

# VOICE/FAX/DATA MODEM USER'S MANUAL

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## **i - FCC/DOC REQUIREMENTS**

### **i -1 FCC General Information**

The Federal Communications Commission (FCC) of the United States restricts specific uses of modems, and places registration responsibilities on both the manufacturer and the individual user:

1. The modem may not be connected to a party line or to a coin operated telephone.
2. The modem manufacturer must make any repairs to the modem to maintain valid FCC registration.
3. Notification to the telephone company is no longer required prior to connecting registered equipment, but upon request from the telephone company, the user shall tell the telephone company which line the equipment is connected to as well as the registration number and ringer equivalence number of the registered protective circuitry. FCC information is printed on a label on the bottom of the modem.

### **i - 2 FCC Notice**

This equipment has been tested and found to comply with the limits for a digital device, pursuant to Subpart B of Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates and uses radio frequency energy and if not installed and used the instructions, may cause interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

Reorient or relocate the receiving antenna.

Increase the separation between the equipment and receiver.

Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

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

Shielded interconnect cables and a shielded power cord must be employed with this equipment to insure compliance with the pertinent RF emission limits governing this device. Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

**NOTE:** The manufacturer is not responsible for any radio or T.V. interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment.

### **i - 3 DOC Notice**

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 companies 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 might not prevent degradation of service in some situations.

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

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

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

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

**Note:** Locate an analog telephone line. Many offices have digital telephone lines, which will not work with a modem.

**Warning:** Do not connect your modem to a digital telephone line. Modems are designed for use only with analog telephone lines; connecting to a digital telephone line may damage the modem. Verify that the line is analog before connecting.

Fax machines use analog telephone lines. If you can't find an analog voice line, find a fax machine and use its line.

## 1 - INTRODUCTION

Congratulations on your purchase of this outstanding Fax/Data Modem. This manual describes how to operate your new Fax/Data Modem.

Instructions for installing your Fax/Data Modem will be found in the Installation Manual, while the information in this manual, deals exclusively with the operation of the modem after it is installed, such as the command set, the internal configuration registers, troubleshooting and testing.

### **Features:**

These Fax/Data Modems combine the features of a 56000(receive only)/33600/28800/14400/9600 bps data modem and a 14400/9600 bps FAX modem. Your new Fax/Data Modem gives your personal computer the ability to send and receive FAX messages over the telephone line like a standard FAX machine. Your Fax/Data Modem also allows your PC to communicate with other personal computers, terminals or BBS's (Bulletin Board Systems) through the data modem functions.

When used as a data modem your Fax/Data Modem uses the standard AT command set and is fully compatible with ITU-T V.42, V.42bis, V.34 (ANNEX 12), V.32bis, V.32, V.22bis, V.23, V.22, V.21, MNP 2-5, Bell 103, 212A, K56flex and/or V.90. When used as a Fax/Data Modem it communicates with all ITU-T Group 3 FAX machines and is compatible with ITU-T V.27ter and V.29, V.17, T.4 and T.30. Switching between DATA mode operation and FAX mode operation of your Fax/Data Modem is done through its firmware, no hardware settings are required.

If you are already familiar with the use of a modem and the Hayes AT command set, this modem will be extremely easy for you to use. Just read the installation procedures in the installation manual and you are ready to begin operation. If you are new to modem communications, we recommend that you read through this manual first. If you come across terms that you don't understand, consult the glossary. Words in boldface type are command names, commands, or default settings. Carriage returns (Enter) are noted with <CR> or [ENTER]; this does not mean to enter these characters literally; but instead to press the Enter key.

The communication software, which should be used, depends on the kind of machine that you are going to communicate with. If you are going to call a FAX machine then you must use the Fax software. If the

machine that you are going to communicate with is a modem then you must use a data modem communications software.

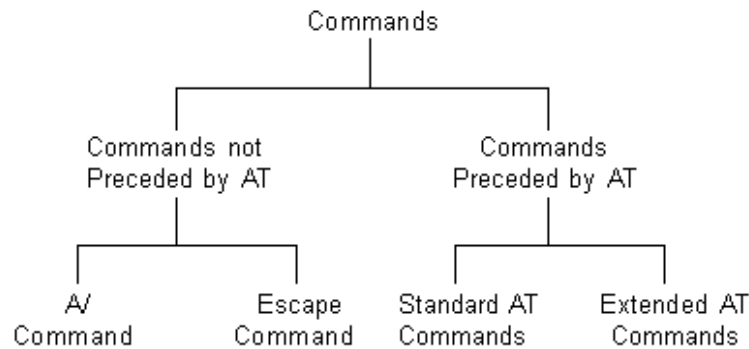
**Note: This manual is written to be used for several models of Fax/Data Modems. Some of the information in this manual may not apply to your fax/data modem.**

**All the description in this manual about Caller ID, V.90 and Fax class 2 applies only to the models which support these functions.**

## 2 - COMMAND REFERENCE

This chapter provides an alphabetized reference with examples for all commands for the modem. The system of commands is depicted below in Figure 2-1.

To use these commands for dialing or configuring the modem, make sure the communications software package you will be using lets you operate the modem through its internal commands. If your software permits use of the modem's internal commands, read this chapter. If not, read your software user's manual and ignore the rest of this manual.



**Fig.2-1 System of Commands**

### 2-1 General Command Information

Except for the **A/** command and the **+++** escape command described in Section 2.4, all commands must be prefixed with the attention code **AT**. For instance, the **A** command (below) would be entered as: "**AT A<CR>**". Without the **AT** prefix, the command line cannot be executed. Once entered, **AT** cannot be deleted with the **Backspace** or **Delete** key.

More than one command can be placed on a single line and, if desired, separated with spaces for readability. Once the carriage return (**Enter**) key is pressed, the command line is executed. A line with no carriage return is ignored.

The modem accepts either upper or lower case characters in the command line and ignores any spaces within or between commands. Typing errors can be corrected with the **Backspace** key. Exceptions are noted in the description of specific commands.

Variables (*r* and *x*) are listed in Italics. Punctuation symbols (*,* *;* *!* *@*) use as dial modifiers are listed alphabetically according to their English names at the beginning of Section 2.3. Where two commands are

separated by a slash, either command will have the same effect. For example, if the command is listed as **B0/B**, issuing either **B0** or **B** will have the same effect.

## 2-2 AT Commands

### A Go On-line in Answer Mode

This command instructs the modem to go off-hook immediately and then make a handshake with the remote modem. Handshaking is not available during leased line operation.

**A** is usually used to manually answer an incoming call or to switch from voice conversation to data communication.

### Bn Select Protocol to 300 bps or 1200 bps

- |             |  |
|-------------|--|
| <b>B0/B</b> | Selects ITU-T 300 or ITU-T 1200 protocol once the command line prefix <b>AT</b> has been entered at the 300 bps or 1200 bps data rate.     |
| <b>B1</b>   | Selects BELL 300 or BELL 212A protocol once the command line prefix <b>AT</b> has been entered at the 300 or 1200 bps data rate. (Default) |

### Cn Carrier Transmit Control

Controls the transmit carrier. The modem is preset to turn carrier on and off as necessary (the **C1** option). The signal is on when the modem is calling, or connected to a remote modem, and is off when it is not. The **C0** option is NOT valid.

- |           |  |
|-----------|--|
| <b>C0</b> | Not permitted; returns ERROR result code.    |
| <b>C1</b> | Normal transmits carrier switching (preset). |

### D Go On-line in Originate Mode

**D** instructs the modem to go off-hook immediately and automatically dial the number contained in the dial string following **D**. The dial string may contain any of the dial modifiers contained in the following section. The **D** command without a dial string is usually used to switch from voice conversation to data communication or to call a remote modem in leased-line operation mode.

### En Command Echo

- |             |                                 |
|-------------|---------------------------------|
| <b>E0/E</b> | Disables command echo.          |
| <b>E1</b>   | Enables command echo. (Default) |

### Hn Hang Up

- |             |                                |
|-------------|--------------------------------|
| <b>H0/H</b> | Goes on-hook. (Hangs up)       |
| <b>H1</b>   | Goes off-hook. (ready to dial) |

### In Identification

- |             |                          |
|-------------|--------------------------|
| <b>I0/I</b> | Report the product code. |
|-------------|--------------------------|

<b>I1</b>	Report the hardware checksum.
<b>I2</b>	Report " ERROR".
<b>I3</b>	Report firmware revision.
<b>I4</b>	Report OEM defined identifier string.
<b>I5</b>	Report the country code parameter.
<b>I6</b>	Report modem data pump model and internal code revision.
<b>I7</b>	Report the DAA code.

### **Ln Control Speaker Volume**

<b>L0/L</b>	Low volume.
<b>L1</b>	Low volume. (Default)
<b>L2</b>	Medium volume.
<b>L3</b>	High volume.

### **Mn Monitor Speaker On/Off**

<b>M0/M</b>	Speaker is always off.
<b>M1</b>	Speaker is off while receiving carrier. (Default)
<b>M2</b>	Speaker is always on.
<b>M3</b>	Speaker disabled while dialing or receiving carrier.

### **Nn Automode Enable**

<b>N0</b>	Automode detection is disabled.
<b>N1</b>	Automode detection is enabled. This command is equivalent to <b>F0</b> . (Default)

### **On Return to On-Line Data Mode**

<b>O0</b>	Enters on-line data mode without a retrain. Handling is determined by the Call Establishment task. Generally, if a connection exists, this command connects the DTE back to the remote modem after an escape (+++).
<b>O1</b>	Enters on-line data mode with a retrain before returning to on-line data mode.

### **P Set Pulse Dial as Default**

Causes the modem to assume that all subsequent dial commands are pulse dials. You may omit the " P " from the dial strings.

### **Q Result Code Display**

Determines whether the modem sends the result codes to the DTE.

<b>Q0</b>	Allows the modem to send result codes to the DTE.
-----------	---

**Q1** Prohibits the modem from sending result codes to the DTE.

## **Sn Reading and Writing to S Registers**

**Sn?** Reads S Registers:  
Read the contents of the S register specified by 'n'.

**Sn=x** Writing to Registers:  
Writes the value of x to the specified S register. All the registers will return the OK response if x is a legal value. However some registers will not actually write the value; these are: S1, S13-S15, S20-S24, and S27. (n=0-95, x=0-255)

## **T Set Tone Dial as Default**

Causes the modem to assume that all subsequent dial commands are tone dial.

## **Vn Select Word or Digit Result Codes**

**V0/V** Displays result codes in digital format.

**V1** Displays result codes in verbose format. (Default)

## **Wn Connect Message Control**

This command controls the format of CONNECT messages. The parameter value, if valid, is written to **S31** bits 2 and 3. Note that the **Wn** command can be overridden by register **S95** bits (see **S95** description).

**W0** Upon connection, the modem reports only the DTE speed (e.g., CONNECT 19200). Subsequent responses are disabled. (Default)

**W1** Upon connection, the modem reports the line speed, the error correction protocol, and the DTE speed, respectively. Subsequent responses are disabled.

**W2** Upon connection, the modem reports the DCE speed (e.g., CONNECT 14400). Subsequent responses are disabled.

## **Xn Extended Result Codes**

This command selects which subset of the result messages will be used by the modem to inform the DTE of the results of commands.

Blind dialing is enabled or disabled by country parameters. If the user wishes to enforce dial tone detection, a "W" can be placed in the dial string (see D command). Note that the information below is based upon the default implementation of the X results table.

If the modem is in facsimile mode (+FCLASS=1 or 2), the only message sent to indicate a connection is CONNECT without a speed indication.

**X0** Disables monitoring of busy tones unless forced otherwise by country requirements; send only OK, CONNECT, RING, NO CARRIER, ERROR, and NO ANSWER result codes. Blind dialing is enabled/disabled by country parameters. If busy tone detection is enforced and busy tone is detected, NO CARRIER will be reported. If dial tone detection is enforced or selected and dial tone is not detected, NO CARRIER will be reported instead of NO DIAL TONE. The value 000b is written to S22 bits 6, 5, and 4, respectively.

**X1** Disables monitoring of busy tones unless forced otherwise by country requirements; send only OK, CONNECT, RING, NO CARRIER, ERROR, NO ANSWER, and CONNECT XXXX(XXXX=rate). Blind dialing is enabled/disabled by country parameters. If busy tone



detection is enforced and busy tone is detected, NO CARRIER will be reported instead of BUSY. If dial tone detection is enforced or selected and dial tone is not elected, NO CARRIER will be reported instead of NO DIAL TONE. The value 100b is written to S22 bits 6, 5, and 4, respectively.

- X2** Disables monitoring of busy tones unless forced otherwise by country requirements; send only OK, CONNECT, RING, NO CARRIER, ERROR, NO DIAL TONE, NO ANSWER, and CONNECT XXXX. If busy tone detection is enforced and busy tone is detected, NO CARRIER will be reported instead of BUSY. If dial tone detection is enforced or selected and dial tone is not detected, NO DIAL TONE will be reported instead of NO CARRIER. The value 101b is written to S22 bits 6, 5, and 4, respectively.
- X3** Enables monitoring of busy tones; send only OK, CONNECT, RING, NO CARRIER, ERROR, NO ANSWER, and CONNECT XXXX. Blind dialing is enabled/disabled by country parameters. If dial tone detection is enforced and dial tone is not detected, NO CARRIER will be reported. The value 110b is written to S22 bits 6, 5, and 4, respectively.
- X4** Enables monitoring of busy tones; send all messages. The value 111b is written to S22 bits 6, 5, and 4, respectively. (Default)

## **Yn Enables or Disables Long Space Disconnect**

- Y0/Y** Disables Long Space Disconnect. (Default)
- Y1** Enables Long Space Disconnect.

## **Zn Reset**

Zn, which must be placed at the end of the command line, resets the active configuration of the modem to the stored configuration saved in nonvolatile RAM, hangs up the modem, and clears the command buffer.

- Z0/Z** Resets the modem and loads stored configuration 0.
- Z1** Resets the modem and loads stored configuration 1.

## **2.2.a Commands Preceded by &**

### **&Cn Select DCD Options**

- &C0/&C** Maintains an ON status for the Data Carrier Detect (DCD).
- &C1** Uses the actual state of the carrier from the remote modem for DCD. (Default)

### **&Dn DTR Option**

Determines actions taken by the modem in relation to the Data Terminal Ready (DTR) signal of the serial port.

- &D0** DTR is ignored. Allows operation with DTEs that do not provide DTR.
- &D1** DTR drop is interpreted by the modem as if the escape sequence has been entered. The modem returns to the command state without disconnecting.
- &D2** DTR drop causes the modem to hang up. Auto answer is inhibited. (Default)
- &D3** DTR drop causes the modem to perform a soft reset as if the Z command were received.

### **&F Fetch Factory Configuration**

- &F0** Recall factory profile 0. (Default)
- &F1** Recall factory profile 1.

### **&Gn Set Guard Tone**

- &G0 - G1** Disable guard tone. (Default)
- &G2** Select 1800Hz-guard tone.

### **&Kn DTE/Modem Flow Control**

Determines how the modem controls the flow of data between the local DTE and the modem. When the modem terminal buffer is nearly full, the modem will either send an XOFF or drop CTS to stop the data flow. When the buffer is nearly empty, the modem will either send an XON or raise CTS to start the data flow.

- &K0** Disable DTE/DCE flow control.
- &K3** Enable RTS/CTS DTE/DCE flow control. (Default)
- &K4** Enables XON/XOFF DTE/DCE flow control.
- &K5** Enables transparent XON/XOFF DTE/DCE flow control.
- &K6** Enable RTS/CTS and XON/XOFF DTE/DCE flow control.

### **&Mn Communication Mode**

(Same as &Q0)

### **&Pn Select Pulse Dialing Make/Break Ratio**

- &P0/&P** Sets a 39/61 make/break ratio @ 10 pps - used in USA. (Default)
- &P1** Sets a 33/67 make/break ratio @ 10 pps.
- &P2** Sets a 39/61 make/break ratio @ 20 pps.
- &P3** Sets a 33/67 make/break ratio @ 20 pps.

### **&Qn Asynchronous Mode Selection**

This command is an extension of the &M command and is used to control the connection modes permitted. It is used in conjunction with S36 and S48.

- &Q0** Select direct asynchronous operation. The value 000b is written to S27 bits 3, 1, and 0 respectively.
- &Q5** The modem will try to negotiate an error-corrected link. The modem can be configured using S36 to determine whether a failure will result in the modem returning on-hook or will result in fallback to an asynchronous connection. The value 101b is written to S27 bits 3, 1, and 0 respectively. (Default)
- &Q6** Select asynchronous operation in normal mode (speed buffering). The value 110b is written to S27 bits 3, 1, and 0 respectively.

## **&Sn DSR Option**

Determines whether DSR operates in accordance with the EIA-232-D specification or remains ON

**&S0** DSR is always ON. (Default)

**&S1** DSR will become active after answer tone has been detected and inactive after the carrier has been lost.

## **&Tn Testing and Diagnostics (See Chapter 4)**

Testing commands must be initiated in command mode (at the end of the command line) with asynchronous operation in the Direct mode, selected (&Q0) at a speed of 1200 bps or faster. A telco connection must be established prior to loopback tests. If these conditions are not met, an ERROR result code is issued. If a local analog loopback is initiated while the modem is connected, the modem disconnects before performing the test. A test remains active for the period of time specified in register S18. If S18 is zero, the test aborts when the user issues the &T0 command.

**&T0/&T** Terminates any test currently in progress.

**&T1** Initiates a local analog loopback in accordance with ITU-T V.54, L3; verifies the path between the local DTE and the local modem.

**&T8** Initiates a local analog loopback with self-test in accordance with ITU-T V.54, L2.

## **&V View Configuration Profiles**

**&V** Displays the active configuration profile.

## **&Wn Store the Current Configuration to Nonvolatile RAM**

**&W0** Writes the current active configuration to profile 0 in nonvolatile RAM.

**&W1** Writes the current active configuration to profile 1 in nonvolatile RAM.

## **&Yn Select the Default Profile**

**&Y0/&Y** Uses profile 0 on power-up. (Default)

**&Y1** Uses profile 1 on power-up.

## **&Zn Store Telephone Numbers (n=0to3)**

**&Zn** Store one of four dial strings (including a telephone number) of up to 45 digits in nonvolatile RAM.

For example: to store the telephone number 002852117 to RAM location 1, issue the following command:

Command: **AT&Z1=002852117<CR>**

### **2.2.b Commands Preceded by \**

## **\An      Select Maximum MNP Block Size**

The modem will operate an MNP error corrected link using a maximum block size controlled by the parameter supplied. The parameter value, if valid, is written to S40 bits 6 and 7.

<b>\A0</b>	64 characters.
<b>\A1</b>	128 characters. (Default)
<b>\A2</b>	192 characters.
<b>\A3</b>	256 characters.

Result Codes:

<b>OK</b>	n=0 to 3.
<b>ERROR</b>	Otherwise.

## **\Bn      Transmit Break to Remote**

In non-error correction mode, the modem will transmit a break signal to the remote modem with a length in multiples of 100ms according to parameter specified. If a number in excess of 9 is entered, 9 is used. The command works in conjunction with the \K command.

In error correction mode, the modem will signal a break through the active error correction protocol, giving no indication of the length.

<b>\B1-\B9</b>	Break length in 100ms units. (Default=3) (Non-error corrected mode only.)
----------------	--

Result Codes:

<b>OK</b>	If connected in data modem mode.
<b>NO CARRIER</b>	If not connected or connected in fax modem mode.

**Note:** When the modem receives a break from the remote modem, break is passed to the DTE as follows: In non-error correction mode direct, the break length is passed; in non-error correction mode normal and in error correction mode, a 300 ms break is passed.

## **\Gn      Modem to Modem Flow Control (XON/XOFF)**

Enables or disables modem flow control during a Normal Mode connection. Since Reliable Mode has its own method of flow control, the \Gn command is ignored when error correction is selected. However, DTE-to-modem flow control remains active during reliable link.

<b>\G0</b>	Disable flow control. (Default)
<b>\G1</b>	Enable flow control.

## **\Kn      Break Control**

Determines the modem's response when a BREAK is received from the DTE or the remote modem, according to the following conditions:

When a BREAK is received from the DTE during Normal or MNP Mode:

<b>\K0,2,4</b>	Modem enters Command Mode (waiting for an AT command) without sending a BREAK to the remote modem.
<b>\K1</b>	Modem clears the terminal and modem buffers.
<b>\K3</b>	Modem does not clear the buffers.
<b>\K5</b>	Modem sends a BREAK to the remote modem in sequence with any transmitted data. (Default)

When a BREAK is received from the remote modem during Normal Mode:

<b>\K0,1</b>	Modem clears the terminal and modem buffers.
<b>\K2,4</b>	Modem does not clear the buffers.
<b>\K4,5</b>	Modem sends a BREAK in sequence with any transmitted data.

When a BREAK is received from the DTE during Direct Mode:

<b>\K0,2,4</b>	Modem sends a BREAK to the remote modem.
<b>\K1,3,5</b>	Modem sends a BREAK to the remote modem.

## **\Nn      Operation Mode Control**

Selects the operating mode to be used during connection

<b>\N0</b>	Selects Normal (speed buffering) Mode. (Same as &Q6)
<b>\N1</b>	Selects Direct (pass-through) Mode. (Same as &Q0)
<b>\N2</b>	Selects Reliable Link Mode.
<b>\N3</b>	Selects Auto-reliable Mode. Modem attempts to connect with error correction.
<b>\N4</b>	Select LAPM error-correction mode.
<b>\N5</b>	Select MNP error-correction mode.

## **\Vn      Single Line Connect Message Enable**

The single line connect message format can be enabled or disabled by the \Vn command as follows:

<b>\V0</b>	Connect messages are controlled by the command settings X, W, and S95.
<b>\V1</b>	Connect messages are displayed in the single line format described below subject to the command settings V (Verbose) and Q (Quiet). In Non-Verbose mode (V0), single line connect messages are disabled and a single numeric result code is generated for CONNECT DTE.

When single line connect messages are enabled, there are no CARRIER, PROTOCOL, or COMPRESSION messages apart from the fields described below.

The single line connect message format is:

**CONNECT <DTE Speed></Modulation></Protocol></Compression></Line Speed></Voice and Data>**

Where:

<b>&lt;DTE Speed=</b>	DTE speed, e.g., 57600.
<b>Modulation=</b>	"V32" for V.32 or V.32bis modulations. "V34" for V.34 modulations. Note: Modulation is omitted for all other modulations.
<b>Protocol=</b>	"NONE" for no protocol. "ALT" for Microcom Network Protocol. "LAPM" for LAP-M protocol.
<b>Compression=</b>	"CLASS5" for Microcom MNP5 compression. "V42BIS" for V.42bis compression. Note: Compression is omitted if protocol is NONE.
<b>Line Speed=</b>	Asymmetric rates are displayed as /rate:TX/rate:RX, e.g., /1200 TX/75 RX. Symmetric rates are displayed as a single DCE rate, e.g., 14400.
<b>Voice and Data=</b>	Blank for Data mode only. "SVD" for AudioSpan analog simultaneous audio/voice and data. "DSVD" for G.729A or DigiTalk digital simultaneous voice and data.

## 2.2.c Commands Preceded by %

### **%C Enable/Disable Data Compression**

Enables or disable data compression negotiation. The modem can only perform data compression on an error-corrected link. The parameter value, if valid, is written to S41 bits 0 and 1.

<b>%C0</b>	Disables data compression. Resets S46 bit 1.
<b>%C1</b>	Enables MNP 5 data compression negotiation. Resets S46 bit 1.
<b>%C2</b>	Enables V.42 bis data compression. Sets S46 bit 1.
<b>%C3</b>	Enables both V.42 bis and MNP 5 data compression. Sets S46 bit 1. (Default)

Result Codes:

<b>OK</b>	n=0,1,2,or 3.
<b>ERROR</b>	Otherwise.

### **%En Enable/Disable Line Quality Monitor and Auto-Retrain or Fallback/Fall Forward**

Control whether or not the modem will automatically monitor the line quality and request a retrain (**%E1**) or fall back when quality is insufficient or fall forward when line quality is sufficient (**%E2**). Applies to dial-up line only. The parameter value valid is written to S41 bits 2 and 6. If enable, the modem attempts to retrain for a maximum of 30 seconds.

<b>%E0</b>	Disable line quality monitor and auto-retrain.
<b>%E1</b>	Enable line quality monitor and auto-retrain.
<b>%E2</b>	Enable line quality monitor and fallback/fall forward. (Default)
<b>%E3</b>	Enable line quality monitor and auto-retrain, but hang-up immediately when EQM reaches hang-up threshold. (fast hang-up)

## **%L Report Received Signal Level**

Returns a value identifying the received signal level. The possible values are:

<b>009</b>	-9 dBm.
<b>010</b>	-10 dBm.
<b>011</b>	-11 dBm.
<b>043</b>	-43 dBm.

## **%Q Line Signal Quality**

Reports the line signal quality (DAA dependent). Returns the higher order byte of the EQM value. Based on the EQM value, retain or fallback/fall forward may be initiated if enabled by **%E1** or **%E2**.

## **%Un Select $\mu$ \_Law or A\_Law Codec Type**

This command selects  $\mu$ \_Law or A\_Law codec type for V.90 and K56 flex modulation similar to the `<x_law>` parameter in the +MS command (see +MS command). This command overrides the `<x_law>` setting specified in a previous +MS command and the `<x_law>` parameter in a +MS command overrides a previous %Un command. This command also stores the selected setting directly to NVRAM.

<b>%U0</b>	Selects $\mu$ _Law.
<b>%U1</b>	Selects A_Law.

Result codes:

<b>OK</b>	n = 0 or 1.
<b>ERROR</b>	Otherwise.

## **2.2.d Commands Preceded by +**

### **+MS Select Modulation**

This extended-format command selects the modulation and, optionally, enables or disables automode, specifies the lowest and highest connection rates, selects u-Low or A-Low codec type, and enables or disables robbed bit signaling generation (server modem) or detection (client modem) using one to five subparameters. The command format is:

**+MS=<mod> [[<automode>][,<min\_rate>][,<max\_rate>][,<x\_law>][,<rb\_signaling>]]]]]]<CR>**

#### **Notes:**

1. For 14400 bps and lower speeds, the Nn command and S37 register can alternatively be used, in which case the +MS subparameters will be modified to reflect the Nn and S37=x settings. Use of the Nn and S37=x commands is not recommended but is provided for compatibility with existing communication software. (S37 is not updated by the +MS command.)
2. Subparameters not entered (enter a comma only or <CR> to skip the last subparameter) remain at their current values.

### **Reporting Selected Options**

The modem can send a string of information to the DTE consisting of selected options using the following command:

**+MS?**

The response is:

**+MS:** <mod>,<automode>,<min\_rate>,<max\_rate>,<x\_law>,<rb\_signaling>

For example,

**K56flex:** +MS: 56,1,300,56000,0,0

**V.90:** +MS: 12,1,300,56000,0,0,33600 (RC56 default values)

### **Reporting Supported Options**

The modem can send a string of information to the DTE consisting of supported options using the following command:

**+MS=?**

The response is:

**+MS:** (list of supported <mod> values), (list of supported <automode> values), (list of supported <min\_rate> values), (list of supported <max\_rate> values), (list of supported <x\_law> values), (list of supported <rb\_signaling> values)

For example,

**+MS:** (0,1,2,3,9,10,11,12,56,64,69), (0,1), (300-33600), (300-56000), (0,1), (0,1)

### **Subparameter Definitions**

1. <mod>= A decimal number which specifies the preferred modulation (automode enabled) or modulation (automode disabled) to use in originating or answering a connection. The options are:

<mod>	Modulation	Possible Rates (bps)	Notes
0	V.21	300	
1	V.22	1200	
2	V.22 bis	2400 or 1200	
3	V.23	1200	See Note 2
9	V.32	9600 or 4800	
10	V.32 bis	14400, 12000, 9600, 7200 or 4800	
11	V.34	33600, 31200, 28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800, or	2400
12	V.90	56000, 54677, 53333, 52000, 50669, 49333, 48000, 46667, 45333, 42667, 41333, 40000, 38667, 37333, 36000, 34667, 33333, 32000, 30667, 29333, 28000	
56	K56flex	56000, 54000, 52000, 50000, 48000, 46000, 44000, 42000, 40000, 38000, 36000, 34000, 32000	
64	Bell 103	300	
69	Bell 212	1200	

- Notes: 1. See optional <automode>, <min\_rate>, and <max\_rate> subparameters.  
2. For V.23, originating modes transmit at 75 bps and receive at 1200 bps; answering modes transmit at 1200 bps and receive at 75 bps. The rate is always specified as 1200 bps.

The modem may also automatically switch to another modulation (automode), subject to the following constraints:



- a. The modem may not be able to automatically switch from the current modulation (specified by <mod>) to some other modulation. For example there is no standard way to automode from Bell 103 to V.23.
  - b. The DTE may disable automode operation (see <automode> below).
  - c. The DTE may constrain the range of modulations available by specifying the lowest and highest rates (see <min\_rate> and <max\_rate> below).
2. <automode> is an optional numeric value, which enables or disables automatic modulation negotiation using V.8 bis/V.8 or V.32 bis Annex A. The options are:

<automode>	Option Selected	Notes
0	Automode disabled	
1	Automode enabled using V.8 bis/V.8 or V.32 Annex A	default

The default value is 1, which enables automode. Note, however, there are modulations for which there is no automode negotiation, e.g., Bell 212 (<mod>=69).

**For <automode> = 0 (automode disabled, i.e., fixed modulation):**

- a. If <max\_rate> is within the rates supported by the selected modulation, the selected rate is that specified by <max\_rate>. For example,

+MS=10, 0, 1200, 4800 selects V.32 bis 4800 bps fixed rate.

- b. If <max\_rate> is greater than the highest speed supported by the modulation specified by <mod>, the starting rate is the highest rate supported by the selected modulation. For example,

+MS=10, 0, 2400, 14400 selects V.32 bis 14400, 12000, 9600, 7200, or 4800 bps.

- c. To emulate issuance of the NOS37=x command sequence to select fixed mode operation, specify the <max\_rate> and <min\_rate> both to be the (same) requested speed, and <mod> to be the modulation for that speed. For example,

+MS=11, 0, 16800, 16800 selects V.34 16800 bps fixed mode (no comparable S37 command).

+MS=10, 0, 12000, 12000 selects V.32 bis 12000 bps fixed mode (same as NOS37=10).

**For <automode> = 1 (automode enabled, i.e., automatically selected speed and modulation):**

The modem connects at the highest possible rate in accordance with V.8 bis/V.8, or V.32 bis Annex A if V.8 bis/V.8 is not supported by the remote modem.

- a. If <max\_rate> is greater than the highest rate supported by the modulation specified by <mod>, the modem automodes down from the highest rate of the selected modulation. For example,

+MS=10, 1, 1200, 24000 selects automoding down from V.32 bis 14400 bps.

- b. To emulate issuance of the N1S37=x sequence command, specify the modulation and the rate to start automoding down from using <mod> and <max\_rate>, respectively. Set <min\_rate> to 300 to allow automoding all the way to V.21 300 bps. For example:

+MS=11, 1, 300, 16800 selects automode starting at V.34 16800 bps (no comparable S37 command).

+MS=9, 1, 300, 12000 selects automode starting at V.32 bis 12000 bps same as N1S37=10).

3. <min\_rate> is an optional number specifies the lowest rate at which the modem may establish a connection. The value is decimal coded, in units of bps, e.g., 2400 specifies the lowest rate to be 2400 bps. The default is 300 for 300 bps.
4. <max\_rate> is an optional number specifies the highest rate at which the modem may establish a connection. The value is decimal coded, in units of bps, e.g., 14400 specifies the highest rate to be 14400 bps. The default is 28800 for 28800 bps.
5. <x\_law> is an optional number, which specifies the codec type. The options are:

0= $\mu$ -Law

1=A-Law

Note that ATZ will reset the <x\_law> selection to 0 ( $\mu$ -law).

\* Also note that the <x\_law> parameter in a +MS command overrides a previous %Un command and a %Un command overrides the <x\_law> setting specified in a previous +MS command.

6. <rb\_signaling> is an optional number, which enables or disables robbed bit signaling generation in a server modem or enables or disables robbed bit signaling detection in a client modem. The options are:

0=Robbed bit signaling generation (server modem) or detection (client modem) disabled. (Default)

1=Robbed bit signaling generation (server modem) or detection (client modem) enabled.

Note that ATZ will reset the <rb\_signaling> selection to 0. (Default)

Result Codes:

<b>OK</b>	Valid subparameter string
<b>ERROR</b>	Otherwise.

## 2.2.e Commands Preceded by \*\*

### \*\* Download to Flash Memory

The linear flash memory downloader in the modem firmware allows flash memory connected to the modem external memory bus to be upgraded with revised modem firmware. This process transfers (uploads) the upgraded modem firmware (data) from the host computer to the modem which transfers (downloads) the data to the flash memory device. Note that this command apply only to the modem with flash memory.

Programming the flash memory device is a two-step process.

1. When the AT\*\* command is issued, the modem firmware boot loader is invoked and the user will first load a flash load module (FLM) into the modem's RAM. The FLM contains the programming algorithm for the flash memory device being programmed and any messages that may be sent during the load process.
2. The user will then load the new modem firmware, which the FLM will then program into the flash memory device.

### Procedure:

1. Install in the modem a flash memory programmed with the modem firmware; ensure that the flash memory device is programmed with the sector secure mode set to UNSECURE (AMD only), otherwise the device cannot be re-programmed in the modem.
2. Put the FLM file and the new modem firmware file (e.g., V1400DS.S37) in an appropriate directory on the computer's hard disk.
3. Configure the communications application program for a DTE rate of between 9600 bps and 57600 bps (57600 bps is faster) and RTS/CTS flow control. A load at 57600 bps will take approximately 2 minutes; a load at 19200 bps will take approximately 6 minutes.
4. Check the modem for response by typing AT.
5. Initiate the download process using the AT\*\*n command, where:

<b>AT**/AT**0</b>	download speed is the last sensed speed (recommended command).
<b>AT**1</b>	Download speed is 38.4k bps.
<b>AT**2</b>	Download speed is 57.6k bps.

The "Download initiated" message appears upon issuing the AT\*\*n command.

6. Perform an ASCII upload of the FLM file (e.g., AMDE.S37) from the host computer to the modem RAM using an industry standard communications software of an equivalent process (ensure that all ASII transmit or pacing is turned off).

To abort the load at this point, wait for the FLM download process to time-out, send a bad S37 record, or reset (POR) the modem. If the load process times-out, the modem must be reset (ATZ) before the FLM can be loaded again.

7. After the FLM has been loaded, perform an ASCII upload of the new modem firmwarehex file (e.g., RC288ACi.S37) from the host computer to the modem RAM using industry standard communications software or an equivalent process. There will be a 3-second pause after the first record of the RC288AXX.S37 file is sent, which is the FLASH erase cycle. **There is no turning back at this point.**

If the flash download fails (because of a bad .S37 record for example) or the upload is aborted, as long as the modem is not turned off or reset, it will remain in the flash load cycle and the upload can be re-attempted at step 7.

A "Wrong Device" message is displayed if an incorrect FLM is used. In this case, restart at step 5 and upload the correct FLM file.

A "Wrong Hex file or flow control" message is displayed if an incompatible hex file format is used (non-Motorola S3 format) or if the DTE ignores flow controls (the flash download uses both Xon/Xoff and RCS/CTS flow control). If the wrong format was used, reinitiate the upload at step 7 using a correct firmware hex file.

8. A "Device successfully programmed" message is displayed by the FLM at the completion of a successful download and the modem will do a cold start.

## 2.3 Dial Modifiers

This section describes all of the dial modifiers, which are used in dial strings.

**@ Answer**

"@", placed after a phone number, this modifier tells the modem to wait for 5 seconds of silence before dialing the next number in the dial string. @ is usually used to access a secure computer system that provides a silent answer as permission for further entrance.

**, Pause**

",", placed anywhere in the dial string, tells the modem to pause for the number of seconds specified by S-register S8 before processing the rest of the dial string.

**! Initiate a Hookflash**

!", placed anywhere in the dial string, tells the modem to initiate a hookflash, which means to hang up for 0.5 seconds and then go off-hook again before processing the rest of the dial string. This modifier allows access to PBX features like call transferring.

**; Return to Command State after Dialing**

;", which must be placed at the end of the dial string, returns to the command state after dialing the number placed ahead of it. A long telephone number would overflow the 40-character command buffer if placed all in one command line, so it must be broken into two or more command lines. Each part includes part of the number, and all but the last command line end with the ";" followed by a carriage return.

**^ Tone Control**

Toggles calling tone enable/disable: applicable to current dial attempt only.

**J Perform MNP**

Perform MNP 10 link negotiation at 1200 bps (for this call only).

**K Enable Power Level**

Enable power level adjustment during MNP 10 link negotiation (for this call only).

**L Re-dial Last Number**

The modem will re-dial the last valid telephone number. The **L** must be immediately after the **D** with all the following characters ignored.

**P Pulse Dialing**

P, placed ahead of a number, tells the modem to dial a number using pulse dialing.

## **S Dial a Stored Number**

**S** is used to dial one of four numbers stored in nonvolatile memory. For example, instead of entering a dial string, you can use this command:

Command: `ATDTS=1<CR>`

## **T Touchtone Dialing**

**T**, placed ahead of a number, tells the modem to dial a number using touchtone dialing.

## **W Wait for Dialtone**

**W**, placed after a number, tells the modem to wait up to 30 seconds to detect a one-second continuous dialtone before dialing the next number. **W** is most often used in a PBX system to wait for the dialtone of an outside telephone line.

## **2.4 Commands Not Preceded by AT**

Two commands, **A/** and **+++**, are neither preceded by the attention code **AT** nor followed by a carriage return.

### **A/ Repeat Command**

**A/** repeats the execution of the last command line stored in the command buffer. If the last command line is invalid, the **ERROR** result code will appear on the screen. Note that **A/** cannot be preceded by **AT**; if it is, **ERROR** will appear on the screen.

### **+++ Escape**

**+++** followed by **AT <CR>** allows the modem to escape from the data mode to the on-line command state (command state without breaking the established connection.)

To escape, stop transmitting data, wait at least one escape guard time (the default time is one second), and then enter three consecutive escape characters (the default character is **+**) followed by **AT <CR>**.

The modem will return to the command state and send the **OK** result code to the screen. Note that the escape command is the only command that can be recognized by the modem in the one-line state; it cannot be recognized in the command state.

## **2.5 Result Codes**

The modem sends a response to the user via the screen after a command is issued. As shown in the figure below, there are two forms for each result code: Modem Response code and digit code.

<b>Modem Response</b>	<b>Digit</b>	<b>Description</b>
OK	0	Command executed without errors
CONNECT	1	Connect to another modem
RING	2	Detect an incoming ring
NO CARRIER	3	Carrier lost or never detected

ERROR	4	Invalid command or invalid character
CONNECT 1200	5	Connection established at 1200 bps
NO DIALTONE	6	Dial tone not detected within timeout
BUSY	7	Detected a busy tone after dialing
NO ANSWER	8	No ringback or quiet answer was detected by the modem
CONNECT 600	9	Connection established at 600 bps
CONNECT 2400	10	Connection established at 2400 bps
CONNECT 4800	11	Connection established at 4800 bps
CONNECT 9600	12	Connection established at 9600 bps
CONNECT 7200	13	Connection established at 7200 bps
CONNECT 12000	14	Connection established at 12000 bps
CONNECT 14400	15	Connection established at 14400 bps
CONNECT 19200	16	Connection established at 19200 bps
CONNECT 38400	17	Connection established at 38400 bps
CONNECT 57600	18	Connection established at 57600 bps
CONNECT 115200	19	Connection established at 115200 bps
CONNECT 230400	20	Connection established at 230400 bps
CONNECT 1200RX/75TX	22	V.23 connection established:transmit at 75 bps, receive at 1200 bps
CONNECT 75RX/1200TX	23	V.23 connection:transmit at 1200 bps, receive at 75 bps
DELAYED	24	Call fails to connect and number dialed is considered 'delayed' due to country blacklisting requirements
BLACKLISTED	32	Call fails to connect and the number dialed is considered 'blacklisted'
FAX	33	A fax modem connection is established in a facsimile mode
DATA	35	A data modem connection is established in a facsimile mode
CARRIER 300	40	Carrier detected
CARRIER 1200TX/75RX V.23	44	Carrier detected
CARRIER 75RX/1200TX V.23	45	Carrier detected
CARRIER 1200	46	Carrier detected
CARRIER 2400	47	Carrier detected
CARRIER 4800	48	When the 4800 bps data rate in V.32 bis or V.32 mode has been detected on the line
CARRIER 7200	49	When the 7200 bps data rate in V.32 bis mode has been detected on the line
CARRIER 9600	50	When the 9600 bps data rate in V.32 bis or V.32 mode has been detected on the line
CARRIER 12000	51	When the 12000 bps data rate in V.32 bis mode has been detected on the line
CARRIER 14400	52	When the 14400 bps data rate in V.32 bis mode has been detected on the line
CARRIER 16800	53	When the 16800 bps data rate in V.34 mode has been detected on the line
CARRIER 19200	54	When the 19200 bps data rate in V.34 mode has been detected on the line
CARRIER 21600	55	When the 21600 bps data rate in V.34 mode has been detected on the line
CARRIER 24000	56	When the 24000 bps data rate in V.34 mode has been detected on the line
CARRIER 26400	57	When the 26400 bps data rate in V.34 mode has been detected on the line
CARRIER 28800	58	When the 28800 bps data rate in V.34 mode has been detected on the line
CONNECT 16800	59	Connection established at 16800 bps
CONNECT 21600	61	Connection established at 21600 bps
CONNECT 24000	62	Connection established at 24000 bps
CONNECT 26400	63	Connection established at 26400 bps
CONNECT 28800	64	Connection established at 28800 bps
COMPRESSION CLASS 5	66	MNP class 5 compression in use
COMPRESSION V.42BIS	67	V.42 bis compression in use
COMPRESSION NONE	69	No compression is being used
PROTOCOL:NONE	76	Normal mode selected
PROTOCOL:LAPM	77	LAPM mode selected
CARRIER 31200	78	When the 31200 bps data rate in V.34 mode has been detected on the line
CARRIER 33600	79	When the 33600 bps data rate in V.34 mode has been detected on the line
PROTOCOL:ALT	80	
PROTOCOL:ALT-CELLULAR	81	
CONNECT 33600	84	Connection established at 33600 bps
CONNECT 31200	91	Connection established at 31200 bps
CARRIER 32000	150	Connection established at 32000 bps
CARRIER 34000	151	Connection established at 34000 bps
CARRIER 36000	152	Connection established at 36000 bps
CARRIER 38000	153	Connection established at 38000 bps
CARRIER 40000	154	Connection established at 40000 bps
CARRIER 42000	155	Connection established at 42000 bps
CARRIER 44000	156	Connection established at 44000 bps
CARRIER 46000	157	Connection established at 46000 bps

CARRIER 48000	158	Connection established at 48000 bps
CARRIER 50000	159	Connection established at 50000 bps
CARRIER 52000	160	Connection established at 52000 bps
CARRIER 54000	161	Connection established at 54000 bps
CARRIER 56000	162	Connection established at 56000 bps
CONNECT 32000	165	Connection established at 32000 bps
CONNECT 34000	166	Connection established at 34000 bps
CONNECT 36000	167	Connection established at 36000 bps
CONNECT 38000	168	Connection established at 38000 bps
CONNECT 40000	169	Connection established at 40000 bps
CONNECT 42000	170	Connection established at 42000 bps
CONNECT 44000	171	Connection established at 44000 bps
CONNECT 46000	172	Connection established at 46000 bps
CONNECT 48000	173	Connection established at 48000 bps
CONNECT 50000	174	Connection established at 50000 bps
CONNECT 52000	175	Connection established at 52000 bps
CONNECT 54000	176	Connection established at 54000 bps
CONNECT 56000	177	Connection established at 56000 bps
+FCERROR	+F4	

**\*\* V.90 Result Codes**

Speed	Carrier	Connect
28000	180	180
29333	181	181
30667	182	182
32000	150	165
33333	183	183
34667	184	184
36000	152	167
37333	185	185
38667	186	186
40000	154	169
41333	187	187
42337	188	171
45333	189	189
46667	190	190
48000	158	173
49333	191	191
50667	192	192
52000	160	175
53333	193	193
54667	194	194
56000	162	177

### 3 - S REGISTERS REFERENCE

Your modem has status registers. These registers are memory locations inside your modem which control your modem's operation. You usually do not have to worry about setting any register because the default values work for most applications.

The S registers are summarized in Fig. 3-1, along with their default values. Registers denoted with an "\*" may be stored in one of the two user profiles by entering the **&Wn** command. One of these profiles may be loaded at any time by using the **Zn** command.

The factory default values are stored in ROM and are loaded into the active configuration at power-up or by the **Zn** command. In addition, the designated default profile is subsequently loaded, and may change some of the factory default values. The designated default profile can be changed by entering the **&Yn** command, where 'n' is one of the two possible user profiles. The factory defaults can be loaded at any time by entering the **&F** command.

### 3.1 Register Summary

The following chart summarizes your modem's registers:

Reg.#	Range	Unit	Dec	Hex	Description
S0	0 - 255	rings	0	00h	Number of rings before auto-answer.
S1	0 - 255	rings	0	00h	Ring count.
S2	0 - 255	ASCII	43	2Bh	Escape character code.
S3	0 - 127	ASCII	13	0Dh	Command terminator (<CR>character).
S4	0 - 127	ASCII	10	0Ah	Line feed character.
S5	0 - 255	ASCII	8	08h	Backspace character.
S6	2 - 255	seconds	2	02h	Wait time for blind dialing.
S7	1 - 255	seconds	50*	32h	Wait time for carrier after dial.
S8	0 - 255	seconds	2*	02h	Pause time for comma (dial delay).
S9	1 - 255	1/10 sec.	6*	06h	Carrier detect response time.
S10	1 - 255	1/10 sec.	14*	0Eh	Lost carrier to hang-up delay.
S11	50 - 255	1/1000 sec.	95	5Fh	DTMF Tone Duration.
S12	0 - 255	1/50 sec.	50*	32h	Escape code timing.
S14	[Bit Mapped Options]*		138	8Ah	
S18	0 - 255	seconds	0*	00h	Test mode timer.
S21	[Bit Mapped Options]		4*	04h	V.24/General bit-mapped options.
S22	[Bit Mapped Options]		117*	75h	Speaker/Results Bit-mapped options.
S23	[Bit Mapped Options]		54	36h	
S24	0 - 255	seconds	0	00h	Sleep Inactivity Timer.
S25	0 - 255	seconds	5*	05h	Delay to DTR.
S26	0 - 255	1/100 sec	1*	01h	RTS to CTS Delay Interval.
S28	[Bit Mapped Options]		0*	00h	
S29	0 - 255	10 ms	70*	46h	Flash Dial Modifier Time.
S30	0 - 255	10 s	0*	00h	Inactivity Disconnect Timer.
S31	[Bit Mapped Options]		194*	C2h	
S32	0 - 255	ASCII		17	11h XON Character.
S33	0 - 255	ASCII		19	13h XOFF Character.
S36			7*	07h	LAPM Failure Control.
S37			0*	00h	Desired Line Connection Speed.
S38	0 - 255	seconds	20*	14h	Delay before Forced-Disconnect.
S39			3	03h	Flow Control.
S40	[Bit Mapped Options]		104	68h	General Bit Mapped Options.
S41			3	03h	Bit-Mapped Options.
S46			138*	8Ah	Protocol Selection.
S48			7*	07h	V.42 Negotiation Action.
S82			128*	80h	Break Handling Option.
S86	0 - 255				Call Failure Reason Code.
S91	0 - 15	dBm	10	0Ah	PSTN Transmit Attenuation Level.
S92	0 - 15	dBm	10	0Ah	Fax Transmit Attenuation Level.
S95	[Bit mapped]		0*	00h	Extended result codes.

Fig. 3-1 S-Register Summary

### 3.2 Glossary of S Registers

#### S0 Number of Rings Before Auto Answer

S0 determines the number of rings that must be received before the modem automatically answers an incoming call. For example, when S0=3, the modem automatically answers after the third ring. When S0=0, the modem does not automatically answer an incoming call; it stays on-hook until the A command is issued manually to answer the incoming call.

Range: 0 - 255 rings

#### S1 Ring Count



**S1** automatically increments its value by one each time the modem receives a ring while in the command state. **S1** is reset to zero if no ring is detected within **8** seconds.

**Range:** 0 - 255 rings

### **S2 ASCII Value of Escape Character**

**S2** stores the ASCII value of the escape character. Setting register **S2** to a value greater than 127 disables the escape command and you cannot return to the command state. With escape disabled, in the on-line state the modem cannot hang up until the power is turned off or the remote modem hangs up.

**Range:** 0 - 255, ASCII decimal.

### **S3 ASCII Value of Carriage Return**

**S3** stores the ASCII value of the carriage return character. (Pertains to asynchronous operation only.)

**Range:** 0 - 127, ASCII decimal.

### **S4 ASCII Value of Line Feed Character**

**S4** stores the ASCII value of the line feed character, if your computer does not recognize the default as a line feed, change the value. A value greater than 127 disables the line feed. When disabled, the line feed character that precedes or follows a result code is canceled.(Pertains to asynchronous operation only.)

**Range:** 0 - 127, ASCII decimal.

### **S5 ASCII Value of Backspace Character**

**S5** stores the ASCII value of the backspace character. The backspace is used to edit a command line. If your computer does not recognize the default as a backspace, change the value. (Pertains to asynchronous operation only.)

Set **S5** to any value from 0 to 31 or 127. Do not set it to any value from 32 through 126 because these values correspond to printable ASCII characters. A value greater than 127 disable the backspace and makes it impossible to edit a command line.

**Range:** 0 - 32, ASCII decimal.

### **S6 Wait Time before Blind Dialing**

**S6** controls how long the modem waits after it goes off-hook before it dials the first digit of the telephone number. The modem always pauses for at least 2 seconds, even if **S6** is set to less than two seconds.

**Range:** 2 - 255 seconds.

### **S7 Wait for Carrier after Dial**

**S7** controls how long the modem waits for a carrier signal from a remote modem after originating a call or from the calling modem after going off-hook when answering a call.

**S7** also controls how long the modem waits for a one-second continuous dialtone after dialing a number followed by the **W** dial modifier. If the modem detects a one-second continuous dialtone within the specified wait time, it proceeds to dial.

**Range:** 1 - 255 seconds.

### **S8 Pause Time for Comma**

**S8** controls how long the modem pauses when a comma ", " is encountered in a dial string while executing a dial command.

**Range:** 0 - 255 seconds.

### **S9 Carrier Detect Response Time**

**S9** determines how long a carrier signal must be present for the modem to confirm it. The longer the response time, the easier it is for the modem to correctly recognize a carrier without mistaking other signals or transient noise on the line as a carrier.

**Range:** 1 - 255 tenths of a second.

### **S10 Delay between Loss of Carrier and Hang-Up**

**S10** determines the delay time between the loss of a carrier from the remote modem and hang-up. This allows for a temporary loss of carrier without causing the local modem to disconnect. When **S10** is set to 255, the modem functions as if a carrier is always present.

The actual interval the modem waits before disconnecting is the value in **S10** minus the value in **S9**. Therefore, the value in **S10** must be greater than that in **S9**, or else the modem disconnects before it recognizes the carrier.

**Range:** 1 - 255 tenths of a second.

### **S11 DTMF (Touch-tone) Tone Duration**

**S11** determines the duration and spacing of tones for Dual Tone Multifrequency (DTMF) dialing. This value has no effect on pulse dialing.

**Range:** 50 - 255 milliseconds.

### **S12 Escape Guard Time**

**S12** determines the escape guard time. The escape guard time is the minimum waiting time required before and after entering the escape code (three consecutive escape characters) in the on-line state. It is also the maximum waiting time allowed between any two consecutive escape characters. If the waiting

time before or after the escape code is shorter than the guard time, or if the waiting time between consecutive escape characters is longer than the guard time, then the modem does not recognize the escape command and stays on-line.

If the escape guard time is set at 0 second, it is impossible to return the modem to command state.

**Range:** 0 - 255 1/50 of a second.

#### **S14 Bit Mapped Options**

<b>Bit</b>	<b>Value</b>	<b>Description</b>
bit 1 (E)	0	Disabled.
	1	Enabled.
bit 2 (Q)	0	Disabled.
	1	Enabled.
bit 3 (V)	0	Numeric.
	1	Verbose.
bit 4	Reserved	
bit 5 (P or T)	0	T (Tone dial).
	1	P (Pulse dial).
bit 6	Reserved	
bit 7	0	Answer mode.
	1	Originate mode.

#### **S18 Test Timer**

The test timer determines how long tests are performed. The modem automatically ends the test when the test time is expired. The default value of 000 disables the test timer. When the timer is thus disabled, all tests must be ended with the &T0 command.

**Range:** 0 - 255 seconds.

#### **S21 V.24/General Bit Mapped Options**

<b>Bit</b>	<b>Value</b>	<b>Description</b>
bit 0	0	<b>&amp;J0.</b>
	1	<b>&amp;J1.</b>
bit 2	0	<b>&amp;R0.</b>
	1	<b>&amp;R1.</b>
bit 3,4	00	<b>&amp;D0.</b>
	01	<b>&amp;D1.</b>
	10	<b>&amp;D2.</b>
	11	<b>&amp;D3.</b>
bit 5	0	<b>&amp;C0.</b>
	1	<b>&amp;C1.</b>
bit 6	0	<b>&amp;S0.</b>
	1	<b>&amp;S1.</b>
bit 7	0	<b>Y0.</b>
	1	<b>Y1.</b>

#### **S22 SPEAKER/Results Bit Mapped Options**

<b>Bit</b>	<b>Value</b>	<b>Description</b>
bit 0,1	00	Select <b>L0.</b>
	01	Select <b>L1.</b>
	10	Select <b>L2.</b>
	11	Select <b>L3.</b>

bit 2,3	00	Select <b>M0</b> .
	01	Select <b>M1</b> .
	10	Select <b>M2</b> .
	11	Select <b>M3</b> .
bit 4,5,6	000	Select <b>X0</b> .
	001	Reserved.
	010	Reserved.
	011	Reserved.
	100	Select <b>X1</b> .
	101	Select <b>X2</b> .
	110	Select <b>X3</b> .
	111	Select <b>X4</b> .
bit 7	[RESERVED]	

### S23 Bit Mapped Options

Bit	Value	Description
bit 0	0	<b>&amp;T5</b> .
	1	<b>&amp;T4</b> . (default)
bit 1,2,3	000	Communications rate = 300 bps.
	001	Communications rate = 600 bps.
	010	Communications rate = 1200 bps.
	011	Communications rate = 2400 bps.
	100	Communications rate = 4800 bps.
	101	Communications rate = 9600 bps.
	110	Communications rate = 19200 bps.
	111	Communications rate = 38400 bps or higher.
bit 4,5	00	Even parity selected.
	01	Not used.
	10	Odd.
	11	None.
bit 6,7	00	<b>&amp;G0</b> .
	01	<b>&amp;G1</b> .
	10	1800Hz. ( <b>&amp;G2</b> )

### S24 Sleep Inactivity Timer

Set the length of time, in units of 10 seconds, that the modem will operate in normal mode with no detected telephone line of DTE line activity before entering low-power sleep mode.

**Range:** 0 - 255 (seconds)

### S25 Delay to DTR

**S25** serves two purposes. When the modem is operating in synchronous mode 1, the value assigned to **S25** specifies the length of time the modem waits after a connection has been made before examining DTR. This allows the modem to ignore an ON-to-OFF transition of DTR, giving the user time to disconnect the modem from the asynchronous terminal and attach it to a synchronous terminal, without forcing the modem back to the asynchronous command mode. During this time, the value for **S25** is read in whole seconds.

In all other modes, and after call establishment in synchronous modes 1 and 4, the value is read in 1/100 seconds. In any mode, a change in DTR (ON or OFF) that persists for a period shorter than the value held in **S25** is ignored by the modem while it is in data mode.

**Range:** 0 - 255 (1 second for synchronous mode 1;  
0.01 second otherwise)

## S26 RTS to CTS Delay Interval

Pertains to synchronous operation only. When CTS tracks RTS (**&R0**) and the modem detects an ON-to-OFF transition on RTS, this register sets the time delay before the modem turns CTS to ON.

**Range:** 0 - 255 hundredths of a second

## S28 Bit Mapped Option Status

bit 0, 1	Reserved.
bit 2	Reserved.
bit 3, 4	Pulse dialing ( <b>&amp;Pn</b> ). 0 = 39%-61% make/break ratio at 10 pulse per second ( <b>&amp;P0</b> ). 1 = 33%-67% make/break ratio at 10 pulse per second ( <b>&amp;P1</b> ). 2 = 39%-61% make/break ratio at 20 pulse per second ( <b>&amp;P2</b> ). 3 = 33%-67% make/break ratio at 20 pulse per second ( <b>&amp;P3</b> ).
bit 5	Reserved.
bit 6-7	MNP Link Negotiation Speed ( <b>*Hn</b> ). 0 = Link negotiation at highest speed ( <b>*H0</b> ). 1 = Link negotiation at highest speed ( <b>*H1</b> ). 2 = Link negotiation at highest speed ( <b>*H2</b> ).

## S29 Flash Dial Modifier Time

**Range:** 0 - 255 10ms intervals

## S30 Inactivity Disconnect Timer

This register determines the length of time, in seconds, the modem waits before disconnecting when no data is sent or received. This only operates in **&Q5** and **&Q6** modes, a value of 0 in this register disables the timer.

**Range:** 0 - 255 tenths of a second

## S31 Bit Mapped Options

Bit	Value	Description
bit 1	0	Controls auto line speed detection ( <b>Nn</b> ). Disable ( <b>N0</b> ).
	1	Enable ( <b>N1</b> ).
bit 2, 3	00	Controls error correction progress messages ( <b>Wn</b> ). DTE speed only ( <b>W0</b> ).
	01	Full reporting ( <b>W1</b> ).
	10	DCE speed only ( <b>W2</b> ).

## S32 XON Character

**Range:** 0 - 255, ASCII decimal

## S33 XOFF Character

**Range:** 0 - 255, ASCII decimal

### S36 LAPM Failure Control

This register is read when the **S48** register contains the value 128 or if an attempted error-correction link fails. These fallback options are initiated immediately upon connection if **S48** = 128

Bit	Value	Action
bit 0,1,2	000	Modem disconnect.
001	001	Modem stays on-line and Direct mode connections established.
010	010	Reserved.
011	011	Modem stays on-line and a Normal mode connection is established.
100	100	An MNP connection is attempted and if it fails, the modem disconnects.
101	101	An MNP connection is attempted and if it fails, a direct mode connection is established.
110	110	Reserved.
111	111	An MNP connection is attempted and if it fails, the normal mode connection is established.

### S37 Desired Line Connection Speed

bit 0-4	Desired line connection speed. This is interlinked with the Fn command. If an invalid number is entered, the number is accepted into the register, but <b>S37</b> will act as if the default value has been entered. 0 = Attempt auto mode connection. 1-3 = Attempt to connect at 300 bps. 4 = Reserved. 5 = Attempt to connect at V.22 1200 bps. 6 = Attempt to connect at V.22bis 2400 bps. 7 = Attempt to connect at V.23. 8 = Attempt to connect at V.32 bis/V.32 4800 bps. 9 = Attempt to connect at V.32 bis/V.32 9600 bps. 10 = Attempt to connect at V.32 bis 12000 bps. 11 = Attempt to connect at V.32 bis 14400 bps. 12 = Attempt to connect at V.32 bis 7200 bps.
bit 5-7	Reserved.

### S38 Delay Before Forced-Disconnect

This register controls how long the modem waits, after receiving the **ATH** command or loss of DTR, before it disconnects from the telephone line. When connected in an error-corrected mode, you can use this register to ensure that all data is transmitted from the modem's buffer before the modem disconnects.

If you set **S38** between 0 and 254, the modem waits that number of seconds for the remote modem to acknowledge all data before it disconnects. If you set **S38** to 255, the modem waits indefinitely for the remote modem to acknowledge all data.

**Range:** 0 - 255 seconds

### S39 Flow Control

Bit	Value	Connect speed
bit 0-2	000	No flow control.
	011	RTS/CTS <b>&amp;K3</b> .
	100	XON/XOFF <b>&amp;K4</b> .

	101	Transparent XON <b>&amp;K5</b> .
	110	Both Method <b>&amp;K6</b> .
bit 3-7		Reserved.

## S40 General Bit Mapped Options

Bit	Value	Description	
bit 0-1	0	MNP Extended Services ( <b>-Kn</b> ). Disable extended services ( <b>-K0</b> ). (Default for non MNP 10 models).	
	1	Enable extended services ( <b>-K1</b> ). (Default for MNP 10 models).	
	2	Enable extended services ( <b>-K2</b> ).	
bit 2		Power level Adjustment for Cellular Use ( <b>JMn</b> ).	
	0	Auto - adjustment ( <b>JM0</b> ).	
bit 3-5	1	Force adjustment ( <b>JM1</b> ).	
		Break handling ( <b>Kn</b> ).	
	0	<b>AK0</b> .	
	1	<b>AK1</b> .	
	2	<b>AK2</b> .	
	3	<b>AK3</b> .	
bit 4	4	<b>AK4</b> .	
	5	<b>AK5</b> .	
	bit 6-7		MNP block size ( <b>AN</b> ).
		0	64 chars ( <b>AA0</b> ).
		1	128 chars ( <b>AA1</b> ).
2		192 chars ( <b>AA2</b> ).	
3	256 chars ( <b>AA3</b> ).		

## S41 Bit-Mapped Options

Bit	Value	Description
bit 0,1		Compress selection <b>%Cn</b> .
	0 0	Disable <b>%C0</b> .
	0 1	MNP 5 <b>%C1</b> .
	1 0	V.42 bis <b>%C2</b> .
bit 6,2	1 1	MNP 5 and V.42 bis ( <b>%C3</b> )
		Auto retrain <b>%En</b> .
	0 0	Retrain disable <b>%E0</b> .
bit 3	0 1	Retrain enable <b>%E1</b> .
	1 0	Fallback/fall forward enable ( <b>%E2</b> ).
		Modem-to-modem flow control <b>IG</b> .
bit 4	0	Disable <b>IG</b> .
	1	Enable <b>IG1</b> .
bit 5		Block mode control <b>Ln</b> .
	0	Store mode <b>LO</b> .
bit 7	1	Block mode <b>LI</b> .
		Reserved.
bit 7		Enable fallback to V.22bis/V.22 ( <b>-Qn</b> ).
	0	Disable ( <b>-Q0</b> ).
	1	Enable ( <b>-Q1</b> ).

## S46 Protocol Selection

This register controls whether the modem tries to use data compression when the modem establishes an error corrected link. The default is for the modem to use data compression (138).

Value	Description
136	Execute error correction protocol with no compression.
138	Execute error correction protocol with compression.

## S48 V.42 Negotiation Action

Value	Description
0	Disable negotiation: bypass the detection and negotiation phases.
7	Enable negotiation.
128	Disable negotiation: bypass the detection and negotiation phases.

## S82 Break Handling Option

S82 is for compatibility purposes only, changing this register will not any affect.

## S86 Call Failure Reason Code

When the modem issues a NO CARRIER result code, a value is written to this S-Register to help determine the reason for the failed connection. S86 records the first event that contributes to a NO CARRIER message. The cause codes are:

<b>Range:</b>	0, 4, 5, 9, 12, 13, or 14
S86 = 0	Normal disconnect, no error occurred.
S86 = 4	Loss of carrier.
S86 = 5	V.42 negotiation failed to detect an error-correction modem at the other end.
S86 = 9	The modems could not find a common protocol.
S86 = 12	Normal disconnect initiated by the remote modem.
S86 = 13	Remote modem does not respond after 10 retransmission of the same message.
S86 = 14	Protocol violation.

## S91 PSTN Transmit Attenuation Level

Sets the transmit attenuation level from 0 to 15 dBm for the PSTN mode resulting in a transmit level from 0 to -15 dBm.

**Range:** 0 to 15 dBm (Corresponding to 0 to -15 dBm transmit level).

## S92 Fax Transmit Attenuation Level

Sets the transmit attenuation level from 0 to 15 dBm for the fax mode resulting in a transmit level from 0 to -15 dBm.

**Range:** 0 to 15 dBm (Corresponding to 0 to -15 dBm transmit level).

## S95 Extended Result Codes

This register can override some of the W command options. Set the appropriate bit to 1 to enable the corresponding result code, regardless of the W command setting Set the bit to 0 to disable the result code.

Bit	Description
0	CONNECT indicates DCE speed.
1	Append /ARQ to the CONNECT result code if the protocol is other than NONE.
2	CARRIER result code.
3	PROTOCOL: result code.
4	Reserved.
5	COMPRESSION: result code.
6	Reserved.
7	Reserved.



## 4 - TESTING

The modem provides five testing features to identify fault location when transmission quality is not good: local digital loopback, local analog loop back, local analog loopback with self-test, remote digital loopback, and remote digital loopback with self-test. These tests are initiated with the **&Tn** command described in Chapter 2.

### 4.1 Local Analog Loopback

The local analog loopback test checks the integrity of the local computer or terminal and the local modem. During the test, the local modem internally loops data sent from the local computer or terminal back to the same computer or terminal as shown in Figure 4-1. During the test, data is not transmitted to the remote modem.

If characters are looped correctly during this test, both the modem and the local computer or terminal are functioning correctly. If incorrect characters appear on the screen, either the local computer or terminal or the local modem is in error.

To perform a local analog loopback, put the local modem in the command state. If it is on-line, issue the escape command + + +, to return to the command state.

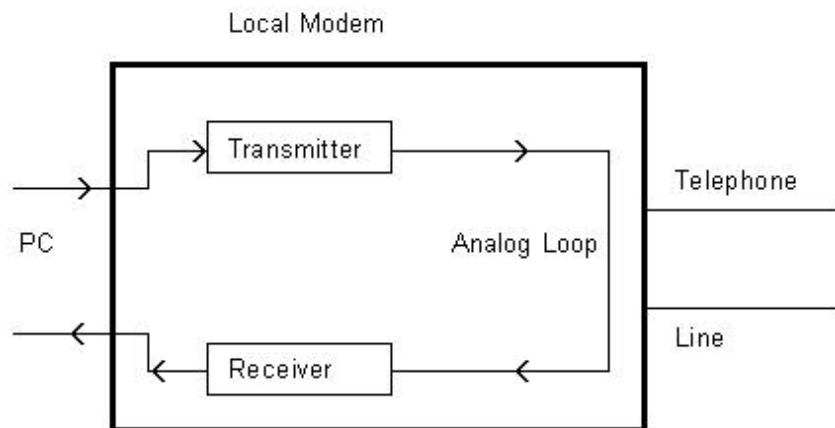


Fig. 4-1 Data Path for Local Analog Loopback

Example 1 - test timer disabled

Command: **AT&Q0<CR>**  
**ATS18=0&TI <CR>**

Result: **CONNECT 56000**

Test message: **THE QUICK BROWN FOX JUMPS OVER THE**  
**LAZY DOG 1234567890**

Escape: **+ + +**  
(return to the on-line command state)

Result code: **OK**

Command: **AT&T0 <CR>** (end the test)

Result code: **OK**

Here, the test timer is disabled and the modem sets up an internal analog loop as shown in Figure 4-1. When the loopback is established, the modem goes on-line and the test message (any character you type) is looped back on the screen for verification. Finally, +++ returns the modem to the command state and **&T0** ends the test and breaks the internal analog loop.

The following command sequence is the same as the previous one except that the test timer is set to 60 seconds. At the end of the test time, the timer expires, the test ends, and the test result is reported.

Example 2 - test timer enabled

Command: **AT&Q0<CR>**  
**ATS18=60&T1<CR>**

Result: **CONNECT 56000**

Test message: **THE QUICK BROWN FOX JUMPS OVER**  
**THE LAZY DOG 1234567890**

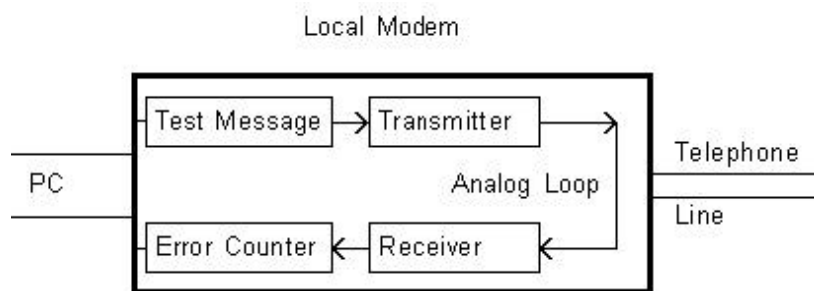
Escape: **+++**

Result code: **OK**

## 4.2 Local Analog Loopback with Self-Test

The local analog loopback with self-test checks the integrity of the local modem. In this test, an internally generated data pattern of alternate binary ones and zeros (reversals) at the selected bit rate is looped through the internal analog loop inside the local modem to an internal error counter as shown in Figure 4-2. An error count of 255 indicates that 255 or more errors were detected.

Example-the test timer is disabled and 12 errors are found during the test



**Fig. 4-2 Local Analog Loopback with Self-test**

Command: **AT&Q0<CR>**  
**ATS18=0&T8<CR>**

Result: **OK**

Command:               **AT&T0<CR>** (ends the test)  
Test result:           **000**  
Result code:           **OK**

## **5 - TROUBLESHOOTING GUIDE**

This chapter describes common problems in the installation, configuration and regular usage of your Fax/Data Modem. To test the Fax/Data Modem, a communication software package is needed and the package must include a mode that allows you to operate your Fax/Data Modem by directly issuing internal commands to the modem.

Follow the procedures in the following sections to resolve these common problems:

### **No Response From Your Modem**

1. If you are using the internal add-on card modems, make sure that the COM port address you have set your modem to corresponds to the appropriate selection in the communications software which you are using.
2. Issue the **ATZ** command to reset your modem. The returned result code should be "0" or "OK" depending on what communications program you are using. Your modem is OK if you get one of these responses. If there is no response after issuing the **ATZ<CR>**, continue to the next step.
3. Check if there are any other interface cards in your computer that use the same COM port address as your modem. If so, you must set your modem to another COM port address. (Keep in mind that on most systems, only two COM ports are available. One of them must be used as either 1 or 3, while the other must be used as 2 or 4.) For example, if a mouse is set to COM 1, your modem should be set to COM2 or COM4. Continue to the next step if the COM port address is OK.
4. Issue the command: **AT&F&W <CR>**, if a "0" or "OK" result code is displayed on the screen, your modem is OK. Otherwise, contact your dealer for assistance.

### **Your Modem Does Not Dial Out**

Make sure that your modem responds normally as described in section 4.1. If you can communicate through the keyboard, check whether the modem is properly connected to the phone line.

### **Your Modem Does Not Connect After It Has Dialed a Phone Number**

The problem may have several causes. The phone line may be too noisy or the telephone cord may be poor. Try the line with a regular phone. Also the remote modem may not recognize your modem's baud rate.

### **Your Can't Transmit After You Have Connected to the Remote Modem**

In this case, check the communication parameters of the remote modem, then configure your software to the same number of data bits, stop bit, and parity.

## 6 - APPLICATION EXAMPLES

### 6.1 Dialing a Remote Modem

Command line: `ATDP9WT002, (886)-7128423<CR>`

This command line instruct the modem to dial a remote modem through a PBX. The modem first use pulse dialing to dial 9 (the access code of the PBX), wait for outside dial tone, and then use touch tone dialing to dial 002 once a one-second continuous dial tone is detected within 30 seconds, pause for 2 seconds (if `S8=2`) and then dial 8867128423.

### 6.2 Dialing a Stored Number

Command line: `AT&Z2=T03,709394<CR>`

Command line: `ATDS=2<CR>`

The first command line store the dial string T03, 709394 to the 3rd location in NVRAM. Afterwards you can use the second command line to dial this stored number. The dial string T03, 709394 will appear on the screen to indicate the number being dialed.

### 6.3 Manual Answer an Incoming Call

Command line: `ATA <CR>`

The factory setting of the S-register S0 is `S0=0`. This condition disables the auto answer capability so that you must issue an ATA command to answer a call. At power up, your modem always monitors if there are incoming rings. If incoming rings are detected, your modem will display result codes on the screen as :

```
RING
:
:
RING
```

Seeing that, you may issue the ATA command to answer the call. This command must be entered within the quiet interval between any two rings.

### 6.4 Auto Answer an Incoming Call

Command line: `AT S0=2 &W &Y <CR>`

Auto answer can be enabled by changing the setting of the S-register S0 to a value between 1 and 255. In the above command line, `S0=2` instructs the modem to answer an incoming call automatically after the 2nd ring. The `&W` command writes this configuration to profile 0 in NVRAM. `&Y` command instruct the modem to load profile 0 as the active configuration on power-up. The last two commands make `S0=2` the default value at power-up or reset.

This example also shows the insertion of space between two neighboring commands to make the command line more readable.

## 6.5 Voice to Data Switch

Command line: **ATA <CR> or ATX1D <CR>**

If you are talking with a remote modem user through the telephone set and want to initiate data communication with the remote modem, follow the procedures below:

1. You or the remote user issue an ATA command first to switch to data communication.
2. When the person on the other end hears an answer tone from the phone, issues an ATX1D command (X1 to disable the dial tone monitor) to instruct the modem to go off-hook and wait for a carrier. If connection is successful, the CONNECT XXXX result code will be displayed on the screen. Now you can hang up your phone and begin data communication with the remote modem.

## A - MNP 10 COMMANDS

### A-1 MNP 10 COMMANDS

#### AT) Commands

#### )Mn Enable Cellular Power Level Adjustment

Enables or disables automatic adjustment of the transmit power level during link negotiation for reliable links to accommodate the signaling requirements of cellular telephone equipment. The parameter value, if valid, is written to S40 bit 2. Note that the @Mn command sets the initial transmit level.

**)M0** Disables power level adjustment during MNP 10 link negotiation. (default)

**)M1** Enables power level adjustment during MNP 10 link negotiation.

Result Codes:

**OK** n = 0 or 1.

**ERROR** Otherwise.

#### AT-Commands

#### \*Hn Link Negotiation Speed

This command controls the connection speed for link negotiations before upshift occurs between two MNP Class 10 modems. The parameter value, if valid, is written to S28 bits 6 and 7.

**\*H0** Link negotiation occurs at the highest supported speed. (default)

**\*H1** Link negotiation occurs at 1200 bps.

**\*H2** Link negotiation occurs at 4800 bps.

Result Codes:

**OK** n = 0 to 2.

**ERROR** Otherwise.

## **-Kn MNP Extended Services**

Enables or disables conversion of a V.42 LAPM connection to an MNP 10 connection. The parameter value, if valid, is written to S40 bit 0, 1.

**-K0** Disables V.42 LAPM to MNP 10 conversion.

**-K1** Enables V.42 LAPM to MNP 10 conversion. (default)

**-K2** Enables V.42 LAPM to MNP 10 conversion; inhibits MNP Extended Services initiation during V.42 LAPM answer mode detection phase.

Result Codes:

**OK** n = 0 or 1.

**ERROR** Otherwise.

## **-Qn Enable Fallback to V.22 bis/V.22**

Enables or disables fallback from MNP 10 to V.22 bis/V.22. The parameter value, if valid, is written to S41 bit 7.

**-Q0** Disables fallback to 2400 bps (V.22bis) and 1200 bps (V.22). Fallback is enabled only to 4800 bps.

**-Q1** Enables fallback to 2400 bps (V.22bis) and 1200 bps (V.22). (default)

Result Codes:

**OK** n = 0 or 1.

**ERROR** Otherwise.

## **B - CALLER ID COMMANDS**

### **#CIDn - Caller ID (Enables or disables Caller ID.)(for U.S.A)**

This command only apply to models which support the Caller ID function.

**#CID=0** Disables Caller ID.(Default.)

**#CID=1** Enables Caller ID with formatted presentation to the DTE. The modem will present the data items in a <Tag><Value> pair format. The expected pairs are data, time, caller code (telephone number), and name.

**#CID=2** Enables Caller ID with unformatted presentation to the DTE. The modem will present the entire packet of information, excluding the leading U's, in ASCII printable hex numbers.

Result Codes:

**OK** n=0 or 2.

**ERROR** Otherwise.

Inquiries :

**#CID?** Retrieves the current Caller ID mode from the modem.

**#CID=?** Returns the mode capabilities of the modem in a list with each element separated by commas.

## Formatted Form Reporting

The modem presents the data in the <tag>=<value> pair format as described in the table below. Spaces are present on both sides of the equal sign.

<b>TAG</b>	<b>Description</b>
<b>DATE</b>	DATE=MMDD where MM is the month number(01 to 12) and DD is the day number (01..31).
<b>TIME</b>	TIME=HHMM where HH is the hour number (00 to 23) and MM is the minute number (00 to 59).
<b>NMBR</b>	NMBR=<number> or P or O where <number> is the telephone number of the caller, where P indicates that the calling number information is not available since the originating caller has requested private service, and where O indicates that the calling number information is not available or out of service at the calling location.
<b>NAME</b>	NAME=<listing name> where <listing name> is the subscription name.
<b>MESG</b>	MESG=<data tag><length of message><data><checksum> in printable ASCII hex numbers. This tag indicates a data item not listed above. The message is only possible for Multiple Message Format.

### Notes:

1. The modem does not present any Caller ID information if the DCE detects a checksum error in the Caller ID packet.
2. In the event of an unrecognized data tag, the modem will present the data in ASCII hex numbers following the MESG tag.

## Example of Formatted Form Reporting

1. The following example illustrates the standard Caller ID message packet.

**RING**

**DATE = 0321**

**TIME = 1405**

**NMBR = 504551234**

**NAME = A N OTHER**

**RING**

**RING**

2. The following example illustrates the case where the tag of the packet is not recognized by the modem.

**RING**

MESG = 06034242431

RING

RING

## Unformatted Form Reporting

The modem presents all information and packet control information found in the message. The modem, however, excludes the leading U's (channel seizure information) from the presentation. The packet is presented in ASCII printable hex numbers, the modem does not insert spaces, or line feeds, for formatting between bytes or words of the packet. The modem does not detect the checksum of the packet.

## Example of Unformatted From Reporting

RING

0412303332323234303539313435353132333435

RING

RING

## C - TECHNICAL SPECIFICATIONS

### C.1 Features

#### Data Rates(bps)

K56flex: 300, 1200, 2400, 4800, 7200, 9600, 12000, 14400, 19200, 21600, 24000, 26400, 28800, 31200, 32000, 33600, 34000, 36000, 38000, 40000, 42000, 44000, 46000, 48000, 50000, 52000, 54000, 56000

V.90: 56000, 54667, 53333, 52000, 50667, 49333, 48000, 46667, 45333, 42667, 41333, 40000, 38667, 37333, 36000, 34667, 33333, 32000, 30667, 29333, 28000 (Receive only)

#### Compatibility

**(Data)** ITU-T V.90 (for modem which supports V.90 only), V.34, V.32 bis, V.32, V.22 bis, V.23, V.22, and V.21

Bell: 212A and 103, K56flex

**(Fax)** ITU-T V.17, V.29, V.27 ter, and V.21 ch 2

**Command Set** Enhanced 'AT' command set, Fax Class 1 command

**Flow Control** Xon/Xoff, Hardware RTS/CTS

**Data Compression** V.42bis, MNP5

**Error Correction** V.42, MNP 2-4

**Operation** Full-or Half-duplex 28800 bps with 26400, 24000, 21600, 19200, 14400, 9600, 4800, 2400 and 1200 bps auto fallback



**Test Modes** Analog loopback, local digital loopback, and remote digital loopback

**Audio Monitor** Built-in speaker, with software-controllable volume control

**Guard Tone** 550/1800 Hz

**Compliance** FCC 15&68

**Command Buffer** 40 characters

**Extra Memory** 4 x 36 digits

**Transmit Level** -11(+/-)dBm

**Receive Sensitivity** -40dBm

**Pulse Dialing Specifications**

	USA	International
Make/Break Ratio	39/61	33/67
Break Length	61ms	67ms
Dial Pulse Length	100m	100ms
Dial Pulse Rate	10pps	10pps
Interdigit Time	800ms	800ms

**Compatibility:**

Data	V.90	56000/54667/53333/52000/50667/49333/48000/46667/45333/42667/41333/40000/38667/37333/36000/34667/33333/32000/30667/29333/28000
	K56flex	56000/54000/52000/50000/48000/46000/44000/42000/40000/38000/36000/34000/32000
	V.34	33600/31200/28800/26400/24000/21600/19200/16800/14400
	ITU-T V.32bis	14400/9600 bps, asynchronous, synchronous
	ITU-T V.32	9600/4800 bps, asynchronous, synchronous
	ITU-T V.22 bis	2400/1200 bps, asynchronous, synchronous
	ITU-T V.23	1200/75 bps, asynchronous, synchronous
	ITU-T V.22	1200 bps, asynchronous, synchronous
	ITU-T V.21	300 bps, asynchronous
	Bell 212A	1200 bps, asynchronous, synchronous
	Bell 103	300 bps, asynchronous
Fax	ITU-T V.17	14400/9600 bps, half-duplex
	ITU-T V.29	9600/7200 bps, half-duplex
	ITU-T V.27 ter	4800/2400 bps, half-duplex
	ITU-T V.26 bis	2400/1200, half-duplex
	ITU-T V.26 A	2400, half-duplex
	G - III	(Group 3 fax)

## **B - QUICK REFERENCE**

<b>A</b>	Go On-line in Answer Mode
<b>Bn</b>	Select Protocol to 300 bps or 1200 bps
<b>Cn</b>	Carrier Transmit Control
<b>D</b>	Go On-line in Originate Mode
<b>En</b>	Command Echo
<b>Hn</b>	Hang Up
<b>In</b>	Identification
<b>Ln</b>	Control Speaker Volume
<b>Mn</b>	Monitor Speaker On/Off
<b>Nn</b>	Automode Enable
<b>On</b>	Return to On-line Data Mode
<b>P</b>	Set Pulse Dial as Default
<b>Q</b>	Result Code Display
<b>Sn</b>	Reading and Writing to S Registers
<b>T</b>	Set Tone Dial as Default
<b>Vn</b>	Select Word or Digit Result Codes
<b>Wn</b>	Negotiation Progress Reporting
<b>Xn</b>	Extended Result Codes
<b>Yn</b>	Enables or Disables Long Space Disconnect
<b>Zn</b>	Reset
<b>&amp;Cn</b>	Select DCD Options
<b>&amp;Dn</b>	DTR Option
<b>&amp;F</b>	Fetch Factory Configuration
<b>&amp;Gn</b>	Set Guard Tone
<b>&amp;Kn</b>	DTE/Modem Flow Control
<b>&amp;Mn</b>	Communication Mode

**&Pn** Select Pulse Dialing Make/Break Ratio

**&Qn** Asynchronous Mode Selection

**&Sn** DSR Option

**&Tn** Testing and Diagnostics (See Chapter 4)

**&V** View Configuration Profiles

**&Wn** Store the Current Configuration to Nonvolatile RAM

**&Yn** Select the Default Profile

**&Zn** Store Telephone Numbers (n=0 to 3)

**\An** Select Maximum MNP Block Size

**\Bn** Transmit Break to Remote

**\Gn** Modem to Modem Flow Control (XON/XOFF)

**\Kn** Break Control

**\Nn** Operating Mode Control

**\Vn** Single Line Connect Message Enable

**%Cn** Enable/Disable Data Compression

**%En** Enable/Disable Line Quality Monitor and Auto-Retrain or Fallback/Fall Forward

**%L** Report Received Signal Level

**%Q** Line Signal Quality

**+MS** Select Modulation

**\*\*** Download to Flash Memory(For models with flash Memory only)

**@** Answer

**,** Pause

**!** Initiate a Hookflash

**;** Return to Command State after Dialing

**^** Tone Control

**J** Perform MNP

**K** Enable Power Level

**L** Re-dial Last Number  
**P** Pulse Dialing  
**S** Dial a Stored Number  
**T** Touchtone Dialing  
**W** Wait for Dialtone  
**A/** Repeat Command  
**+++** Escape

## **E - GLOSSARY**

**ASCII** - An acronym for American Standard Code for Information Exchange. ASCII is a seven-bit code which defines 128 standard characters, including control characters, letters, numbers, and symbols. An extra 128 characters comprise the extended ASCII set.

**Baud Rate** - The transmission rate between two serial devices, e.g., modems, fax machines, etc. Measured in Bits Per Second.

**Blind Dialing** - In blind dialing, the modem continues to dial, regardless of the existence of a dialtone, ring, or busy signal.

**BPS** - Bits Per Second; the number of bits that can be transmitted in one second.

**Carrier Signal** - The analog data signal that a modem sends over telephone wires.

**COMx** - Where (x = 1, 2, 3, or 4), COMx is the name(address) of serial communications ports on personal computers. Each serial port in a personal computer has a different number.

**CTS** - Clear To Send.

**Default** - The assumed value that is used for a command parameter when no other value is explicitly provided.

**DCD** - Data Carrier Detect.

**DCE** - Data Communication Equipment.

**DTE** - Data Terminal Equipment.

**DTMF** - Dual Tone Multifrequency(for touchtone dialing).

**DTR** - Data Terminal Ready.

**FSK** - Frequency Shift Keying.

**Make/Break Ratio** - The ratio of the off-hook (make) to on-hook (break) interval is the make/break ratio in pulse dialing.

**Modem** - A combination of the words MOdulator and DEModulator. Modems transform digital data into analog signals and back again.

**Nonvolatile Memory** - An area of memory inside the modem where the default configuration profile is stored. Values recorded in this memory will not be lost when the power is turned off.

**Off-Hook** - The condition when the modem has picked up the telephone line.

**Off-Line Command State** - A modem state in which the modem accepts, interprets and executes commands from an asynchronous computer or terminal.

**On-Hook** - The condition when the modem has not picked up the telephone line; the telephone is hung up.

**On-Line** - A carrier signal link with a remote modem has been established; communication is in progress.

**On-Line State** - A modem state in which the modem is connected with a remote modem. Data can be sent or received from the remote modem in this state. No commands will be accepted from the modem except the escape command which will bring the modem into the on-line command state.

**On-Line Command State** - A modem state in which the modem can accept or execute commands from an asynchronous computer or terminal while remaining connected with the remote modem. The user can return the modem to the on-line state by issuing the **ATOn** command or put it into the off-line command state by issuing command such as **ATZ** or **ATH**.

**Parity** - An error-checking method by which the modem verifies that the data just sent is correct.

**pps** - Pulse per second.

**Profile** - A list of default settings.

**Protocol** - A technical specification for serial communications; the protocols supported by the modem are listed in Appendix B.

**PSK** - Phase Shift Keying.

**Pulse Dialing** - A dialing form in which each digit is represented by a series of pulses. Rotary telephones all use pulse dialing.

**QAM** - Quadrature Amplitude Modulation.

**Result Codes** - The response the modem returns to the screen upon executing a command.

**RAM** - Random Access Memory.

**ROM** - Read-Only Memory. A chip inside the modem which stores the factory default settings. This memory cannot be changed.

**RTS** - Request To Send.

**RX** - Reception.

**S Register** - RAM locations in the modem which store the active configuration.

**Serial Port** - See COMx.

**TCM** - Trellis-Coded Modulation.

**Touchtone Dialing** - A dialing format in which each digit is represented by a musical frequency.

**TX** - Transmission.

## F - ASCII CODE TABLE

Decimal	Hex Value	Decimal	Hex Value	Decimal	Hex Value	Decimal	Hex Value			
000	00	NUL	032	20 (space)	064	40	@	096	60	'
001	01	SOH	033	21 !	065	41	A	097	61	a
002	02	STX	034	22 "	066	42	B	098	62	b
003	03	ETX	035	23 #	067	43	C	099	63	c
004	04	EOT	036	24 \$	068	44	D	100	64	d
005	05	ENQ	037	25 %	069	45	E	101	65	e
006	06	ACK	038	26 &	070	46	F	102	66	f
007	07	BEL	039	27 '	071	47	G	103	67	g
008	08	BS	040	28 (	072	48	H	104	68	h
009	09	HT	041	29 )	073	49	I	105	69	i
010	0A	LF	042	2A *	074	4A	J	106	6A	j
011	0B	VT	043	2B +	075	4B	K	107	6B	k
012	0C	FF	044	2C ,	076	4C	L	108	6C	l
013	0D	CR	045	2D -	077	4D	M	109	6D	m
014	0E	SO	046	2E .	078	4E	N	110	6E	n
015	0F	SI	047	2F /	079	4F	O	111	6F	o
016	10	DLE	048	30 0	080	50	P	112	70	p
017	11	DC1	049	31 1	081	51	Q	113	71	q
018	12	DC2	050	32 2	082	52	R	114	72	r
019	13	DC3	051	33 3	083	53	S	115	73	s
020	14	DC4	052	34 4	084	54	T	116	74	t
021	15	NAK	053	35 5	085	55	U	117	75	u
022	16	SYN	054	36 6	086	56	V	118	76	v
023	17	ETB	055	37 7	087	57	W	119	77	w
024	18	CAN	056	38 8	088	58	X	120	78	x
025	19	EM	057	39 9	089	59	Y	121	79	y
026	1A	SUB	058	3A :	090	5A	Z	122	7A	z
027	1B	ESC	059	3B ;	091	5B	[	123	7B	{
028	1C	FS	060	3C <	092	5C	\	124	7C	
029	1D	GS	061	3D =	093	5D	]	125	7D	}
030	1E	RS	062	3E >	094	5E	^	126	7E	~
031	1F	US	063	3F ?	095	5F	_	127	7F	DEL