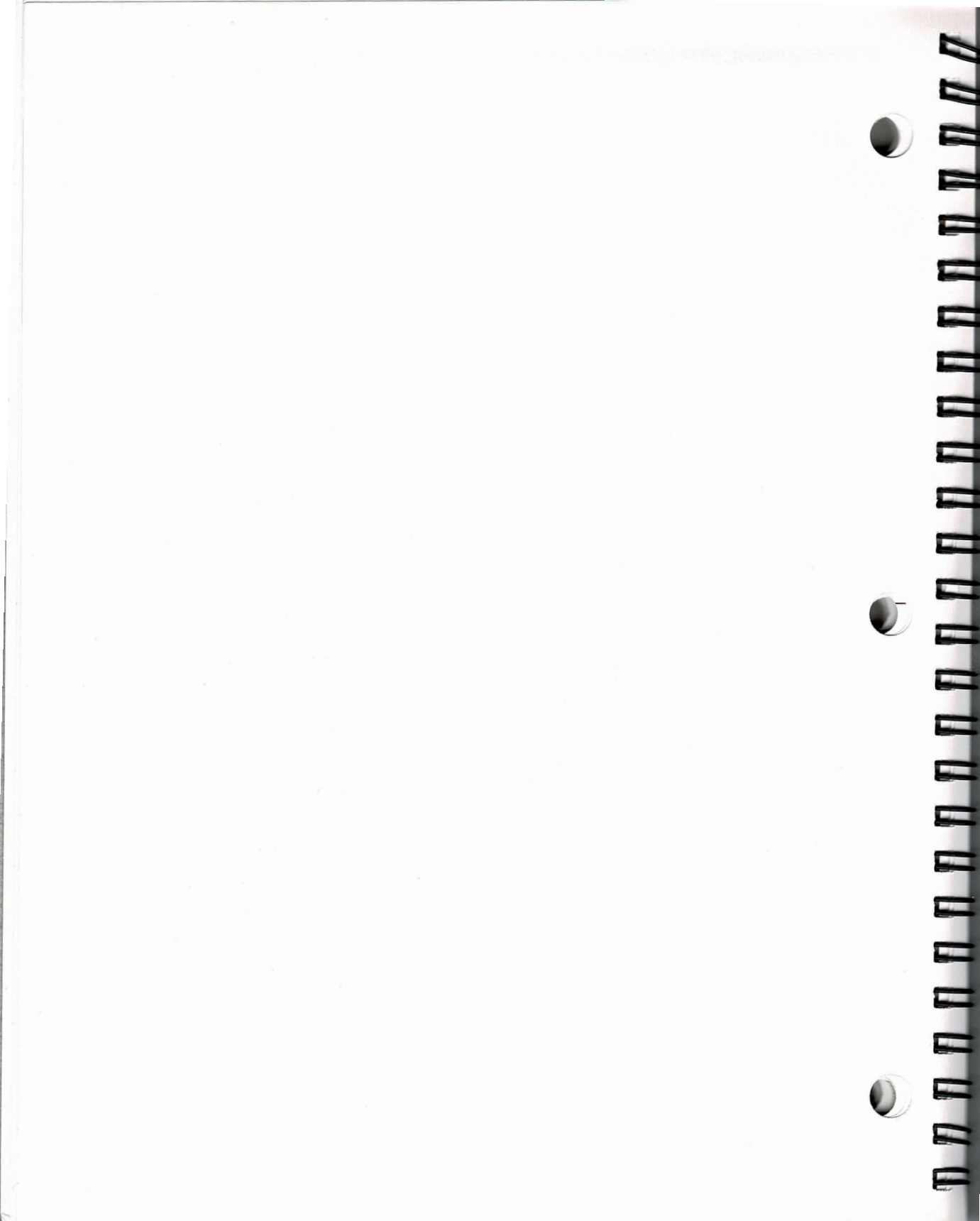
FCC # BDB8Q5-16182-MD-E

DOC Certified

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**CHAPTER 3:**  
**MNP 2400 BPS MODEM**





## Limited Warranty and Limitation of Liability

**You should carefully read the following terms and conditions. You will be deemed to have accepted these terms and conditions if you have not returned the product with your proof of purchase to your GRiD representative, within five days of the date of payment.**

The term "Products," as used herein, means hardware, hardware parts, and documentation sold by GRiD.

### 1. Warranty

GRiD warrants that the Products sold hereunder shall be free from defects in materials and workmanship for a period of one year after date of shipment. Defective Products will be repaired or replaced, at GRiD's option, by GRiD during the warranty period. You shall notify GRiD of the defective Product within the one-year period, obtain a Product Repair Order, and return the Product to GRiD along with proof of purchase data. If this Product is delivered by mail, you agree to insure the Product or assume the risk of loss or damage in transit, to prepay shipping charges to the warranty service location, and to use the original shipping container or equivalent. Contact an authorized GRiD Systems representative, call the GRiD Resource Center (GRC) at 1-800-654-GRID (4743), or write to: GRiD Systems Corporation, GRiD Resource Center, P.O. Box 5003, Fremont, California 94537-5003, for further information.

You are responsible for removing any data or programs or keeping backup copies prior to returning Products to GRiD. GRiD shall not be liable for loss of data contained in any returned equipment.

This warranty is not valid if the products have been misused, altered, neglected, or if repairs are attempted by unauthorized personnel. **Except as provided above, GRiD makes no warranties, expressed or implied, including any warranty of merchantability or fitness for a particular purpose.**

## **2. Limitation of Liability**

**In no event will GRiD be liable for special, incidental, or consequential damages, however caused. GRiD's liability under or for breach of this agreement shall be limited to refund of the purchase price.**

## **3. General**

You shall not assign this Agreement nor any rights hereunder without the prior written consent of GRiD. GRiD reserves the right to withhold such consent for any reason whatsoever. Subject to the foregoing, this Agreement shall bind and inure to the benefit of the respective parties hereto and their heirs, personal representatives, successors, and assigns.

The Terms and Conditions of this Limited Warranty and Limitation of Liability and of the Class A Software License Agreement represent the entire Agreement between GRiD and you relating to Product purchases and software licensing and may only be modified in writing, signed by both parties.

**By reading this agreement, you acknowledge that you understand it, and agree to be bound by its terms and conditions.**



## CHAPTER 3 CONTENTS

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## **CHAPTER 3: MNP 2400 BPS MODEM**

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This chapter describes the command set for the MNP 2400 bps modem. It also provides FCC information that may be required from your local telephone company, as described in the following section. (The section ABOUT THIS BOOK in the beginning of this user's guide provides a list of computers for which this modem option is available.)

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### **FCC Regulations**

The local telephone company may ask that you contact them before using telephone lines to transmit data and may request the following information:

- FCC registration number: CJE794-72748-MD-E
- Ringer equivalence: 0.4B

The Ringer equivalence number (REN) is used to determine the quantity of devices you can connect to your telephone line and still have all of those devices ring when your number is called. In most areas, the sum of the RENs of all devices connected to one telephone line cannot exceed five. Check with your telephone company to determine the maximum REN for your calling area.

The internal modem complies with Part 68 of the FCC rules. In compliance with these rules, the FCC requires that you be aware of the following restrictions on the use of the internal modem:

- The internal modem may not be connected to a coin telephone or party line.
- If the modem malfunctions, it may harm the telephone network. You should disconnect the internal modem from the telephone line until the problem is repaired. If you don't disconnect the modem, the telephone company may temporarily discontinue your service, though they must notify you as soon as possible.
- The telephone company must notify you in advance if it makes changes that could affect the operation of the internal modem.

If the modem malfunctions, do not attempt to repair it yourself. Contact the GRiD Resource Center at 1-800-654-GRID (4743).

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## Canadian Department of Communications (DOC) Notice

The Canadian Department of Communications registration information is as follows:

- Certificate number: CS03-4427
- Certification number: 550 2111 A

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## Command Set

This section describes the AT command set for the MNP 2400 bps modem. This modem provides the de facto Hayes standard AT command set for auto dialing and Microcom Networking Protocol (MNP) AT command subset, and Class 1 (EIA-578) command set.

### AT (attention command)

Unless otherwise noted, all modem commands must begin with the characters AT. The AT prefix must be either all uppercase or all lowercase. These characters stand for *attention*, and they tell the modem that subsequent characters constitute a command to the modem rather than data to be transmitted. The AT command set allows you to combine commands on a line. After you press **Return**, the modem executes the commands in the order they appear.

Example: *AT command characters*

**NOTE:** In order to enable MNP Class 5 data compression for your modem, you must enter the command, AT%C1. This command is described in the Error Detection, Correction, and Data Compression Commands section of this chapter.

## Automatic Dialing Commands

### D (dial command)

Instructs the modem to dial the number specified by subsequent digits. Spaces, hyphens, and parentheses can be omitted; if present, they are ignored. Valid dial string characters are 0-9, #, \*, A, B, C, and D. The following options can be used with the Dial command and are explained in the following paragraphs: P T , ; “ ! W @ R S=n

Example: ATD4085551212

**P (pulse dialing command)**

Instructs the modem to use pulse dialing. Can be used alone or with a dial command. Pulse dialing is the default when power is first supplied to the modem.

Example: ATP

Example: ATDP4085551212

**T (Touch-Tone dialing command)**

Instructs the modem to use Touch-Tone dialing. Can be used alone or with a dial command.

Example: ATT

Example: ATDT4085551212

**, (pause command)**

Each comma inserted in a dial command causes a two-second delay (or the value of register S8) at that point in the dialing sequence. Delays are necessary when you need to dial part of a number, wait for dial tone or signal of some sort, and then resume dialing. In the example, a four-second delay is inserted after dialing 9 to get an outside line.

Example: ATD9,,4085551212

**; (return to command state after dialing)**

Causes the modem to dial the specified number and then return to the command state (the OK prompt) without hanging up. Ordinarily, the modem goes on-line as soon as it makes a connection. When the modem is on-line, you cannot issue any modem commands except the escape command. When you end a dial command with a semicolon (;), the modem dials the number, but does not go on-line when the connection is made.

Example: ATD4085551212;

**! (flash switch hook command)**

Causes the modem to “depress” the switch hook<sup>1</sup> for half a second, then “release” the switch hook for half a second before continuing to dial. On some telephone systems, you can use this command to transfer an incoming call to another line. The example below transfers a call and then hangs up (the H command is discussed in the following section).

Example: `ATD!1507;H`

**W (wait for second dial tone command)**

Causes the modem to wait for a second dial tone at this point in the dial command before proceeding to dial any remaining digits. Use this command when you access a telecommunications service that requires you to dial an access number, wait for a dial tone, and then dial another number or enter a code. You can use the W command only when the result code command currently in effect is X3 or higher. The W command can be used more than once in a single dial command.

Example:

`ATD9501022W04085551212W86455478853064`

<sup>1</sup> The term “switch hook” refers to whatever mechanism your telephone uses to distinguish between a raised and a lowered receiver. On the most common types of telephone, the two buttons on which the handset rests constitute the switch hook. On a wall-mounted phone, the switch hook is the bracket from which the receiver hangs when the phone is not in use.

**@ (wait for answer command)**

Causes the modem to wait for five seconds of silence at the other end of a completed call before proceeding to dial. This is useful if you need to wait for a recorded message to complete before entering digits in response to that message. To use the @ command, set the result code command X3 or higher. The @ command can be used more than once in a single dial command. In the example below, assume that the @ command corresponds to a recorded message asking you to enter your access code. The dialing operation stops while the message is played. Five seconds after the message completes, the digits of the access code are dialed.

Example: ATD4085553825@32863

**R (reverse frequency command)**

Reverses the modem's originate and answer frequencies. This is necessary when you want to call an originate-only modem. The R command can immediately precede or follow the number to be dialed.

Example: ATDR4085551212

Example: ATD4085551212R

**DS=*n* (dial stored number)**

Dials the stored number, where *n* is location 0-3. See &Z*n*=*x* command for information on storing a number.

Example: ATDS=2

**A/ (repeat last command)**

Causes the modem to repeat whatever command was last entered. This command is **not** preceded by the AT (attention command), and it is not terminated with the **Return** key. Just type A/ and the modem performs **one** repetition of the last command entered. In the example, A/ is used to redial a busy phone number.

Example: ATD4085551212  
 NO CARRIER  
 A/

**Any key**

While the modem is dialing, pressing any character key causes the modem to cancel the call.

## Modem Operation Commands

**+++ (escape command)**

Use this command to take the modem to the command state. (The connection remains established.) The escape command is **not** preceded by the AT (attention) command, and it is not terminated with the **Return** key. The first + must be separated from any previous keystroke by at least one second, and the last + must be separated from any following keystroke by at least one second. Otherwise, the modem interprets the three + signs as part of the data stream instead of the escape command. The + signs must be entered with less than one second between each one.

Example: *data keystrokes* [1 sec. pause]+++  
 [1 sec. pause] *command keystrokes*

**A (answer manually)**

Forces the modem to go off hook in answer mode. Use this command to answer a call manually. This command must be the last one on a command line.

**Bn (CCITT/Bell mode)**

Selects either CCITT or Bell standard for 1200 bps operation. At 0-300 bps, Bell 103 is automatically selected. At 2400 bps, CCITT V.22 bis is selected. At 1200 bps, either standard can be chosen to match the standard used by the remote system.

ATB0        Selects CCITT V.22 standard.

ATB1        Selects Bell 212A standard (factory setting).



***En* (command-state echo command)**

Turns local echo off or on for modem commands.

**ATE0** Turns local echo off. In this state, commands you type at the keyboard are not echoed to your screen.

**ATE1** Turns local echo on (factory setting).

***Hz* (on/off hook command)**

Causes modem to go on hook or off hook.

**ATH0** Causes the modem to hang up or go on hook (factory setting).

**ATH1** Causes the modem to go off hook (same as picking up the receiver of a telephone).

***In* (identification command)**

*In* is used to identify the modem code and status of the ROM.

**ATI0** Displays the product ID code (factory setting).

**ATI1** Performs checksum on ROM and displays result.

**ATI2** Performs checksum on ROM and displays status, either OK or ERROR.

**$L_n$  (speaker volume)**

Sets the speaker volume. If your computer is equipped with a voice-quality speaker, you can set three different speaker volumes. Otherwise, the speaker volume is medium.

ATL0, ATL1 Low speaker volume.

ATL2 Medium speaker volume (factory setting).

ATL3 High speaker volume.

 **$M_n$  (speaker control command)**

The number you enter to replace  $n$  determines when the modem's built-in speaker is on and when it is off. The four possible values are shown below.

ATM0 Speaker OFF.

ATM1 ON through dialing and carrier detect, OFF at connection (factory setting).

ATM2 ON continuously, even during data transmission.

ATM3 ON after last digit dialed until carrier detect; OFF at connection.

 **$O_n$  (on-line command)**

Switches modem from command state to on-line state.

ATO0 Takes the modem from the command state back to the on-line state when a connection is still open.

ATO1 Also returns modem to on-line state and initiates equalizer retrain sequence (at speeds of 2400 bps).

**Qn (quiet command)**

This command determines whether or not result codes are displayed on the screen.

ATQ0 Causes the codes to be displayed (factory setting).

ATQ1 Causes the codes to be suppressed.

**Sr=n (register command)**

Sets register *r* to value *n*. You can use this command if you need to change the values stored in any of the modem's registers. (It is unlikely that you will need to do this—do not change register values unless you are sure of what you are doing.) The general form of the register command is shown below. In an actual command, you would replace *r* with the register number and *n* with the value to be set (from 0-255). The registers and their values are listed in Table 3-1.

ATSr = n

Table 3-1. Modem Registers and Values

Register Number	Function	Default Value
0	Sets number of rings before automatic answering.	0
1	Counts and stores number of times the phone rings. Reverts to 0 if no ring occurs for 8 seconds.	0
2	Sets ASCII value of escape code sequence. A value greater than 127 disables the escape sequence.	43 (+)
3	Sets ASCII value of carriage return <CR> character.	13
4	Sets ASCII value of line feed character.	10
5	Sets ASCII value of backspace character.	8
6	Sets number of seconds modem waits for dial tone. This value is used when X0, X1, or X3 commands are in effect.	2
7	Sets number of seconds modem waits for carrier tone.	30
8	Sets duration of delay generated by comma (,) dial modifier.	2
9	Sets length of time, in tenths of a second, carrier signal must be present for modem to recognize signal and turn on DCD (data carrier detect). Prevents a ring or a busy signal from being mistaken as a carrier.	6
10	Sets duration, in tenths of a second, that modem waits after loss of carrier before hanging up.	14

Register Number	Function	Default Value
11	Sets duration, in milliseconds, of spacing between touch-tones during dialing.	70
12	Sets duration, in 20 millisecond increments, of guard time required in escape code sequence. Interval between each character must be shorter than this value.	50
13	<i>Reserved</i>	
14	<i>Reserved</i>	
15	<i>Reserved</i>	
16	<i>Reserved</i>	0
17	<i>Reserved</i>	
18	Sets duration, in seconds, of modem diagnostic tests. When a test is active for a length of time equal to this value, modem automatically terminates the test. 0 disables the timer. The range is 0-255.	0
19	<i>Reserved</i>	
20	<i>Reserved</i>	
21	<i>Reserved</i>	
22	<i>Reserved</i>	

Register Number	Function	Default Value
23	<i>Reserved</i>	
24	<i>Reserved</i>	
25	Delay to DTR (in 100ths of a second). A change in state (ON or OFF) of DTR that persists for less than this value is ignored by the modem while it is online. The range is 0-255.	5
26	<i>Reserved</i>	
27	<i>Reserved</i>	

**Sr?** To display the value stored in register *r*, use the command *ATSr?*, where *r* is the register number that you want to query.

Example: *ATS8?*

**Vn (verbose command)** Determines whether result codes are displayed as numbers or text.

ATV0 Causes codes to be displayed as numbers.

ATV1 Causes codes to be displayed as text (factory setting). See Table 3-2 for codes and messages.

**Xn (result code command)**

Every operation the modem performs has one of several possible results. The modem reports the actual result of each operation in the form of a result code from 0 to 10. Each result code has an associated text message. Whether or not a particular result code appears on the screen depends on the result code command (see Table 3-3). Your choice of a result code set also determines whether or not certain modem functions are enabled, as explained later in this section. The factory setting is X4.

The result codes and their associated messages are shown in Table 3-2.

*Table 3-2. Result Codes*

Code	Message	Connection Indicated
0	OK	Command executed
1	CONNECT	Connection at 300/1200/2400 bps
2	RING	Ring signal detected
3	NO CARRIER	Carrier signal not detected, or lost
4	ERROR	Invalid command, checksum, error in command line, or command line exceeds 40 characters
5	CONNECT 1200	Connection at 1200 bps
6	NO DIAL TONE	No dial tone detected
7	BUSY	Busy signal detected
8	NO ANSWER	No silence detected when dialing a system not providing a dial tone (Replaces NO CARRIER if an @ is present in the dial string)
10	CONNECT 2400	Connection at 2400 bps
20	CONNECT/REL	Reliable connection at 300 bps
22	CONNECT 1200/REL	Reliable connection at 1200 bps
23	CONNECT 2400/REL	Reliable connection at 2400 bps

Table 3-3 lists the result code commands and indicates which result codes are reported according to which command is in effect.

Table 3-3. Result Code Commands

Command	Codes Reported												
	0	1	2	3	4	5	6	7	8	10	20	22	23
X0	.	.	.	.	.						.		
X1	.	.	.	.	.	.				.	.	.	
X2	.	.	.	.	.	.	.			.	.	.	
X3	.	.	.	.	.	.		.		.	.	.	
X4	.	.	.	.	.	.	.	.	.	.	.	.	.

Whether reported codes appear on the screen as numbers or as messages depends on what V command is in effect, as explained earlier in this section.

Example: ATX3

**Yn (long space disconnect)**

Allows modem to recognize and respond to a long space disconnect.

ATY0 Modem does not recognize or respond to a long space disconnect (factory setting).

ATY1 Modem recognizes and responds to a long space disconnect.

**Zn (reset command)**

Resets the modem and recalls a user profile.

ATZ0 Recalls user profile 0.

ATZ1 Recalls user profile 1.



**&Cn (data carrier detect)**

Controls the Data Carrier Detect (DCD) signal on the serial port. The modem can be programmed to keep the DCD interchange circuit on at all times, ignoring data carrier presence or absence, or it can be programmed to turn on the DCD when a data carrier is detected. Use this command if your computer or terminal requires DCD to be OFF at certain times.

**AT&C0** DCD always ON; assumes data carrier always present (factory setting).

**AT&C1** DCD tracks presence of data carrier from the remote modem; DCD is on when data carrier is detected.

**&Dn (DTR control)**

The ON-to-OFF transition of DTR must last as long as the value specified in register S25 (default = 0.05 second). Positive transitions of DTR (OFF-to-ON) that occur within five seconds after disconnect are ignored. When AT&D2 or AT&D3 is set, DTR must be ON to autoanswer.

**AT&D0** Ignores DTR signal; DTR is not needed for autoanswer (factory setting).

**AT&D1** Enters command state when an ON-to-OFF transition of DTR is detected.

**AT&D2** Hangs up and enters command state when an ON-to-OFF transition of DTR is detected.

**AT&D3** Hangs up and resets when an ON-to-OFF transition of DTR is detected.

**&F (restore factory settings)**

Restores the factory settings as the active configuration. The factory settings are as follows:

B1, E1, H0, I0, L2, M1, Q0, V1, X4, &C0, &D0, &G0, &J0, &P0, &T4, &Y0, %A0, %B2400, %C0, \C0, \G0, \H0, \J1, \N0, \Q0, \T0, \V0

**&Gn (guard tone)**

Sets the guard tone. Calls within the United States do not require guard tones.

AT&G0      Disables guard tone (factory setting).

AT&G1      Sets guard tone on the answering modem to 550 Hz.

AT&G2      Sets guard tone to 1800 Hz.

**&Jn (phone jack type)**

Designates the type of jack with which the modem is connected to the telephone line.

AT&J0      RJ11, RJ41S, or RJ45S type phone jack (factory setting).

AT&J1      RJ12 or RJ13 type phone jack.

**&M0 (asynchronous mode)**

The &M command is used in some modems to set the communication mode. Any value other than &M0 is not valid for the MNP modem.

- &Pn (pulse dial ratio)** Controls the ratio of the off-hook (make) to on-hook (break) interval that the modem uses for pulse dialing.
- AT&P0 Pulse dial make/break ratio = 39/61 for use in the United States (factory setting).
- AT&P1 Pulse dial make/break ratio = 33/67 for use in the United Kingdom.
- &Tn (diagnostic test)** This is the modem's diagnostic and test facility.
- AT&T0 Ends a test in progress without terminating a connection and returns the local and remote modems to normal operation.
- AT&T1 Initiates local analog loopback. The modem should display the characters on your screen exactly as you type them.
- AT&T3 Allows a remote modem that does not support the CCITT V.54 standard to perform a local digital loopback test with the modem.
- AT&T4 Allows the modem to respond to a remote caller's request to enter remote digital loopback mode (factory setting).
- AT&T5 Prevents the modem from responding to a remote digital loopback request.
- AT&T6 Instructs the remote modem to initiate remote digital loopback.
- AT&T7 Instructs the remote modem to initiate a remote digital loopback with self-test.

	<b>AT&amp;T8</b>	Initiates remote analog loopback with self-test. The modem sends itself the CCITT V.54 test pattern and verifies these characters to make sure they are received correctly. It reports errors upon completion of the test.
<b>&amp;V (view configuration and profiles)</b>		Displays the active configuration, user profiles, and stored telephone numbers. This command should not be issued in conjunction with other commands. It should be issued on a line by itself.
<b>&amp;W<sub>n</sub> (store current configuration)</b>		Saves the storable parameters of the active configuration in memory as one of two user-defined profiles. (The &V command displays the storable parameters.)
	<b>AT&amp;W0</b>	Saves storable parameters of active configuration as user profile 0.
	<b>AT&amp;W1</b>	Saves storable parameters of active configuration as user profile 1.
<b>&amp;Y<sub>n</sub> (recall user profile)</b>		Recalls user profiles on power-up. Either user profile can be designated as the default to recall when the modem is powered up.
	<b>AT&amp;Y0</b>	Recalls user profile 0 at power-up (factory setting).
	<b>AT&amp;Y1</b>	Recalls user profile 1 at power-up.
<b>&amp;Z<sub>n</sub>=<i>x</i> (store phone number)</b>		Stores dial string (phone number) <i>x</i> in location <i>n</i> , where <i>n</i> is a decimal integer (0 to 3) and <i>x</i> is a string of up to 33 characters. Valid dial string characters are 0-9, dial modifiers, and (for tone dialing) A, B, C, D, #, *. The modem ignores invalid characters.

## Error Detection, Correction, And Data Compression Commands

**%An (autoreliable  
fallback character)**

Sets the ASCII character recognized as the autoreliable fallback character on the answering modem, where *n* is a decimal integer between 0 and 127. (The factory setting is 0, meaning the autoreliable fallback character is disabled.)

Autoreliable fallback character recognition stops if the modem receives a SYN character (ASCII 22). The modem ignores the autoreliable fallback character parity bit. Note that with this command, either AT\N3 or AT\C2 must also be set.

**%Bn (modem port  
bps rate)**

When issued locally, sets the maximum modem port bps rate, where *n* = 300, 1200, or 2400. An AT <RETURN> command issued locally causes the modem port speed to match the serial port speed, regardless of any previous AT%B setting. The factory setting is 2400.

**\Cn (autoreliable  
buffer)**

Determines if the answering modem buffers the data that it receives from the remote modem during the 3-second interval in which it attempts to establish a reliable connection. Use this command when the answering modem is in autoreliable mode.

When AT\C1 or AT\C2 is set, reliable and normal connections may result independent of bps rate adjust. When AT\C0 is set, however, bps rate adjust affects the type of connection as follows: reliable and direct connections may result when bps rate adjust is

on (ATV1); reliable and normal connections may result when bps rate adjust is off (ATV0).

AT\C0 Does not buffer data during link negotiation. Switches to normal or direct mode if SYN not detected in 3 seconds (factory setting).

AT\C1 Buffers all data on the answering modem until either 200 non-SYN characters are received or a SYN character is detected within 3 seconds. If 200 non-SYN characters are received, the modem switches to normal mode and passes the data through to the serial port. If a SYN character is detected within 3 seconds, the modem attempts to establish a reliable connection. Otherwise, the modem switches to normal mode. If the buffer fills, the modem switches to normal mode.

AT\C2 Does not buffer data on the answering modem. Switches to normal mode upon receipt of a character defined by the AT%A command and passes that character to the serial port.

When the modem is set to autoanswer and receives calls from modems that both support and do not support MNP, use autoreliable mode and set AT\C2. This allows the modem to switch to normal mode as soon as it detects a logon character (defined by the AT%A command) from a non-MNP caller, thereby eliminating the 3-second wait.

**%Cn (compression control)**

Determines whether the modem attempts to use data compression during reliable connections. Both modems must have this command set to AT%C1 at the time the reliable connection is established. For the most efficient results, also set the bps rate adjust off (ATJ0).

AT%C0 Disables data compression (factory setting).

AT%C1 Enables MNP Class 5 data compression only.

**\Gn (modem port flow control)**

Sets the flow control method used to pace data sent from the remote modem to this modem during a normal mode connection.

NOTE: The reliable link has its own method of flow control and ignores the AT\G setting. However, the serial port flow control settings (AT\Qn) remain active during a reliable link.

AT\G0 Disables modem port flow control (factory setting).

AT\G1 Sets modem port flow control to XON\XOFF (the modem sends an XOFF character to stop received data and sends an XON character to resume receiving data).

**\Hn (HP ENQ/ACK support)**

Allows the modem to emulate the Hewlett-Packard ENQ/ACK protocol when an MNP reliable link is established. Flow control may be used in addition to the ENQ/ACK protocol. Data blocks should not exceed 250 characters each.

AT\H0	Disables HP ENQ/ACK protocol (factory setting).
AT\H1	Enables HP ENQ/ACK protocol during MNP reliable link. Modem emulates terminal.
AT\H2	Enables HP ENQ/ACK protocol during MNP reliable link. Modem emulates host.

Use the HP ENQ/ACK protocol as follows:

1. Set the modem at the host to AT\H1.
2. Set the modem at the terminal to AT\H2.
3. Enable either XON/XOFF (AT\Q1) or hardware (AT\Q3) flow control on the serial port on both modems to prevent data loss.
4. Establish an MNP reliable link.



**\Jn (bps rate adjust)**

Controls the bps rate adjust feature. To retain the highest throughput, disable the bps rate adjust when data compression is used.

**ATJ0** Disables the bps rate adjust feature. The serial port is independent of the rate of the connection.

**ATJ1** Enables the bps rate adjust feature (factory setting). After a connection is made, the modem adjusts the speed of the serial port to match the speed of the connection. The serial port remains at the adjusted bps rate after the connection terminates. If your computer or terminal does not automatically change to the adjusted bps rate, you must manually change the bps rate to the new setting.

**\Nn (operating mode)**

Selects the operating mode the modem uses while in the connect state. The operating mode determines how the modem communicates with the remote system.

**ATN0** Sets normal mode; no error correction (factory setting). In normal mode, when bps rate adjust is OFF, the serial and modem ports can operate at different speeds during a connection. Flow control should be used to avoid data loss.

**ATN1** Sets direct mode; responds with OK; same effect as \N0. The modem does not buffer data, and flow control is ignored. In connect state, the serial port always adjusts to the speed of the connection, regardless of the setting of bps rate adjust command. The escape code sequence is disabled in direct mode if ATJ0 is set.

**AT\N2**

Sets reliable mode. Uses the MNP reliable link to provide error detection and automatic retransmission of data if an error occurs. This ensures that communications between your system and the remote system are error-free. The remote system must also be equipped to handle an MNP reliable link. The modem attempts to establish a reliable link immediately after making a connection. If the attempt fails, the modem disconnects.

During an MNP reliable link, you should use flow control on the modem's serial port. When the modem detects a transmission error, it holds data from the serial port in a buffer while correcting the transmission error. The remote system should also support flow control.

**NOTE:** Certain other protocols may not be timed to work with MNP and can interfere with its effectiveness.

**AT\N3**

Sets autoreliable mode. This mode is designed to allow a modem to communicate with remote systems that both support and do not support the MNP reliable link. The answering modem looks for incoming MNP protocol characters from the remote modem. If it detects them within approximately three seconds, it tries to establish a reliable link connection.

When the modem is set to autoanswer, you can shorten this period by using the AT%A command with the AT\C2 command. You must set AT\C2 so

that the modem recognizes an incoming autoreliable fallback character. When the modem encounters this character from a remote modem, it stops waiting for an MNP protocol character and falls back to a normal connection.

**NOTE:** If both modems are set to autoreliable mode, a normal connection or no connection could result due to noise on the telephone line.

If the modem does not detect incoming MNP characters, and bps rate adjust is ON (ATJ1) and autoreliable buffer is OFF (AT\C0), the modem establishes a direct connection instead. If bps rate adjust is OFF (ATJ0), the modem falls back to a normal connection and uses flow control if it is enabled.

**\Qn (serial port flow control)**

Sets the type of flow control used on the serial port. If the serial port speed is faster than the modem port speed, data from your computer or terminal enters the modem faster than it is sent out. The modem holds characters in a buffer and sends them out at the slower modem port bps rate. When the buffer is full, flow control instructs your computer or terminal to stop transmitting data to the modem; the modem continues to send out the characters and empty the buffer. When there is room in the buffer, flow control instructs your computer or terminal to resume transmitting data to the modem.

For reliable connections, retransmission can reduce the effective modem port speed. If this occurs, flow control prevents buffer overflow.

Flow control is not used during direct mode connections, and the modem ignores the setting of this command.

- AT\Q0 Disables flow control (factory setting).
- AT\Q1 Enables bidirectional XON/XOFF flow control. Transmission is stopped by sending an XOFF character and is restarted by sending an XON character. The modem generates XON and XOFF characters at the same parity as used on the serial port. The serial port also responds to XON and XOFF characters sent to it from the local computer or terminal in the same way.
- AT\Q2 Enables unidirectional hardware flow control. The modem turns CTS OFF to stop the local computer or terminal from transmitting data, and turns CTS ON to allow the local computer or terminal to resume transmitting data.
- AT\Q3 Enables bidirectional hardware flow control using the CTS and RTS signals. The modem uses the CTS signal to start and stop data transmission from the local computer or terminal. When RTS is OFF, the modem stops transmitting data to the local computer or terminal. When RTS is ON, the modem resumes sending data.
- AT\Q4 Enables unidirectional XON/XOFF flow control. The modem serial port generates, but does not respond to, XON/XOFF flow control characters. This setting allows for computers to transmit data that has XON/XOFF data characters. The computer can still be set to respond to XON/XOFF flow control characters sent to it from the modem during serial port flow control.

	AT\Q5	Enables unidirectional hardware flow control, but also keeps CTS OFF until a connection is established.
	AT\Q6	Enables bidirectional hardware flow control, but also keeps CTS OFF until a connection is established.
<b>\Tn (inactivity timer)</b>		Specifies the number of minutes the modem waits before automatically hanging up when data is not sent or received. The range for <i>n</i> is 0-90 with a factory setting of 0. AT\T0 disables the inactivity timer. The activity timer is only available during normal and reliable link connections. It is ignored when the modem is in direct mode.
<b>\Vn (MNP result code form)</b>		Determines whether result codes indicate that a reliable link connection is in effect.
	AT\V0	Disables modified MNP result codes. The modem uses the results codes listed with the ATV command. Use AT\V0 when the communications software you are using does not expect to see a reliable link result code, even if a reliable connection is made (factory setting).
	AT\V1	Enables modified MNP result codes. Use this setting when your software supports MNP result codes.
<b>%V (display modem firmware version)</b>		Displays the modem firmware version.
<b>\Z (switch to normal mode)</b>		Causes the local and remote modems to switch to normal mode during a reliable link. Switching to normal mode erases all data that may be in the buffer. <b>This command is for advanced use only.</b>
		If ATV1 and AT\C0 are set, this command forces the modem to direct mode rather than to normal mode.

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## MNP 2400 Bps Modem Specifications

### Communication Modes

Asynchronous, MNP Classes 1-5

### Communication Rates and Communication Standards Supported

300 bps Bell 103

1200 bps Bell 212A

1200 bps CCITT V.22

2400 bps CCITT V.22bis

### Error Control

Microcom Networking Protocol (MNP) Class 4

### Data Compression

Microcom Networking Protocol (MNP) Class 5

### Command Set

Hayes "AT" command set

Microcom "AT" command subset

### Operating Modes

Full duplex at 2400 bps and below

### Flow Control

None, RTS/CTS, XON/XOFF (Stop/Start), Transparent XON/XOFF

### Call Progress Monitoring

Dial tone, busy tone, ring detect, answer tone

### Dialing Capability

Command-selectable tone or pulse dialing

### Command Buffer

40 characters

### Receive Levels

-9 to -43 dBm

Transmit Levels

-11 dBm to -9 dBm

Carrier Detection Level

On > -34 dBm and OFF < -40 dBm

Line Requirements

Two-wire switched network (standard telephone line)

Ringer Equivalence: 0.4B

Regulatory Approvals

FCC Part 68

CSA/DOC

Registration and Approvals

FCC # CJE794-72748-MD-E

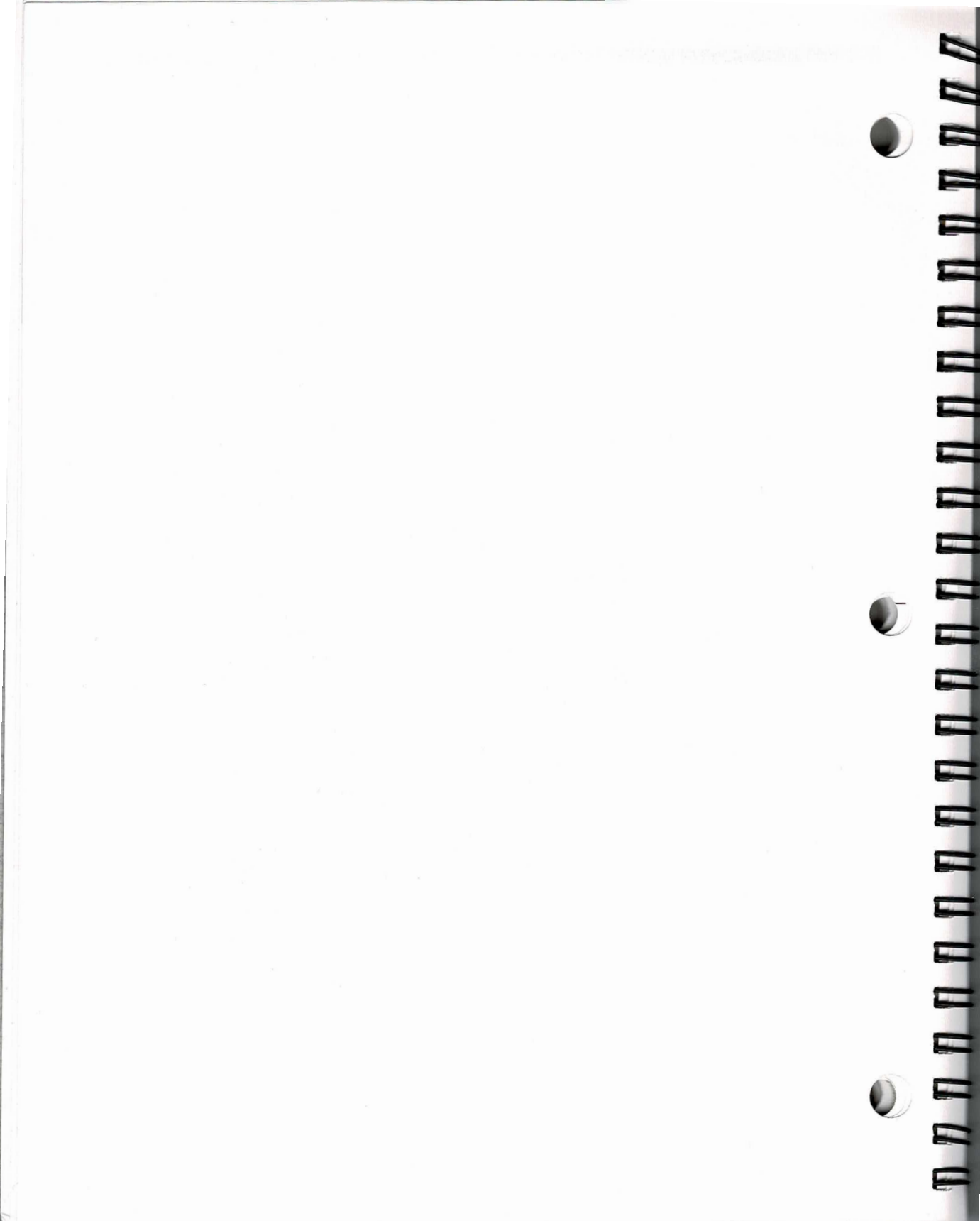
DOC Certified

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**CHAPTER 4:**  
**UK MNP 2400 BPS MODEM**







## Limited Warranty and Limitation of Liability

**You should carefully read the following terms and conditions. You will be deemed to have accepted these terms and conditions if you have not returned the product with your proof of purchase to your GRiD representative, within five days of the date of payment.**

The term "Products," as used herein, means hardware, hardware parts, and documentation sold by GRiD.

### 1. Warranty

GRiD warrants that the Products sold hereunder shall be free from defects in materials and workmanship for a period of one year after date of shipment. Defective Products will be repaired or replaced, at GRiD's option, by GRiD during the warranty period. You shall notify GRiD of the defective Product within the one-year period, obtain a Product Repair Order, and return the Product to GRiD along with proof of purchase data. If this Product is delivered by post, you agree to insure the Product or assume the risk of loss or damage in transit, to prepay shipping charges to the warranty service location, and to use the original shipping container or equivalent. Contact an authorised GRiD Systems representative, call GRiD Computer Systems, Ltd. at (0372) 60266, or write to: GRiD Computer Systems, Ltd., 140 High Street, Esher Surrey KT 10 9QJ, United Kingdom, for further information.

You are responsible for removing any data or programs or keeping backup copies prior to returning Products to GRiD. GRiD shall not be liable for loss of data contained in any returned equipment.

This warranty is not valid if the products have been misused, altered, neglected, or if repairs are attempted by unauthorised personnel. **Except as provided above, GRiD makes no warranties, expressed or implied, including any warranty of merchantability or fitness for a particular purpose.**

## **2. Limitation of Liability**

**In no event will GRiD be liable for special, incidental, or consequential damages, however caused. GRiD's liability under or for breach of this agreement shall be limited to refund of the purchase price.**

## **3. General**

You shall not assign this Agreement nor any rights hereunder without the prior written consent of GRiD. GRiD reserves the right to withhold such consent for any reason whatsoever. Subject to the foregoing, this Agreement shall bind and inure to the benefit of the respective parties hereto and their heirs, personal representatives, successors, and assigns.

The Terms and Conditions of this Limited Warranty and Limitation of Liability and of the Class A Software License Agreement represent the entire Agreement between GRiD and you relating to Product purchases and software licensing and may only be modified in writing, signed by both parties.

**By reading this agreement, you acknowledge that you understand it, and agree to be bound by its terms and conditions.**

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## **CHAPTER 4: UK MNP 2400 BPS MODEM**

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This chapter describes the command set for the UK MNP 2400 bps modem. It also provides regulatory information concerning the use of this modem.

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### **UK Approval and Use**

The UK MNP modem allows your GRiD computer (with suitable communications software) to transmit and receive data over standard telephone lines with other computers.

To use the UK MNP modem over the telephone network, you must have a British Telecom socket available for direct connection, which you may need to have installed in some older homes and offices. If this is the case, contact your local British Telecom office to arrange installation of the socket using the application form provided at the end of this section.

Your GRiD MNP modem is approved for connection to direct exchange lines of the Public Switched Telephone Network, but not the shared lines or "one-plus-one" carrier systems. Both PULSE dialling (loop disconnect) and Tone dialling (DTMF multi-frequency) are supported. A bell tinkle-suppression circuit is provided. The modem is suitable for household or office use. It should not be used with a pay phone.

The apparatus is only approved for use as an extension instrument to compatible PBXs. The supplier of the apparatus should be consulted for an up-to-date list of PBXs with which the apparatus is compatible.

It cannot be guaranteed that the apparatus will operate correctly under all possible conditions of connection to compatible PBXs. Any cases of difficulty should be referred in the first case to the supplier of the telephone apparatus.

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

1. Loudspeaking (including call monitoring).
2. Storage of telephone numbers for retrieval by a predetermined code.
3. Detection of initial proceed indication.
4. Detection of secondary proceed indication.
5. Auto dialling facility.
6. Detection of the following tones: dial, ring, busy, and number obtainable.
7. Repeat attempt facility of the last number dialled.
8. Loop disconnect and DTMF dialling.
9. Operation at V.21, V.22, V.22 bis transmission rates:

CCITT V.21	Originate/Answer 300 bps, full duplex
CCITT V.22	Originate/Answer 1200 bps, full duplex
CCITT V.22 bis	Originate/Answer 2400 bps, full duplex

Any other usage will invalidate the approval of the apparatus if, as a result, it then ceases to comply with the standards against which the approval was granted. The modem is approved for connection to telecommunication systems specified in the instructions for use, subject to the conditions set out for them. The approval number of the GRiD UK MNP modem is NS/3471/3/K/601013.

The approval of this modem for connection to the British Telecom public switched network is **invalidated** if the apparatus is subject to any modification in any material way that is not authorised by BABT (British Approvals Board for Telecommunications) or if it is used with or connected to:

- Internal software that has not been formally accepted by BABT, or
- External control software or external control apparatus that causes the operation of the modem or associated call set-up equipment to contravene the requirements of the standards set out in BABT/SITS/82/005S/D.

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

## Data Communications Line Interface (DCLI)

Your GRiD MNP modem is intended for use only with the GRiD-supplied Data Communications Line Interface (DCLI) unit. To connect your GRiD computer to the telephone system, **you must use the DCLI**. Connecting your modem to the telephone system without the DCLI will invalidate the approval. See the section, Connecting The Telephone Line, later in this chapter for information on connecting your modem.

### WARNING

Connect only apparatus complying with BS6301 to this port.

## Ringer Equivalence Number (REN)

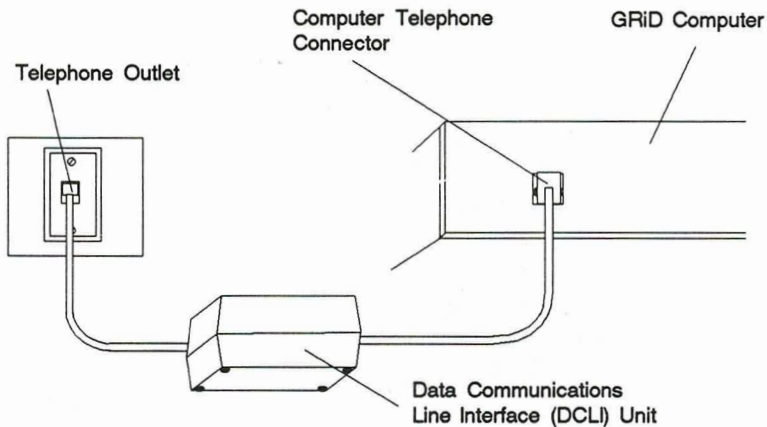
It is possible to connect a number of devices such as telephones, answering machines, FAX machines, modems, etc. simultaneously to one telephone line. However, there is a limit to the number of devices you may connect. This is determined by adding together the RINGER EQUIVALENCE NUMBER (REN) of each device you wish to put on a line. The number should be clearly marked on each device. The REN of the GRiD UK MNP modem is 1. You can usually assume that British Telecom equipment has an REN of 1 also, unless otherwise marked.

**NOTE:** You should ensure that the sum of the RENs is not more than 4 for all equipment connected to one line.

## Connecting the Telephone Line

To connect your GRiD computer UK MNP modem to the telephone system, you must use the Data Communications Line Interface (DCLI) unit. This unit has two telephone plugs attached to it. One plug connects to the computer and the other connects to the telephone outlet. The plugs cannot be connected incorrectly because they are different sizes.

As shown below, plug the smaller telephone plug into one of the telephone connectors on the back of the computer. Plug the larger telephone plug into the telephone outlet.





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## Command Set

This section describes the command set for the UK MNP 2400 bps modem. This modem provides both the de facto Hayes standard AT command set for auto dialling and Microcom Networking Protocol (MNP) level 5 error detection, correction, and data compression commands.

### AT (attention command)

Unless otherwise noted, all modem commands must begin with the characters AT. The AT prefix must be either all uppercase or all lowercase. These characters stand for *attention*, and they tell the modem that subsequent characters constitute a command to the modem rather than data to be transmitted. The AT command set allows you to combine commands on a line. After you press **Return**, the modem executes the commands in the order they appear.

Example: *AT command characters*

**NOTE:** In order to enable MNP Class 5 data compression for your modem, you must enter the command, AT%C1. This command is described in the Error Detection, Correction, and Data Compression Commands section of this chapter.

## Automatic Dialling Commands

### D (dial command)

Instructs the modem to dial the number specified by subsequent digits. Spaces, hyphens, and parentheses can be omitted; if present, they are ignored. Valid dial string characters are 0-9, #, \*, A, B, C, and D. The following options can be used with the Dial command and are explained in the following paragraphs: P T , ; " W @ R S=n

Example: ATD4085551212

**P (pulse dialling command)**

Instructs the modem to use pulse dialling. Can be used alone or with a dial command. Pulse dialling is the default when power is first supplied to the modem.

Example: ATP

Example: ATDP4085551212

**T (Touch-Tone dialling command)**

Instructs the modem to use Touch-Tone dialling. Can be used alone or with a dial command.

Example: ATT

Example: ATDT4085551212

**, (pause command)**

Each comma inserted in the dial command causes a four-second delay (or the value of register S8) at that point in the dialling sequence. Delays are necessary when you need to dial part of a number, wait for a dial tone or signal of some sort, and then resume dialling. For example, a four-second delay is inserted after dialling 9 to get an outside line.

Example: ATD9,4085551212

**NOTE:** Do not enter consecutive pauses as doing so could result in unsatisfactory operation. In order to get delays of greater than four seconds, register S8 should be adjusted.

**; (return to command state after dialling)**

Causes the modem to dial the specified number and then return to the command state (the OK prompt) without hanging up. Ordinarily, the modem goes on-line as soon as it makes a connection. When the modem is on-line, you cannot issue any modem commands except the escape command. When you end a dial command with a semicolon (;), the modem dials the number, but does not go on-line when the connection is made.

Example: ATD4085551212;

**W (wait for second dial tone command)**

Causes the modem to wait for a second dial tone at this point in the dial command before proceeding to dial any remaining digits. Use this command when you access a telecommunications service that requires you to dial an access number, wait for a dial tone, and then dial another number or enter a code. You can use the W command only when the result code command currently in effect is X3 or higher. The W command can be used more than once in a single dial command.

Example:

```
ATD9501022W04085551212W86455478853064
```

**@ (wait for answer command)**

Causes the modem to wait for five seconds of silence at the other end of a completed call before proceeding to dial. This is useful if you need to wait for a recorded message to complete before entering digits in response to that message. To use the @ command, set the result code command X3 or higher. The @ command can be used more than once in a single dial command. In the example below, assume that the @ command corresponds to a recorded message asking you to enter your access code. The dialling operation stops while the message is played. Five seconds after the message completes, the digits of the access code are dialled.

Example: 

```
ATD4085553825@32863
```

**R (reverse frequency command)**

Reverses the modem's originate and answer frequencies. This is necessary when you want to call an originate-only modem. The R command can immediately precede or follow the number to be dialled.

Example: 

```
ATDR4085551212
```

Example: 

```
ATD4085551212R
```

**DS=*n* (dial stored number)**

Dials the stored number, where *n* is location 0-3. See **&Zn=x** command for information on storing a number.

Example: **ATDS=2**

**A/ (repeat last command)**

Causes the modem to repeat whatever command was last entered. This command is **not** preceded by the AT (attention command), and it is not terminated with the **Return** key. Just type A/ and the modem performs **one** repetition of the last command entered. In the example, A/ is used to redial a busy phone number.

Example: **ATD4085551212  
NO CARRIER  
A/**

**Any key**

While the modem is dialling, pressing any character key causes the modem to cancel the call.

## Modem Operation Commands

**+++ (escape command)**

Use this command to take the modem to the command state. (The connection remains established.) The escape command is **not** preceded by the AT (attention) command, and it is not terminated with the **Return** key. The first + must be separated from any previous keystroke by at least one second, and the last + must be separated from any following keystroke by at least one second. Otherwise, the modem interprets the three + signs as part of the data stream instead of the escape command. The + signs must be entered with less than one second between each one.

Example: *data keystrokes* [1 sec. pause]+++  
[1 sec. pause] *command keystrokes*

**A (answer manually)**

Forces the modem to go off hook in answer mode. Use this command to answer a call manually. This command must be the last one on a command line.

**En (command-state echo command)**

Turns local echo off or on for modem commands.

**ATE0** Turns local echo off for modem commands. In this state, commands you type at the keyboard are not echoed to your screen.

**ATE1** Turns local echo on (factory setting).

**Hz (on/off hook command)**

Causes modem to go on hook or off hook.

**ATH0** Causes the modem to hang up or go on hook (factory setting).

**ATH1** Causes the modem to go off hook (same as picking up the receiver of a telephone).

**In (identification command)**

In is used to identify the modem code and status of the ROM.

**ATI0** Displays the product ID code (factory setting).

**ATI1** Performs checksum on ROM and displays result.

**ATI2** Performs checksum on ROM and displays status, either OK or ERROR.

**L $n$  (medium speaker volume)**

Sets speaker volume to medium, which is the only speaker volume setting. All four settings below set the volume to medium. The factory setting is L2.

ATL0, ATL1, Medium speaker volume.  
ATL2, ATL3

**M $n$  (speaker control command)**

The number you enter to replace  $n$  determines when the modem's built-in speaker is on and when it is off. The four possible values are shown below.

ATM0 Speaker OFF.

ATM1 ON through dialling and carrier detect, OFF at connection (factory setting).

ATM2 ON continuously, even during data transmission.

ATM3 ON after last digit dialled until carrier detect; OFF at connection.

**On (on-line command)**

Switches modem from command state to on-line state.

ATO0 Takes the modem from the command state back to the on-line state when a connection is still open.

ATO1 Also returns modem to on-line state and initiates equalizer retrain sequence (at speeds of 2400 bps).

**Qn (quiet command)**

This command determines whether or not result codes are displayed on the screen.

ATQ0 Causes the codes to be displayed (factory setting).

ATQ1 Causes the codes to be suppressed.

**Sr=n (register command)**

Sets register *r* to value *n*. You can use this command if you need to change the values stored in any of the modem's registers. (It is unlikely that you will need to do this—do not change register values unless you are sure of what you are doing.) The general form of the register command is shown below. In an actual command, you would replace *r* with the register number and *n* with the value to be set (from 0-255). The registers and their values are listed in Table 4-1.

ATSr = n

*Table 4-1. Modem Registers and Values*

<b>Register Number</b>	<b>Function</b>	<b>Default Value</b>
0	Sets number of rings before automatic answering.	0
1	Counts and stores number of times the phone rings. Reverts to 0 if no ring occurs for 8 seconds.	0
2	Sets ASCII value of escape code sequence. A value greater than 127 disables the escape sequence.	43 (+)
3	Sets ASCII value of carriage return <CR> character.	13
4	Sets ASCII value of line feed character.	10
5	Sets ASCII value of backspace character.	8
6	Sets number of seconds modem waits for dial tone. This value is used when X0, X1, or X3 commands are in effect.	4
7	Sets number of seconds modem waits for carrier tone.	30
8	Sets duration of delay generated by comma (,) dial modifier.	4
9	Sets length of time, in tenths of a second, carrier signal must be present for modem to recognize signal and turn on DCD (data carrier detect). Prevents a ring or a busy signal from being mistaken as a carrier.	6
10	Sets duration, in tenths of a second, that modem waits after loss of carrier before hanging up.	14



Register Number	Function	Default Value
11	Sets duration, in milliseconds, of spacing between touch-tones during dialling.	70
12	Sets duration, in 20 millisecond increments, of guard time required in escape code sequence. Interval between each character must be shorter than this value.	50
13	<i>Reserved</i>	
14	<i>Reserved</i>	
15	<i>Reserved</i>	
16	<i>Reserved</i>	0
17	<i>Reserved</i>	
18	Sets duration, in seconds, of modem diagnostic tests. When a test is active for a length of time equal to this value, the modem automatically terminates the test. 0 disables the timer. The range is 0-255.	0
19	<i>Reserved</i>	
20	<i>Reserved</i>	
21	<i>Reserved</i>	
22	<i>Reserved</i>	

Register Number	Function	Default Value
23	<i>Reserved</i>	
24	<i>Reserved</i>	
25	Delay to DTR (in 100ths of a second). A change in state (ON or OFF) of DTR that persists for less than this value is ignored by the modem while it is online. The range is 0-255.	5
26	<i>Reserved</i>	
27	<i>Reserved</i>	

**Sr?** To display the value stored in register *r*, use the command `ATSr?`, where *r* is the register number that you want to query.

Example: `ATS8?`

**Vn (verbose command)**

Determines whether result codes are displayed as numbers or text.

**ATV0** Causes codes to be displayed as numbers.

**ATV1** Causes codes to be displayed as text (factory setting). See Table 4-2 for codes and messages.

**Xn (result code command)**

Every operation the modem performs has one of several possible results. The modem reports the actual result of each operation in the form of a result code from 0 to 10. Each result code has an associated text message. Whether or not a particular result code appears on the screen depends on the result code command (see Table 3-3). Your choice of a result code set also determines whether or not certain modem functions are enabled, as explained later in this section. The factory setting is X4.

The result codes and their associated messages are shown in Table 4-2.

*Table 4-2. Result Codes*

Code	Message	Connection Indicated
0	OK	Command executed
1	CONNECT	Connection at 300/1200/2400 bps
2	RING	Ring signal detected
3	NO CARRIER	Carrier signal not detected, or lost
4	ERROR	Invalid command, checksum, error in command line, or command line exceeds 40 characters
5	CONNECT 1200	Connection at 1200 bps
6	NO DIAL TONE	No dial tone detected
7	BUSY	Busy signal detected
8	NO ANSWER	No silence detected when dialling a system not providing a dial tone (Replaces NO CARRIER if an @ is present in the dial string)
10	CONNECT 2400	Connection at 2400 bps
20	CONNECT/REL	Reliable connection at 300 bps
22	CONNECT 1200/REL	Reliable connection at 1200 bps
23	CONNECT 2400/REL	Reliable connection at 2400 bps

Table 4-3 lists the result code commands and indicates which result codes are reported according to which command is in effect.

Table 4-3. Result Code Commands

Command	Codes Reported												
	0	1	2	3	4	5	6	7	8	10	20	22	23
X0	.	.	.	.	.						.		
X1	.	.	.	.	.	.				.		.	.
X2	.	.	.	.	.	.	.			.		.	.
X3	.	.	.	.	.	.		.	.	.		.	.
X4	.	.	.	.	.	.	.	.	.	.		.	.

Whether reported codes appear on the screen as numbers or as messages depends on what V command is in effect, as explained earlier in this section.

Example: ATX3

#### Yn (long space disconnect)

Allows modem to recognize and respond to a long space disconnect.

ATY0      Modem does not recognize or respond to a long space disconnect (factory setting).

ATY1      Modem recognizes and responds to a long space disconnect.

#### Zn (reset command)

Resets the modem and recalls a user profile.

ATZ0      Recalls user profile 0.

ATZ1      Recalls user profile 1.

**&Cn (data carrier detect)**

Controls the Data Carrier Detect (DCD) signal on the serial port. The modem can be programmed to keep the DCD interchange circuit on at all times, ignoring data carrier presence or absence, or it can be programmed to turn on the DCD when a data carrier is detected. Use this command if your computer or terminal requires DCD to be OFF at certain times.

**AT&C0**      DCD always ON; assumes data carrier always present (factory setting).

**AT&C1**      DCD tracks presence of data carrier from the remote modem; DCD is on when data carrier is detected.

**&Dn (DTR control)**

The ON-to-OFF transition of DTR must last as long as the value specified in register S25 (default = 0.05 second). Positive transitions of DTR (OFF-to-ON) that occur within five seconds after disconnect are ignored. When AT&D2 or AT&D3 is set, DTR must be ON to autoanswer.

**AT&D0**      Ignores DTR signal; DTR is not needed for autoanswer (factory setting).

**AT&D1**      Enters command state when an ON-to-OFF transition of DTR is detected.

**AT&D2**      Hangs up and enters command state when an ON-to-OFF transition of DTR is detected.

**AT&D3**      Hangs up and resets when an ON-to-OFF transition of DTR is detected.

**&F (restore factory settings)**

Restores the factory settings listed below as the active configuration.

E1, H0, I0, L2, M1, Q0, V1, X4, &C0, &D0, &T4, &Y0, %A0, %B2400, %C0, \C0, \G0, \H0, \J1, \N0, \Q0, \T0, \V0

**&J1 (phone jack type)**

Designates RJ12 type of jack with which the modem is connected to the telephone line.

**&Tn (diagnostic test)**

This is the modem's diagnostic and test facility.

AT&T0      Ends a test in progress without terminating a connection and returns the local and remote modems to normal operation.

AT&T1      Initiates local analog loopback. The modem should display the characters on the screen exactly as you type them.

**NOTE:** This test is not available at 300 bps.

AT&T3      Allows a remote modem that does not support the CCITT V.54 standard to perform a local digital loopback test with the modem.

AT&T4      Allows the modem to respond to a remote caller's request to enter remote digital loopback mode (factory setting).

AT&T5      Prevents the modem from responding to a remote digital loopback request.

AT&T6      Instructs the remote modem to initiate remote digital loopback.

AT&T7      Instructs the remote modem to initiate a remote digital loopback with self-test.

AT&T8	Initiates remote analog loopback with self-test. The modem sends itself the CCITT V.54 test pattern and verifies these characters to make sure they are received correctly. It reports errors upon completion of the test.
	<b>NOTE:</b> This test is not available at 300 bps.
<b>&amp;V (view configuration and profiles)</b>	Displays the active configuration, user profiles, and stored telephone numbers. This command should be issued on a line by itself without any other commands.
<b>&amp;W<sub>n</sub> (store current configuration)</b>	Saves the storable parameters of the active configuration in memory as one of two user-defined profiles. (The &V command displays the storable parameters.)
	AT&W0 Saves storable parameters of active configuration as user profile 0.
	AT&W1 Saves storable parameters of active configuration as user profile 1.
<b>&amp;Y<sub>n</sub> (recall user profile)</b>	Recalls user profiles on power-up. Either user profile can be designated as the default to recall when the modem is powered up.
	AT&Y0 Recalls user profile 0 at power-up (factory setting).
	AT&Y1 Recalls user profile 1 at power-up.
<b>&amp;Z<sub>n</sub>=<i>x</i> (store phone number)</b>	Stores dial string (phone number) <i>x</i> in location <i>n</i> , where <i>n</i> is a decimal integer (0 to 3) and <i>x</i> is a string of up to 33 characters. Valid dial string characters are 0-9, dial modifiers, and (for tone dialling) A, B, C, D, #, *. The modem ignores invalid characters.
	<b>NOTE:</b> You should check the number entered during modem autocal setup phase prior to dialling.

## Error Detection, Correction, And Data Compression Commands

### ***%An* (autoreliable fallback character)**

Sets the ASCII character recognized as the autoreliable fallback character on the answering modem, where *n* is a decimal integer between 0 and 127. (The factory setting is 0, meaning the autoreliable fallback character is disabled.)

In autoreliable mode, when the modem encounters an incoming reliable fallback character from the remote system, it automatically switches to normal mode and passes the character to the serial port. Autoreliable fallback character recognition stops if the modem receives a SYN character (ASCII 22). The modem ignores the autoreliable fallback character parity bit. Note that with this command, either AT\N3 or AT\C2 must also be set.

### ***%Bn* (modem port bps rate)**

When issued locally, sets the maximum modem port bps rate, where *n* = 300, 1200, or 2400. An AT <RETURN> command issued locally causes the modem port speed to match the serial port speed, regardless of any previous AT%B setting. The factory setting is 2400.

### ***\Cn* (autoreliable buffer)**

Determines if the answering modem buffers the data that it receives from the remote modem during the 3-second interval in which it attempts to establish a reliable connection. Use this command when the answering modem is in autoreliable mode.

When AT\C1 or AT\C2 is set, reliable and normal connections may result independent of bps rate adjust. When AT\C0 is set, however, bps rate adjust affects the type of connection as follows: reliable and direct connection may result when bps rate adjust is on (AT\J1); reliable and normal connections may result when bps rate adjust is off (AT\J0).



- AT\C0 Does not buffer data during link negotiation. Switches to normal or direct mode if SYN not detected in 3 seconds (factory setting).
- AT\C1 Buffers all data on the answering modem until either 200 non-SYN characters are received or a SYN character is detected within 3 seconds. If 200 non-SYN characters are received, the modem switches to normal mode and passes the data through to the serial port. If a SYN character is detected within 3 seconds, the modem attempts to establish a reliable connection. If a SYN character is detected within 3 seconds, the modem attempts to establish a reliable connection. Otherwise, the modem switches to normal mode. If the buffer fills, the modem switches to normal mode.
- AT\C2 Does not buffer data on the answering modem. Switches to normal mode upon receipt of a character defined by the AT%A command and passes that character to the serial port.
- When the modem is set to autoanswer and receives calls from modems that both support and do not support MNP, use autoreliable mode and set AT\C2. This allows the modem to switch to normal mode as soon as it detects a logon character (defined by the AT%A command) from a non-MNP caller, thereby eliminating the 3-second wait.

**%Cn (compression control)**

Determines whether the modem attempts to use data compression during reliable connections. Both modems must have this command set to AT%C1 at the time the reliable connection is established. For the most efficient results, also set the bps rate adjust off (ATJ0).

AT%C0 Disables data compression (factory setting).

AT%C1 Enables MNP Class 5 data compression only.

**\Gn (modem port flow control)**

Sets the flow control method used to pace data sent from the remote modem to this modem during a normal mode connection.

NOTE: The reliable link has its own method of flow control and ignores the AT\G setting. However, the serial port flow control settings (AT\Qn) remain active during a reliable link.

AT\G0 Disables modem port flow control (factory setting).

AT\G1 Sets modem port flow control to XON\XOFF (the modem sends an XOFF character to stop received data and sends an XON character to resume receiving data).

**\Hn (HP ENQ/ACK support)**

Allows the modem to emulate the Hewlett-Packard ENQ/ACK protocol when an MNP reliable link is established. Flow control may be used in addition to the ENQ/ACK protocol. Data blocks should not exceed 250 characters each.

- |       |  |
|-------|--|
| AT\H0 | Disables HP ENQ/ACK protocol (factory setting).                                |
| AT\H1 | Enables HP ENQ/ACK protocol during MNP reliable link. Modem emulates terminal. |
| AT\H2 | Enables HP ENQ/ACK protocol during MNP reliable link. Modem emulates host.     |

Use the HP ENQ/ACK protocol as follows:

1. Set the modem at the host to AT\H1.
2. Set the modem at the terminal to AT\H2.
3. Enable either XON/XOFF (AT\Q1) or hardware (AT\Q3) flow control on the serial port on both modems to prevent data loss.
4. Establish an MNP reliable link.

**\n (bps rate adjust)**

Controls the bps rate adjust feature. To retain the highest throughput, disable the bps rate adjust when data compression is used.

**AT\n0** Disables the bps rate adjust feature. The serial port is independent of the rate of the connection.

**AT\n1** Enables the bps rate adjust feature (factory setting). After a connection is made, the modem adjusts the speed of the serial port to match the speed of the connection. The serial port remains at the adjusted bps rate after the connection terminates. If your computer or terminal does not automatically change to the adjusted bps rate, you must manually change the bps rate to the new setting.

**\N (operating mode)**

Selects the operating mode the modem uses while in the connect state. The operating mode determines how the modem communicates with the remote system.

**AT\n0** Sets normal mode; no error correction (factory setting). In normal mode, when bps rate adjust is OFF, the serial and modem ports can operate at different speeds during a connection. Flow control should be used to avoid data loss.

**AT\n1** Sets direct mode; responds with OK; same effect as \N0. The modem does not buffer data, and flow control is ignored. In connect state, the serial port always adjusts to the speed of the connection, regardless of the setting of bps rate adjust command. The escape code sequence is disabled in direct mode if AT\n0 is set.

**ATN2**

Sets reliable mode. Uses the MNP reliable link to provide error detection and automatic retransmission of data if an error occurs. This ensures that communications between your system and the remote system are error-free. The remote system must also be equipped to handle an MNP reliable link. The modem attempts to establish a reliable link immediately after making a connection. If the attempt fails, the modem disconnects.

During an MNP reliable link, you should use flow control on the modem's serial port. When the modem detects a transmission error, it holds data from the serial port in a buffer while correcting the transmission error. The remote system should also support flow control.

**NOTE:** Certain other protocols may not be timed to work with MNP and can interfere with its effectiveness.

**ATN3**

Sets autoreliable mode. This mode is designed to allow a modem to communicate with remote systems that both support and do not support the MNP reliable link. The answering modem looks for incoming MNP protocol characters from the remote modem. If it detects them within approximately three seconds, it tries to establish a reliable link connection.

When the modem is set to autoanswer, you can shorten this period by using the AT%A command with the AT\C2 command. You must set AT\C2 so

that the modem recognizes an incoming autoreliable fallback character. When the modem encounters this character from a remote modem, it stops waiting for an MNP protocol character and falls back to a normal connection.

**NOTE:** If both modems are set to autoreliable mode, a normal connection or no connection could result due to noise on the telephone line.

If the modem does not detect incoming MNP characters, and bps rate adjust is ON (ATJ1) and autoreliable buffer is OFF (AT\C0), the modem establishes a direct connection instead. If bps rate adjust is OFF (ATJ0), the modem falls back to a normal connection and uses flow control if it is enabled.

**\Qn (serial port flow control)**

Sets the type of flow control used on the serial port. If the serial port speed is faster than the modem port speed, data from your computer or terminal enters the modem faster than it is sent out. The modem holds characters in a buffer and sends them out at the slower modem port bps rate. When the buffer is full, flow control instructs your computer or terminal to stop transmitting data to the modem; the modem continues to send out the characters and empty the buffer. When there is room in the buffer, flow control instructs your computer or terminal to resume transmitting data to the modem.

For reliable connections, retransmission can reduce the effective modem port speed. If this occurs, flow control prevents buffer overflow.

Flow control is not used during direct mode connection, and the modem ignores the setting of this command.

- ATQ0 Disables flow control (factory setting).
- ATQ1 Enables bidirectional XON/XOFF flow control. Transmission is stopped by sending an XOFF character and is restarted by sending an XON character. The modem generates XON and XOFF characters at the same parity as used on the serial port. The serial port also responds to XON and XOFF characters sent to it from the local computer or terminal in the same way.
- ATQ2 Enables unidirectional hardware flow control. The modem turns CTS OFF to stop the local computer or terminal from transmitting data, and turns CTS ON to allow the local computer or terminal to resume transmitting data.
- ATQ3 Enables bidirectional hardware flow control using the CTS and RTS signals. The modem uses the CTS signal to start and stop data transmission from the local computer or terminal. When RTS is OFF, the modem stops transmitting data to the local computer or terminal. When RTS is ON, the modem resumes sending data.
- ATQ4 Enables unidirectional XON/XOFF flow control. The modem serial port generates, but does not respond to, XON/XOFF flow control characters. This setting allows for computers to transmit data that has XON/XOFF data characters. The computer can still be set to respond to XON/XOFF flow control characters sent to it from the modem during serial port flow control.

- ATQ5** Enables unidirectional hardware flow control, but keeps CTS OFF until a connection is established.
- ATQ6** Enables bidirectional hardware flow control, but keeps CTS OFF until a connection is established.
- \Tn (inactivity timer)** Specifies the number of minutes the modem waits before automatically hanging up when data is not sent or received. The range for *n* is 0-90 with a factory setting of 0. AT\T0 disables the inactivity timer. The activity timer is only available during normal and reliable link connections. It is ignored when the modem is in direct mode.
- \Vn (MNP result code form)** Determines whether result codes indicate that a reliable link connection is in effect.
- ATV0** Disables modified MNP result codes. The modem uses the results codes listed with the ATV command. Use ATV0 when the communications software you are using does not expect to see a reliable link result code, even if a reliable connection is made (factory setting).
- ATV1** Enables modified MNP result codes. Use this setting when your software supports MNP result codes.
- %V (display modem firmware version)** Displays the modem firmware version.
- \Z (switch to normal mode)** Causes the local and remote modems to switch to normal mode during a reliable link. Switching to normal mode erases all data that may be in the buffer. **This command is for advanced use only.**
- If AT/J1 and AT/C0 are set, AT/Z forces the modem to direct mode rather than to normal mode.



# Application for Installation of Telephone Socket

**NOTE:** To be completed by the subscriber and sent to the local telephone sales office only if a suitable British Telecom socket or an extension is required. (The address of the telephone sales office is available in your phone directory.)

**To:** British Telecom

I am the owner of a GRiD modem.

**Model:** GRiD MNP Modem - UK

**Approval Number:** NS/3471/3/K/601013

Please arrange to fit a suitable new modular socket as soon as possible.

Name -----

Address -----

-----

-----

Postcode -----

Telephone -----

Date ----- Signed -----

GRiD Systems Corporation  
47211 Lakeview Boulevard, Fremont, CA 94538-6599

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Rev. F