



**V.90 56Kbps Fax/Modem PC Card**



## FCC General Information

The Federal Communications Commission (FCC) of the United States restricts 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 repair 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.

## FCC Notice

This equipment has been tested and found to comply with the limits for a digital device, pursuant to Subpart B and 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 modification 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.

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## CHAPTER 1 INTRODUCTION

Congratulations on your purchase of the V.90 56Kbps Fax/Modem PC card. This manual describes how to operate your new Fax/Modem.

### V.90 Technology

V.90 technology is developed to achieve data rates beyond V.34 33.6 kbits/s on connections between an analog (client) modem and a digital (central-site) modem. This is accomplished by recognizing that this connection is fundamentally different from traditional analog point-to-point modem connection. A modulation designed specifically for this type of connection utilizes the available bandwidth to achieve up to 56 kbits/s. With this technology, the downstream data rate to the analog modem is higher than the upstream data rate to the service provider. On connections where the central-site modem is not V.90 capable, the client modem will automatically fall back to X2 or V.34.

When used as data modem your Fax/Modem PC card uses the standard AT command set and is fully compatible with CCITT V.80 V.42, V.42bis, V.34, V.32bis, V.32, V.22bis, V.23, V.22, V.21, MNP2-5, Bell 103 and 212A. When used as a Fax/Data Modem it communicates with all CCITT Group 3 FAX machines and is compatible with CCITT 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 driver diskette 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

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mean to enter these characters literally; but instead to press the Enter key.

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.

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## CHAPTER 2 AT COMMAND SET

The basic AT commands used to control modem operation are defined in this section. These commands are summarized in Chapter 4. All these commands may not be available in a specific product depending upon supported data rates and modes.

The default values are typical of a fully configured modem supporting all data rates and options. The actual default value is dependent upon modem firmware as defined by the firmware release notes.

### AT Command Descriptions

All command lines sent to modem, except for A/, must be preceded by an 'AT' and terminated by the contents of S-register S3 (typically a carriage return <CR>). AT stands for 'attention' and prompts the modem to receive a command line from the DTE. A <CR> informs the modem that the entire command string has been transmitted and to begin processing all the commands in the command line. A command line can include one or more AT commands. The commands can be separated by a space, if desired, but no Punctuation is needed except for fax and voice commands. In a multiple-command line, fax and voice AT commands must be separated from following commands by a semicolon (;).

#### Examples:

```
ATS1?<CR>
A/
AT &F &D2 +FCLASS=?<CR>
AT +FCLASS=80; S0=1<CR>
```

The modem provides status information to the DTE in the form of response codes. The supported response codes are listed in Section 2.4.

After sending an AT command string to the modem, the DTE must wait for a response code from the modem before sending a new AT command string to the

modern.

Examples of modem responses:

OK  
ERROR  
CONNECT 288000

In the online state, the DCE is off-hook and communicating with a remote modem. Any data sent from the DTE to the DCE is transmitted to the remote modem. Similarly, any data that the DCE receives from the remote modem is transmitted to the DTE.

**NOTE:** In the online state, the DCE does not 'echo-back' any of the data that the DTE sent to the DCE.

The modem recognizes AT commands from the DTE at any valid data rate from 300 bps to 115,200 bps (that is, the modem autobauds up to 115,200 bps); however, the DTE should use the data rate specified for each mode (see the following table).

Mode	Data	Rate (bps) Affected Data
Data (V.34)	300-33,600	Modem-to-modem data rates
	300-115,200	DTE-to-modem data rates
Data (transmit only)	4800-31,200	Modem-to-modem data rates
Data (receive only)	33,333-57,333	Internet Service Provider-to-modem data rates
Data (receive only)	300-115,200	DTE-to-modem data rates
Fax	19,200	AT commands and fax data transfers
Voice	19,200-115,200	AT commands, playback and record modes (varies according to compression type)

#### Data Rate for Each Mode

Each command may have one or more parameters associated with it. If a parameter is not sent for a command requiring a numeric parameter, then the

modem assumes a zero ('0') parameter (only if zero is a valid parameter for the command). For example, ATZ and ATZ0 commands perform identical functions (that is, the modem sees 'ATZ' and automatically uses the '0' parameter during processing the command). Other commands do not use parameters.

#### AT Escape Sequences

The 56-kbps FAX/MODEM provides two industry-standard escape sequences, TIES (Time Independent Escape Sequence) and the Hayes® Escape Sequence.

The DTE sends the escape sequence to return the modem to command state while in the online data state (that is, connected to another modem) or in diagnostic mode (&Tn commands). Currently, most modems implement the Hayes Escape Sequence; but since its use may require a license from Hayes, TIES is provided as an alternative.

#### Hayes® Escape Sequence

The Hayes Escape Sequence, developed by Hayes Microcomputer Products, Inc., has been adopted by many modem manufacturers. The DTE implements the escape sequence by sending the modem an escape character three times, preceded and followed by guard times. Upon detecting the escape sequence, the modem sends and 'OK' response to the DTE. To re-enter the online data state, the DTE then sends the modem ATO followed by the contents of S-register S3 (typically a <CR>).

The escape character is determined by the value stored in S-register S2 and is typically a '+' character. Guard times are silence times when the DTE does not send any data to the modem. Guard times ensure that the modem does not falsely detect an escape sequence if three consecutive escape characters are received from the DTE. The preceding and following guard times are defined in S-register S12. Typically, these guard times are 1 second. In addition to the preceding and ending guard times, there are inter-character time-outs between each escape character sent. The inter-character time-outs define the maximum amount of time allowed between characters before the modem ignores the

previous escape characters. This inter-character delay time is set to 1 second. An example of the Hayes Escape Sequence is provided here:

Format:     <gt 1><char1><tm 2><char2><tm3><char3><gt14>  
          gt1=gt14 > = preceding and following guard times(S12)  
          tm2=tm3 < =inter-character time-out(= 1 second)  
          char1=char2=char3=escape character(S2)

Example:

DTE:     1 second + + + 1 second

DEC:     OK

### Time-Independent Escape Sequence

TIES(Time-Independent Escape Sequence)was developed by a group of modern manufacturers as an alternative to the Hayes Escape Sequence. TIES was designed for compatibility with existing communication software written for the Hayes Escape Sequence.

The DTE implements the escape sequence by sending the escape character (as defined in S2) three times, followed by a valid AT command, and then the contents of S3(typically a <CR>). Upon detecting the three consecutive by a valid AT command, and then the contents of S3 (typically a <CR>). Upon detecting the three consecutive escape characters, the modem changes to TIES command mode and starts an internal EPD(Escape Prompt Delay)timer (with the time limit defined by S12). The modem then looks for one of the following conditions to occur:

- 1) No additional data is received and the EPD timer times out: the modem sends an 'OK' message to the DTE and then waits indefinitely for an incoming valid AT command string from the DTE. Until the modem receives a valid AT command, it monitors any data received from the DTE and passes on the data to the remote modem(that is, the modem does not echo back the received character to the DTE).  
a)If the subsequent character received by the modem is not an 'A' or 'a', the modem returns to data mode and sends a 'connect' message back to the DTE.

b)If the modem receives and 'A' or 'a', it stores any additional data received from the DTE in the modem's internal command buffer and continues to send the data to the remote modem. The modem then waits until the DTE sends a <CR> or up to 39 data characters, before deciding whether to go to command mode or to return to data mode. Upon detecting a <CR> or receiving the 39 data characters, the modem determines if a valid AT command has been received. If a non-AT command string or an invalid command string has been received, then the modem changes back to data mode and sends a 'CONNECT' message to the DTE. If a valid AT command has been received, the modem changes to command mode and sends an 'OK' message. After sending the 'OK' message, the modem echoes any received data from the DTE while in command mode.

- 2) An 'A' or 'a' is received from the DTE. The modem disables the EPD timer and sends the character to the remote modem. The modem then stores any received data from the DTE into the modem internal command ters, the modem determines if a valid AT command has been received; if so, it processes the valid commands. If a non-AT command string or an invalid command string has been received, then the modem remains in data mode. If a valid AT command has been received, then the modem changes to command mode and sends an 'OK' message. After sending this, the modem (while in command mode) echoes back any data received from the DTE.
- 3) Any character except an 'A' or 'a' is received from the DTE. The modem disables the EPD timer and changes back to data mode.

If an AT command string is received while in TIES command mode, the modem processes any valid AT command. Upon detecting an invalid AT command, the modem changes back to data mode and issues a 'CONNECT' message to the DTE. While in TIES command mode, the modem ignores certain characters that may cause the modem to incorrectly decide that an incoming AT string is invalid. The ignore characters are<LF>, <space>, and<CR>( <CR> is ignored only when S3 is not equal to <CR>). Not all AT commands are supported during TIES command mode. The following is a list of supported commands:

**En, Hn, Mn, On, Sn, Vn, Xn, and ' & ' commands (except &Tn and &F)**

The escape character is determined by the value stored in S-register S2, and it is typically a '+' character. The following is an example of the TIES Escape Sequence:

Format: <char1><char2><char3><AT commands><contents of S3>  
 char1=char2=char3=escape character(S2)

Example:

DTE: ++ + AT<CR>  
 DCE: OK

NOTE: TIES requires the three-character escape sequence be contiguous and not repeated. The character immediately preceding the first character of the three-character sequence cannot be the same as the escape character. Therefore, '+++ AT<CR>' is valid, but '+++ AT<CR>' is not.

**2.1 Basic Data Mode AT Command Set**

Note: An asterisk (\*) in the following table denotes factory-default setting.

Command	Default	Description
AV	none	Repeat Last Command: This command re-executes the last AT command string stored in the register. Sending any character (such as a carriage return) after AV and before a modem response is sent to the DTE causes the modem to abort the remainder of the command string in the modem internal command buffer.
A	none	Answer Command: This command causes the modem to immediately go off-hook and initiate an answer mode handshake without waiting for an incoming ring signal. This command is useful for manually answering a call or establishing a back-to-back connection with an originate-mode modem.
Bn	1	Select ITU-T or BellR: This command selects the

ITU-T or BELL configuration for the modem.

n=0 Selects ITU-T V.22 when the modem is at 1200 bps and ITU-T V.21 when the modem is at 300 bps.

n=1\* Selects BellR 212A when the modem is at 1200 bps and BellR 103J when the modem is at 300 bps.

n=2 Selects ITU-T V.23 modulation connections only (that is, the modem does not connect for any other speed or modulation). The originating modem transmits at 75 bps (and receives at 1200 bps), and the answering modem transmits at 1200 bps (and receives at 75 bps).

n=3 Selects ITU-T V.23 modulation connections only (that is, the modem does not connect for any other speed or modulation). The originating modem transmits at 1200 bps (and receives at 75 bps), and the answering modem transmits at 75 bps (and receives at 1200 bps).

Cn	1	Carrier Control Option: This command is reserved for selecting between controlled carrier or constant carrier modes. This modem supports only constant carrier mode. n=0 Transmit carrier always off (returns an ERROR message) n=1* Normal transmit carrier (constant carrier)
D	none	Dial Command: this command causes the modem to immediately go off-hook as an originating modem and dial a telephone number with corresponding dial modifiers. Dial modifiers are parameters that define how the modem should dial the telephone number. Dial Modifiers

0-9 Dialing Digits

A,B,C, Tone Dial Characters D, \*, #

,P Pulse Dial-configures the modem to use pulse dialing to dial a telephone number.

R

Reverse Originate Mode-places the modem in answer mode. This modifier should be the last character in the dialing string (for example, ATDT 12345678R). After dialing the telephone number, the modem goes into data modem answer mode instead of originate mode.

S=n Dial NVRAM Telephone Number-causes the modem to dial a telephone number previously stored in the NVRAM with the AT&Zn=x command.

T Tone Dial-configures the modem to use DTMF tones to dial a telephone number.

W Wait for Dial Tone-causes the modem to look for dial tone for a specified amount of time. If dial tone or the amount of time specified by the S-register, S6, times out, the modem processes the next command in the dial string. If a busy signal is detected, the modem responds to the DTE with a busy response code and then goes into off-line command mode.

Pause-causes the modem to pause or delay implementing the next parameter in the dial string by the time specified in S-register S8.

Flash Hook-causes the modem to go on-hook for 0.75 seconds.

@ Wait for Quiet Answer-causes the modem to wait for specified amount of time (S-register S7) followed by 5 seconds of silence before processing the next dial modifier.

Return to Idle State-causes the modem to enter online command mode without initiating a data

modem handshake (used for phone directory autodialers).  
<space>- ( ) Ignored by Modem-these four characters are ignored by the modem. Spaces also may be included in the dial string to separate area codes and numbers.

En 1 Command Mode Echo: This command selects whether the modem echoes AT commands back to the host in either online or off-line command mode.  
n=0 Echo disabled  
n=1\* Echo enabled

Fn 1 Online Echo: Usually this command selects whether the modem echoes data back to the host during online data mode. This chipset does not support online data mode echo.  
n=0 Echo enabled (returns an error message) ]  
n=1\* Echo disabled

Hn 0 Switch Hook Control: This command controls the telephone line relay (OHREL\*) and causes the modem to either hang up or pick up the telephone line.  
n=0\* Hang up telephone line (go on-hook)  
n=1 Pick up telephone line (go off-hook)

In 0 Identification/Checksum Option: This command causes the modem to send product  
n=0\* Report product code  
n=1 Modem chip firmware version #  
n=2 Verifies ROM checksum  
n=3 Reports chipset name  
n=4 Reserved  
n=5 Reports the following hardware configuration:  
programmed host interface (HOST 1/F),  
program memory (P Mem), data memory (D Mem), and DSP code location (see example at the end of the In description).



n=6 Country Code  
 US=United States  
 JP=Japan  
 UK=United Kingdom  
 GR=Germany  
 FR=France  
 IT=Italy  
 NT=Netherlands

n=7 Board manufacturer firmware version #

n=8 Modem firmware features  
 Bit 0 0=No Voice View  
 1=Voice View supported

Bit 1 0=No DSVD  
 1=DSVD supported

Bits 2-7 Reserved

n=9 Reserved

n=10 Modem board configuration-Bits set by board manufacturer  
 Bit 2 Bit 1 Bit 0  
 0 0 0 =Telephone-Emulation Mode  
 1 0 0 =CL-MD56XX digital  
 speakerphone (+VSP=n)

Bit 3 0=No Caller ID  
 1=Caller ID hardware on board

Bit 4 0=Reserved  
 1=Reserved

Bit 5 0=No plug and play  
 1=Plug and play supported by board

Bit 6 0=Microcontroller firmware in EPROM  
 1=Microcontroller firmware in FLASH

Bit 7 Reserved configuration-Bits set by board manufacturer  
 Bit 0 0=Modem only board  
 1=Modem and sound card board  
 Manufacturer

Bit 1 0=No microphone jack  
 1=Microphone jack on board

Bit 2 0=No external speaker  
 1=External speaker on board

Bit 3 0=No local telephone off-hook  
 detection on board  
 1=Local telephone off-hook detection  
 on board

Bit 4 0=Local telephone on-hook detection  
 on board  
 1=Local telephone on-hook detection  
 on board

Bit 4-7 Reserved

n=12 Reserved

n=13 Reserved

n=14 SAFE device

n=20 Cirrus Logic silicon version

n=21 Cirrus Logic firmware version

n=22 Cirrus Logic manufacturer name

n=23 Cirrus Logic product model

n=24 Reserved

n=25 Reserved

Examples:

AT11  
 CD04.08-MM03.XX  
 OK

AT12  
 OK

AT13  
 CL-MD56XX  
 OK

AT15  
 HOST I/F: Parallel  
 P Mem: 016 Bit 001 W.S.  
 D Mem: 008 Bit 001 W.S.  
 DSP Code location=External RAM

Ln	2	Speaker Volume Control: This command selects the modem's speaker volume. n=0 Low speaker volume n=1 Low speaker volume n=2* Medium speaker volume n=3 High speaker volume
Mn	1	Speaker Control: This command specifies when the speaker is turned on and off. n=0 Speaker always off n=1* speaker on until carrier present n=2 Speaker always on n=3 Speaker off during dialing, and on until carrier
Nn	1	Select Data Rate Handshake: This command specifies whether the resulting modem-to-modem modulation can be different from the modulation specified in the +MS=m <carrier> parameter. n=0 When originating or answering, connect only at the data rates specified by the modulation. n=1* When originating or answering, begin handshaking at the modulation data rate. If the remote modem does not support the specified modulation data rate, fall down in data rate or modulation to the highest compatible data rate. n=0 When originating or answering, connect only at the data rates specified by the modulation. n=1* When originating or answering, begin handshaking at the modulation data rate. If the remote modem does not support the specified modulation data rate, fall down in data rate or modulation to the highest compatible data rate.

On	0	Go Online: this command causes the modem to return back to online data mode from online command mode. n=0* Returns the modem to data mode n=1 Begins an equalizer retrain sequence, then returns to data mode
P	none	Select Pulse Dialing: This command configures the modem to use pulse dialing next time the modem dials a telephone number.
On	0	Result Code Display Control: This command selects whether the modem sends result codes to the DTE. n=0* Result codes enabled n=1 Result codes disabled
Sn	none	Select an S-Register: This command selects the current S-Register. n=0-37
Sn=x	none	Write to an S-Register: This command writes a decimal number 'X' to S-register 'n'. n=0-37 x=0-255
Sn?	none	Read an S-Register: This command is used to read a decimal number from S-register 'n'. n=0-37
T	none	Select Tone dialing: This command configures the modem to use DTMF tones the next time the modem dials a telephone number (touch tone dialing).
Vn	1	Result Code Form: This command selects whether modem response codes are in numeric or verbose form. n=0 Numeric form n=1* Verbose (text) form

Wn

0

Response Code Data Rate: This command selects whether the modem sends the DTE independent modem connection result codes for speed, error control protocol, or data compression.

n=0\* CONNECT result code reports DTE speed.

n=1 CONNECT result code reports DTE speed.

n=2 CONNECT result code reports DCE speed.

n=3 CONNECT result code reports DTE data rate, modulation mode, error correction, data compression, DCE transmitter speed and DCE receiver speed when the mode is configured for verbose V1 (text) response codes. For numeric responses V0, the modem responds with the W0 numeric response codes. The verbose response codes use the following format:

CONNECT (DTE data rate) / (modulation)

/(error correction) / (data compression)

/TX=(DCE transmit data rate)

/RX=(DTE receive data rate)

Modulation types include: V21, V22, V22B, V23C, V32, V32B, V34, and X2, V.90

Error correction types include: NONE, LAPM, MNP

Data compression types include: NONE, V42B, MNP5

For example:

CONNECT 115200V34/LAPM/V42B/TX=28800/RX=28800

n=4 CONNECT result code reports DTE protocol, data compression, and DTE data rate when the mode is configured for verbose V1 (text response codes). For numeric responses V0, the modem responds with the W0 numeric response codes. The verbose response codes use the following format:

(DTE protocol)

(data compression)

(line speed)

Error correction types include: NONE, LAPM, MNP

Data compression types include: NONE, V42B, MNP5

For example:

PROTOCOL: LAPM

COMPRESSION: V42B

CONNECT 33,600

Xn

4

Result Code Type/Call Progress: This command determines which modem result codes are enabled. Additionally, this command specifies whether busy and dial tone detection are enabled or disabled.

n=0 Result codes 0-4 enabled. Busy and dial tone detect disabled.

n=1 Result codes 0-5, 10 and above enabled. Busy and dial tone detect disabled.

n=2 Result codes 0-6, 10 and above enabled. Busy detect disabled and dial tone detect enabled.

n=3 Result codes 0-5, 7, 10 and above enabled. Busy detect enabled and dial tone detect disabled.

n=4\* Result codes 0-7, 10 and above enabled. Busy and dial tone detect enabled.

Yn

0

Long Space Disconnect:: This command determines whether the modem disconnects after receiving 1.6 seconds of silence and whether the modem sends a period of silence to the remote modem before disconnecting.

n=0\* Disables long space disconnect  
 n=1 Enables long space disconnect. The modem disconnects after receiving 1.6 seconds of silence from the remote modem. Additionally, after receiving an ATH0 command, the modem sends at least 4 seconds of silence before hanging up.

**Zn 0 Reset Modern/Recall Stored Profile:** This command causes the modem to go on-hook (hang-up), perform a warm reset, and load user-configuration profile 'n' (previously stored in the NVRAM) into the active profile. The Zn command must be the last command in command string, as it causes all subsequent commands to be ignored.  
 n=0\* Resets the modem and recalls user profile 0  
 n=1 Resets the modem and recalls user profile 1

**&Cn 1 DCD (Data Carrier Detect) Option:** This command controls how the modem functions in relation to the DCD or RLSA signal.  
 n=0 State of carrier from remote modem is ignored. DCD is always on.  
 n=1\* State of carrier from remote modem is tracked. DCD reflects the state of the received carrier.

**&Dn 2 DTR (Data Terminal Ready) Option:** This command controls how the modem responds to DTR. After toggling DTR, the host should wait 200 ms before modifying the UART registers or sending a new command to the modem. This is done because the modem does not send an 'OK' message to indicate it has performed the requested function.  
 n=0 In asynchronous mode (&Q0), the modem ignores DTR.

n=1 The modem switches from data mode to command mode when an on-to-off transition of DTR occurs.

n=2\* An on-to-off transition of DTR causes the modem to go on-hook (hang up). While DTR is off, auto-answer is disabled.

n=3 An on-to-off transition of DTR re-initializes the modem. The re-initialize procedure performs the same function as a power-up reset, except that the UART registers are not reconfigured.

**&F none Load Factory Defaults:** This command loads command defaults and S-register factory defaults into the active configuration and configures the modem for data mode.

**&Gn 0 Guard Tone Option:** This command controls whether the modem sends out guard tones while connected to a remote modem (for ITU-T V.22 bis (1200 bps) and V.22 bis (2400 bps) connections only). Guard tones may be required in some countries but are not needed in the United States. Guard tones are sent by the answer modem to disable Central Office echo cancelers.  
 n=0\* Guard tone disabled  
 n=1 550-Hz guard tone enabled  
 n=2 1800-Hz guard tone enabled

**&Jn 0 Auxiliary Relay Control:** This command controls whether the modem supports the A/A1 function. A/A1 is used only for RJ-12 and RJ-13 telephone connectors and not for RJ-11 telephone connectors. A and A1 are two pins on the RJ-13 connector that indicate when a modem/telephone is being used on a multi-line telephone system. To implement the A/A1 feature, the chipset provides an A/A1\* relay driver.

Typically, the A/A1\* relay driver drives a normally open relay that connects the A and A1 signals from the RJ-13 telephone connector-pins 2 and 5, respectively. When enabled (&J1), the modem activates the A/A1\* relay driver whenever it goes off-hook.

Activating the A/A1\* relay driver causes the normally open relay to close, shorting A and A1 together.

**CAUTION:** The A/A1 function should never be used on an RJ-11 telephone jack, since most United States homes provide a second telephone signal on RJ-11 pins 2 and 5. Thus, it is recommended that &J0 always be used.

n=0\* Auxiliary relay is never operated.  
 n=1 A lead is connected to the A1 lead while the modem is off-hook.

&Kn	3	<p><b>Select Serial Port Flow Control:</b> This command specifies the DTE-to-modem flow control. Software flow control uses the characters XOFF (13h) and XON (11h) to stop and start data transmission, respectively, both to and from the DTE. Bidirectional hardware flow control uses RTS/CTS to stop and start data from the modem.          n=0 Disables flow control          n=3* Bidirectional hardware flow control-RTS/CTS          n=4 XON/XOFF software flow control</p> <p><b>Select Communication Mode:</b> This command controls whether the modem operates in asynchronous or synchronous mode. This modem only supports asynchronous mode. This command is the same as &amp;Q0.          n=0* Asynchronous normal. The modem operates</p>
&M0	0	

asynchronously in both command and online modes.

**Dial Pulse Ratio:** This command determines the make/break (that is, off-hook/on-hook) ratio during pulse dialing.  
 n=0\* Make=39%;Break=61% at 10 pulses per second-for use in the United States.  
 n=1 Make=33%;Break=67% at 10 pulses per second-for use in the United Kingdom and Hong Kong.

**Select Communication Mode:** This command controls whether the modem is operating in asynchronous or synchronous mode. This modem only supports asynchronous mode. This command is the same as &M0.  
 n=0\* Asynchronous normal. The modem operates asynchronously in both command and online modes.

**DSR (Data Set Ready) Option:** This command controls how the modem treats the DSR signal.  
 n=0\* DSR circuit always on  
 n=1 DSR circuit is on during handshaking, off in test or idle modes. DSR is off when the carrier is lost.

&Sn	0	<p><b>Data Mode Self-Test Command:</b> This command is used in data mode to initiate and terminate loopback tests for testing modem-to-modem and DTE-to-modem data communication integrity.          n=0* Terminates test in progress          n=1 Local analog loopback          n=4 Grants RDI request from remote modem          n=5 Denies RDI request from remote modem          n=6 Remote digital loopback          n=7 Remote digital loopback with self-test          n=8 Local analog loopback with self-test</p>
&Tn	0	

&Un 0 **Disable Trellis Coding:** This command selects

whether the modem transmits or receives modulated 9600 bps carrier with QAM or Trellis encoding for V.32.

Range: n=0-1

n=0\* Enabled (Trellis modulation with QAM modulation as a fallback)

n=1 Disabled (QAM modulation only)

&Vn 0 **View Active Configuration and Stored Profiles:**

This command causes the modem to display the command and S-register information contained in the active user profile and in one of two stored profiles. The command &V0 displays the active profile and the stored profile 0;&V1 displays the active profile and the stored profile 1. The information in the active profile is stored into the user profiles with the &Wn command. &W0 stores the active profile into the stored profile 0;&W1, the stored profile 1.  
n=0\* Stored profile 0  
n=1 Stored profile 1  
n=3 Relay, general-purpose input/output status

**AT&V0**

**ACTIVE PROFILE:**

B1 E1 L2 M1 N1 P Q0 V1 W3 X4 Y0 &C1 &D2  
&G0 &J0 &P0 &Q0 &S0 &U0 &Y0 %A013 %C1  
%E1 %G1 \A3 \G0 \J0 \K5 \N3 \Q3 \T000 \X0 -  
C1 -J1 "H3" O032 S00:001 S01:000 S02:043  
S03:013 S04:010 S05:008 S06:002 S07:060  
S08:002 S09:006 S10:014 S11:070 S12:050  
S18:000 S25:005 S30:000 S33:010 S37:000  
STORED PROFILE 0:  
B1 E1 L2 M1 N1 P Q0 V1 W3 X4 Y0 &C1 &D2

&G0 &J0 &P0 &Q0 &S0 &U0 %A013 %C1 %E1  
%G1 \A3 \G0 \J0 \K5 \N3 \Q3 \T000 \X0 -C1 -  
J1 "H3" O032 S00:001 S02:043 S06:002 S07:060  
S08:002 S09:006 S10:014 S11:070 S12:050  
S18:000 S25:005 S30:000 S33:000 S37:000  
TELEPHONE NUMBERS:  
&Z0=12345  
&Z1=T4444444  
&Z2=T12345  
&Z3=T11234567890

OK

&Wn 0 **Store Active profile:** This command causes the

modem to store a subset of the active profile command and S-register configurations into the NVRAM user profile 'n'.

n=0\* Store in user profile 0

n=1 Store in user profile 1

&Yn 0 **Select Stored Profile on Power-up:** This command selects the particular stored user profile from the NVRAM to be loaded into the active profile upon modem power-up.  
n=0\* Select profile 0  
n=1 Select profile 1

&Zn=x **Store Telephone Number:** This command stores a telephone number up to 30 digits (including dial modifiers) in the NVRAM. To dial the stored telephone number, use the ATDS=n command. Use the &V command to see the stored telephone number.  
n=0-3  
x=0-9 A B C D # \* T P R W @ ! ;

%En 1 **Auto-Retrain Control:** This command controls whether the modem automatically initiates a modem retrain whenever the received data signal quality falls below a threshold that may affect data

reliability. The value for 'n' is stored in the NVRAM.  
 n=0 Disabled  
 n=1\* Enabled

**%Gn** 0 Rate Re-negotiation: This command selects whether the modem automatically initiates a change to a higher speed or lower speed depending on received signal quality (that is, rate negotiation). The modem always responds to any rate change initiated by the remote modem.  
 n=0\* Disabled  
 n=1 Enabled

**-Cn** 1 Generate Data Modem Calling Tone: This command allows the DTE to select whether the modem sends a 1300-Hz calling tone or V.8 calling tone when originating a data modem connect.  
 n=0 Calling tone disabled 27  
 n=1\* 1300-Hz calling tone sent for all data connections  
 n=2 V.8 calling tone sent for V.34 modulation and 1300-Hz calling tone sent for all other modulations

**+GMI** none **Identify Modem Manufacturer:** This command causes the DCE to send a message to the DTE indicating the DCE manufacturer. This command is identical to AT+FMFR? and AT+FMII?  
 AT+GMI?  
 CIRRRUS LOGIC  
 OK

**NOTE:** The modem manufacturer's name can be changed using the firmware configuration utility.

**+GMM?** none **Identify Product Model:** This command causes the DCE to report the modem chipset name. This command is identical to AT+FMIDL? and AT+FMMP? commands.

AT+GMM?  
 CL-MD56XX  
 OK

**NOTE:** The modem product model can be changed using the firmware configuration utility.

**+GMR?** none **Identify Product Revision:** This command causes the DCE to report the modem chipset revision level. This command is identical to AT+FREV? and AT+FMRR?  
 AT+GMR?  
 CD 2.07-MM 02.02  
 OK

**NOTE:** The modem product model can be changed using the firmware configuration utility.

**+MS=m** see 'm' **Modulation Selection:** This command sets the type of modulation used and the send and receive speeds. Settings for Br, +MS=m, Nn and S37 determine the allowable modem connections. Nn performs the same function as the +MS=m<automode>parameter. S37 performs the same function as the +MS=m<max rate>parameter.

V.34 modulation connections can be symmetrical or asymmetrical. In symmetrical connections, the transmit and receive speeds are the same; in asymmetrical, they are different. Modems using CL-MD56XX chipsets can be configured by the +MS=m command to support only asymmetrical or symmetrical connections. The factory default is for a 33,600-bps asymmetrical connection. Note that the transmitter speed and receiver speeds typically are different for most V.34 connections over the PSTN.

The +MS command sets the modulation speeds in the V.34 chipsets; however, to set the modulation

to either V.22 or Bell 212, the B0 or B1 command also must be sent. To set the modulation type to ITU-T V.22, send the B0 command; to set the modulation type to Bell 212, send B1. These commands can be typed before or after the +MS command.

For example, to set the modulation to ITU-T V.22:

+MS=V22,1,1200,1200;B0

To check the settings for the +MS command, type

AT+MS?

m=<carrier>, <automode>, <min rate>, <max rate>

Defaults: m=VX2,1,300,0

<carrier> This eight-digit string parameter specifies the type of modulation used. Approved codes are shown in the following table. The modem can switch automatically between some types.

<carrier>	Description
V21	V.21 300 bps
V22	V.22 1200 bps
V22B	V.22 bis 1200 and 2400 bps
V23C	V.23, with constant carrier, 1200 bps forward and 300 bps reverse
V32	V.32 bis 7200, 9600, 12,200, and 14,400 bps
V32B	V.32 bis 7200, 9600, 12,200 and 14,400 bps
V34	V.34 asymmetrical connections: 2400, 4800, 7200, 9600, 12,200, 14,400, 16,800, 19,200, 21,600, 24,000, 26,400, 28,800, 31,200, and 33,600 bps
V34S	V.34 symmetrical-only connections: 2400, 4800, 7200, 9600, 12,200, 14,400, 16,800, 19,200, 21,600, 24,000,

V34B V.34 extended asymmetrical connections: 2400, 4800, 7200, 9600, 12,200, 14,400, 16,800, 19,200, 21,600, 24,000, 26,400, 28,800, 31,200, and 33,600 bps

V34BS V.34 extended symmetrical connections: 2400,

4800, 7200, 9600, 12,200, 14,400, 16,800, 19,200, 21,600, 24,000, 26,400, 28,000, 31,200, and 33,600 bps  
 56-kbps asymmetrical connections  
 (transmit) : 4800, 7200, 9600, 12,000, 14,400, 16,800, 19,200, 21,600, 24,000, 26,400, 28,800, and 31,200 bps  
 56-kbps asymmetrical connections (receive) : 33,333, 37,333, 41,333, 42,667, 44,000, 45,333, 46,667, 48,000, 49,333, 50,667, 52,000, and 53,333 bps

+MS=m

Modulation Selection: (cont.)

<automode> When enabled, this parameter allows the modem to negotiate modulation speeds automatically (if an automatic value is defined for that particular modulation). This feature is also controlled by the Nn AT command. The automode setting is based on which command, Nn or +MS=m, was issued last.  
 Range: <automode>=0,1  
 Default: <automode>=1  
 <automode>=0 Disabled  
 <automode>=1 Enabled  
 <min rate> This parameter specifies the lowest data transfer rate at which the modem may establish a carrier signal connection.  
 Range: <min rate> = 0,300, 1200, 2400, 4800, 7200, 9600, 12,200, 14,400, 16,800, 19,200,



21,600, 24,000, 26,400, 28,800, 31,200,  
33,600, bps.  
Default: <min rate>=0

<min rate>=0 Minimum allowed data rate:  
-<automode>=1  
Lowest data rate=300bps

-<automode>=0  
Lowest data rate= ( Lowest  
modulation data rate)

<min rate>\*0 Lowest permitted connection rate  
<max rate> This parameter sets the highest speed  
at which the modem may establish a connection.  
This feature is also controlled by the S37 s-  
register. The <max rate> setting is based on which  
command, S37 or +MS=m, was issued last.

Range: <max rate>=0, 300, 1200, 2400, 4800,  
7200, 9600, 12,200, 14,400, 16,800, 19,200,  
21,600, 24,000, 26,400, 28,800, 31,200, 33,333,  
33,600, 37,333, 41,333, 42,666, 44,000, 45,333,  
46,666, 48,800, 49,333, 50,666, 52,000, 53,333,  
54,666+, 56,000+, and 57,333+ bps.  
Default: <max rate>=0

<max rate>=0 Maximum allowed data rate:

- If the maximum modulation data rate is less than or equal to the DTE data rate, then the highest data rate is the highest modulation data rate.
- If the maximum modulation data rate is greater than the DTE data rate, then the highest data rate is the modulation data rate equal to or just below the DTE data rate.

<max rate>\*0 Highest permitted data rate  
Modulation Selection: (cont.)

+MS=m

Examples ( DTE data rate=115,200 bps) :Speed

- +MS=V32B, 1, 9600, 14400 9600-14400
- +MS=V34, 1, 0, 0 300-28800
- +MS=V34, 1, 300, 28800 300-28800
- +MS=V34, 1, 9600, 28800 9600-28800
- +MS=V34, 1, 28800, 28800 28800 only
- +MS=V34, 0, 19200, 26400 19200-26400
- +MS=V32, 1, 0, 0 300-9600
- +MS=V32, 0, 0, 0 4800-9600
- +MS=VX2, 1, 0, 0

Examples ( DTE data rate=2400 bps) :Speed

- +MS=V32B, 1, 9600, 14400 9600-14400
- +MS=V34, 1, 0, 0 300-2400
- +MS=V34, 1, 300, 28800 300-28800
- +MS=V34, 1, 9600, 28800 9600-28800
- +MS=V34, 1, 28800, 28800 28800 only
- +MS=V34, 0, 0, 0 2400 only
- +MS=V34, 0, 19200, 26400 19200-26400
- +MS=V32, 0, 0, 0 NO CARRIER

## 2.2 Data Mode Error Correction and Data Compression Commands

This card support two types of error correction (MNP-2-4 and V.42 bis) and data compression (MNP 5 and V.42 bis). V.42 error correction uses LAPM as the primary error-control protocol and uses MNP 2-4 as an alternative. V.42 bis data compression requires V.42 (LAPM only). MNP 5 requires MNP 2-4. The supported V.42 bis/MNP AT command set is listed below.

### V.42 and MNP Data Mode Command

NOTE: An asterisk (\*) denotes the factory-set default setting.

Command	Default	Description
---------	---------	-------------

**%An 13 Set Auto-Reliable Fallback Character:** In auto-reliable mode (N3) with auto-reliable fallback character enabled (C2), receipt of the fallback character from the line during the V.42 detection phase causes the modem to switch to buffer (normal) mode. This allows a remote user with a non-V.42 modem to connect immediately with a V.42 modem. A space or carriage return is usually chosen for the fallback character.

**%Cn 1 MNP 5 Data Compression Control:** This command controls whether the data sent during the MNP frames is compressed using MNP Class 5 compression standard. MNP 5 data compression can improve throughput by as much as 150%.  
 n=0,1  
 n=0 No compression  
 n=1\* MNP Class 5 compression

**\An 3 MNP Block Size:** This command specifies the maximum number of data bytes in an MNP data frame. A smaller frame size may improve throughput on high-impairment (noisy) telephone lines.  
 n=0-3  
 n=0 Maximum 64 characters  
 n=1 Maximum 128 characters  
 n=2 Maximum 192 characters  
 n=3\* Maximum 256 characters

**\Bn none Transmit Break:** This command causes the modem to send a break (attention signal) to the remote modem for a duration specified by 'n'. When n=0, the default break length is used.  
 n=0-9 (units of 100 ms)

**\Cn 0 Set Auto-Reliable Buffer (requires a license from Microcom\*):** In auto-reliable mode (N3), this command determines the fallback method and enables data buffering. The settings for this command are used by the modem during the V.42 detection phase.  
 n=0-2  
 n=0\* Does not buffer data.  
 n=1 Buffers data for four seconds or until 200 characters have been buffered or the SYN character is detected, then switches to reliable mode.  
 If the buffer fills, data is passed to the serial port.  
 n=2 Does not buffer data. Switches to buffer (normal) mode upon receipt of auto-reliable fallback character and passes it to serial port. This feature allows non-V.42 modems to connect immediately to a V.42 modem without data loss.

**\Gn 0 Set Modem Port Flow Control:** In buffer (normal) mode (either \NO or after fallback), this command enables modem -to-modem flow control using XOFF (13h) to stop and XON (11h) to start transmission between modems.  
 n=0,1  
 n=0\* Disables port flow control  
 n=1 Sets port flow control to XON/XOFF

**\Hn 0 bps Rate Adjust Control:** If this command is enabled, the serial port speed automatically changes to the modem-connection speed. This forces the user to change the DTE-to-modem bps rate, if needed. If the command is disabled, the serial port speed is independent of the connection speed, which allows much greater

throughput when using error correction and data compression.

n=0,1

n=0\* Turns off feature

n=1 Turns on feature

**Set Break Control:** Defines what action the modem takes when a break (attention signal) is sent or received, as described below.

n=0-5

In connect state, transmits break to remote (if in reliable mode) :

n=0, 2, 4 Enter command state, but does not send a break

n=1 Destructive/expedited

n=3 Nondestructive/expedited

n=5\* Nondestructive/non-expedited

In command state, transmits break to remote (if in reliable mode) :

n=0,1 Destructive/expedited

n=2,3 Nondestructive/expedited

n=4,5 Nondestructive/non-expedited

In connect state, receives break at serial port (if in direct mode) :

n=0, 2, 4 Immediately sends break and enters command state

n=1, 3, 5\* Immediately sends break through

In connect state, receives break at modem port and sends to serial port:

n=0,1 Destructive/expedited

n=2,3 Nondestructive/expedited

n=4,5 Nondestructive/non-expedited

**Set Operating Mode:** Determines the type of connection attempted by the modem.

n=0-4

n=0,1 Buffer (Normal) Mode-no data

compression or error correction, but uses speed buffering.

n=2

MNP Reliable Mode-the modem attempts to negotiate an MNP error-correction 'reliable' link, hanging up if it fails.

n=3\*

V.42 Auto-Reliable Mode-if V.42 detection is enabled (-Jn), a LAPM or MNP link can be detected and negotiated; otherwise, only LAPM is attempted. If configured for -J0 and a protocol connection is not made, the modem hangs up. If configured for -J1 and a protocol connection is not made, the modem falls back to speed buffering mode.

n=4

V.42 Reliable Mode-the modem attempts to negotiate LAPM error correction, hanging up if it fails.

\O

none

**Originate Reliable Link:** In buffer (normal) mode (N0 or \N1), the modem attempts to originate an MNP link, regardless of whether the modem originated or answered the telephone call (physical connection). The remote modem must answer the MNP link request for the link to be established (refer to the \U command that follows).

\On

3

**Set Serial Port Flow Control:** This command specifies the DTE-to-modem flow control. Software flow control uses the XOFF (13h) command to stop and the XON (11h) characters to start data transmission, both to and from the DTE. Unidirectional hardware flow control uses the CTS control line to stop or start data from the DTE only, while bidirectional hardware flow

control also uses the RTS control to stop or start data from the modem.

- n=0-3 Disables flow control
- n=0 Disables flow control
- n=1 XON/XOFF software flow control
- n=2 Unidirectional hardware flow control-CTS
- n=3\* Bidirectional hardware flow control-RTS/CTS

**Set Inactivity Timer:** During a Buffer (normal) or reliable connection, if no data is sent or received within the inactivity time period, the link is disconnected. The default, '0', disables this feature.

- n=0-90 Length in minutes
- n=0\* Disables inactivity timer

**Accept Auto-Reliable Link:** In buffer (normal) mode (N0 or N1), the modem attempts to answer an MNP link request, regardless of whether the modem originated or answered the telephone call (physical connection). The remote modem must originate the MNP link request for the link to be established (refer to the preceding VO command).

**Set XON/XOFF Pass-Through:** If software flow control is enabled (Q1), this command defines whether the XON (11h) and XOFF (13h) characters received from the DTE are sent to the remote modem. In addition, if the modem port flow control is enabled (G1) in normal mode, the command specifies whether the XON and XOFF characters received from the remote modem are sent to the DTE. In both cases, flow control operation is not affected.

- n=0,1
- n=0\* Processes flow control characters\*

n=1 Processes flow control characters and passes them through to the local or remote so they can process the characters.

**Switch to Reliable Mode:** In buffer (normal) mode (N0 or N1), the modem attempts to originate or answer an MNP link request, depending on whether the modem originated or answered the physical connection, respectively. The remote modem must attempt to answer/originate the MNP link for the link to be established.

**Switch to Buffer Mode:** During an MNP link, the modem disconnects the link (exit error correction/data compression) and changes to buffer mode without disconnecting the modem-to-modem connection.

**Set V.42 Detect Phase:** In V.42 modes (N3, N4), this command specifies whether the modem detects V.42, MNP, or no error-correcting protocols from the remote modem and changes to the appropriate mode. Otherwise, only V.42 is attempted.

- n=0, 1
- n=0 Disables the V.42 detect phase
- n=1\* Enables the V.42 detect phase

**V.42 bis compression Control:** This command specifies whether the data in the LAPM frames are compressed using V.42 bis data compression. This can improve throughput by as much as 400%. Compression can be negotiated to operate in one direction or both.

- n=0-3
- n=0 Disables V.42 bis
- n=1 Enables V.42 bis only when transmitting

data  
 n=2 Enables V.42 bis only when receiving data  
 n=3\* Enables V.42 bis for both transmitting and receiving data

**"On 32 V.42 bis String Length:** This command specifies the maximum number of characters that can be compressed into one V.42 bis code word. The default value of 32 optimizes throughput for most file types.  
 n=6-250 Number of characters  
 n=32\* Usual number of characters

### 2.3 Fax Mode AT Command Set

NOTE: An asterisk (\*) denotes the factory-default setting.

Command	Default	Description
+FAE=n	0	Fax/Data Auto recognition: This command allows the modem to determine automatically whether an incoming call is data or fax and to answer accordingly. When disabled, the modem answers as a fax modem only. n=0* Disable data/fax auto-answer mode n=1 Enable data/fax auto-answer mode
+FCLASS=	0	<b>Fax Mode Selection:</b> This command is used to select a fax class, indicate, current fax class mode setting, and indicate supported fax classes. All fax mode commands, except for +FCLASS, are valid only in fax mode. +FCLASS? Indicates current fax class selection +FCLASS=? Indicates supported fax classes +FCLASS=n Configures DCE for selected fax class. The modem
1	0	

responds back with an 'OK' message at the same DTE-to-modem data rate used to issue this command

n=0, 1, 8, 80  
 n=0\* Configures DCE for data modem operation  
 n=1 Configures DCE for fax Class 1 modem operation  
 n=8 Configures DCE for IS-101 voice mode  
 n=80 Configures DCE for Voice View operation  
 n=80 Configures DCE for IS-101 voice mode  
 n=80 Configures DCE for Voice View operation

**+FRH=n** none  
**Receive HDLC Data:** The +FRH=<mod> command causes the modem to receive HDLC-framed data using the modulation mode selected in <mod>. The modem then delivers the next-received frame to the DTE.

If the modem detects the selected carrier signal with an HDLC flag, the modem sends a 'CONNECT' result code to the DTE. If the modem detects a different signal, the modem sends the '+FCERROR' (fax connect error) result code to the DTE and returns to command mode. Upon loss of carrier, the modem returns to command mode and sends a 'NO CARRIER' result code to the DTE.

After receiving the HDLC flags, the modem strips away the flags and buffers the received frames. The modem then transfers the received data to the DTE, starting with the first non-flag byte and continuing through the last FCS byte. The DTE should ignore the value of the FCS bytes. The modem also performs HDLC zero-bit deletion and error checking.  
 After the FCS bytes are transferred, the modem

marks the end of the frame with <DLE><ETX> and reports the status of the frame reception to the DTE. If the frame was received correctly (FCS is correct), the modem returns a 'OK' result code. If the frame was received in error (FCS is not correct, carrier lost, or data lost due to data overflow), the DCE returns an 'ERROR' result code. The DTE should then discard this frame.

After sending the status result code, the modem is ready to accept new commands from the DTE. The modem obeys the configured flow control from the DTE. If the DTE sends any character to the modem other than DC1 or DC3 while the modem is in this mode, the modem enters command mode and return an 'OK' result code.

After sending the result code indicating that frame reception is complete, the modem continues to receive and buffer the data in the selected mode. If the DTE issues another +FRH=<mod>command, the modem returns another 'CONNECT' result code and continues with HDLC reception. If the DTE issues any command that changes modulation, the DCE stops the receive process; the DCE then discards any buffered data and processes the command.

Range:<mod>=3

**+FRM=n**      none      **Receive Data:** The +FRM=<mod>command causes the modem to enter receive mode using the modulation scheme specified in <mod>.

When the selected carrier is detected, the modem sends a 'CONNECT' result to the DTE. If a different signal is detected, the modem sends a '+FCERROR' (connect error) result code to the

DTE and returns to command mode. After receiving the selected carrier, the modem transfers all received data patterns to the DTE as consecutive start-stop framed bytes, including leading marking conditions or flags. The modem marks the end of the data stream with <DLE><ETX>.

Upon loss of carrier, the modem returns to command state and sends a 'NO CARRIER' result code to the DTE.

**NOTE:** If the modem is on-hook, then the modem always returns an 'ERROR' message to the DTE after receiving the +FRM=<mod> command.

Range:<mod>=24,48,72,73,74,96,97,98,121,122,145,146

After receiving the selected carrier, the modem transfers all received data patterns to the DTE as consecutive start-stop framed bytes, including leading marking conditions or flags. The modem marks the end of the data stream with <DLE><ETX>.

Upon loss of carrier, the modem returns to command state and sends a 'NO CARRIER' result code to the DTE.

**NOTE:** If the modem is on-hook, then the modem always returns an 'ERROR' message to the DTE after receiving the +FRM=<mod> command.

Range:<mod>=24,48,72,73,74,96,97,98,121,122,145,146

**+FRS=n**      none      **Wait for Silence:** The +FRS=<TIME> command causes the modem to send an 'OK' result code to the DTE when silence has been detected on the line for the amount of time specified. The

value <TIME> is in 10-ms intervals. The command terminates when the required amount of silence has been detected on the line or the DTE sends the modem another character that is discarded. In either event, the DTE returns the 'OK' result code.

Range:<TIME>=1-255 (10ms)

+FTH=n none **Transmit HDLC Data: The +FTH=<mod>** command causes the modem to transmit data framed in HDLC protocol using the modulation mode selected. After receiving the +FTH command, the modem sends a 'CONNECT' result code to the DTE. The modem then transmits signal converter training (if required) followed by flags until the first byte of data is sent by the DTE. The modem terminates the +FTH command upon detecting <DLE> <ETX> characters in the data stream. When the buffer is empty, the modem computes and appends the FCS (Frame Check Sequence) and a closing flag to the frame. The modem ensures that the minimum number of flags required by T.30 are sent before the data from the DTE begins to be transmitted. The modem checks the final frame bit in the control field of each frame; this is the fifth-received bit of the second byte of each frame. If the final frame bit is a '1', the modem ceases transmission after the frame is sent, returns to command state, and sends the 'OK' result code to the DTE. If the final frame bit is a '0', the modem sends another 'CONNECT', result code to the DTE after the current frame is sent. The modem continues to transmit flags until the DTE takes one of the following actions: The DTE sends additional data. The modem

then transmits another frame.  
· The DTE sends only <DLE> <ETX> (a null frame).

· The modem then turns off the transmit carrier and send the 'OK' result code to the DTE. If the DTE transmits no additional data within 5 seconds from when the modem reported the 'CONNECT' result code, the modem turns off the transmit carrier mode, returns to command mode, and sends the 'ERROR' result code to the DTE.

In HDLC transmit mode, the modem performs HDLC transparency functions, FCS generation, and buffers the transmit data. The modem uses the configured method of flow control to pause the DTE as necessary.

NOTE: If the modem is on-hook, it always returns an 'ERROR' message to the DTE after receiving the +FTH=<mod> command.

Range:<mod>=3

+FTM=n none **Transmit Data: The +FTM=<mod>command** causes the modem to transmit data using the modulation selected in <mod>.  
The modem returns a 'CONNECT' result code and transmits the proper training sequence in the selected mode, followed by constant '1' bits until data is received from the DTE. The modem terminates this command upon detecting <DLE> <ETX> characters in the data stream. If the modem's transmit buffer empties and the last transmitted character is an ASCII NULL (00), the modem continues to transmit NULLs until the DTE sends more data or 5 seconds have elapsed. After 5 seconds have elapsed with an

empty transmit buffer, the DCE turns off the transmit carrier, returns to command state, and returns an 'ERROR' result code to the modem.  
 NOTE: Hex \$00 replication does not provide the required timing needed for generating the TCF frame (1.5 seconds of '0's').

If the modem's transmit buffer empties and the last transmitted character was not a NULL, the modem turns off the transmit carrier, returns to command state, and sends the 'OK' result code to the DTE.

NOTE: If the modem is on-hook, the modem always returns an 'ERROR' message to the DTE after receiving the +FTM=<mod> command.  
 Range:<mod>=24,48,72,73,74,96,97,98,121,122,145,146

**Stop transmission and Pause:** The +FTS=<TIME> command causes the modem to stop all transmissions. The modem waits for the specified amount of time, then sends an 'OK' result code to the DTE. The value<TIME> is in 10-ms intervals.  
 Range:<TIME>=0-255 (in 10-ms intervals)

### 2.4 AT Command 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: Verbose code and Numeric code.

Numeric Code	Verbose Code
0	OK
1	CONNECT
2	RING
3	NO CARRIER

4	ERROR
5	CONNECT 1200
6	NO DIALTONE
7	BUSY
8	NO ANSWER
23	CONNECT 75/1200
22	CONNECT 1200/75
10	CONNECT 2400
11	CONNECT 4800
24	CONNECT 7200
12	CONNECT 9600
25	CONNECT 12000
13	CONNECT 14400
59	CONNECT 16800
14	CONNECT 19200
61	CONNECT 21600
62	CONNECT 24000
63	CONNECT 26400
64	CONNECT 28800
65	CONNECT 31200
33	CONNECT 33333
6	CONNECT 33600
34	CONNECT 37333
28	CONNECT 38400
35	CONNECT 41333
36	CONNECT 42666
37	CONNECT 44000
38	CONNECT 45333
39	CONNECT 46666
42	CONNECT 48000
43	CONNECT 49333
53	CONNECT 50666
54	CONNECT 52000
55	CONNECT 53333



## CHAPTER 3 S-REGISTERS

The 56-kbps FastPath chipsets provide direct access to the internal registers known as S-registers. The DTE uses S-registers to set up and check modem configurations. The contents of these registers can be changed using the ATSn=x command, where 'n' is the register number and 'x' is the value to be stored. The contents of the S-registers can be read using the ATSn? command. Most S-registers can be read from or written to; however, some S-registers (such as S14) are read-only. Writing to a read-only register may cause the modem to act improperly (that is, even though the contents of a read-only S-register may be changed using the ATSn=x command, changing the contents of the S-register does not normally configure the entire modem).

Reserved S-registers are used by the modem and provide no valuable information to the DTE. These registers should never be written to, as they cause the modem to lock up. A list of the supported S-registers follows.

Table 3-1 S-Register

Command	Function	Default	Type	Reported by & Vn	Page
S0*	Number of rings to auto - answer on	0	R/W	Yes	108
S1	Ring count	0	R/W	Yes	108
S2*	Escape character	43	R/W	Yes	108
S3	Carriage return character	13	R/W	Yes	108
S4	Line feed character	10	R/W	Yes	108
S5	Backspace character	8	R/W	Yes	108
S6*	Wait before dialing	2	R/W	Yes	109
S7*	Wait for carrier	60	R/W	Yes	109
S8*	Pause time for dial modifier	2	R/W	Yes	109
S9*	Carrier recovery time	6	R/W	Yes	109

S10*	Lost carrier hang up delay	14	R/W	yes	109
S11*	DTMF dialing speed	95	R/W	yes	110
S12*	Guard time	50	R/W	yes	110
S14*	Bit-mapped options	None	R	no	110
S16	Modern test options	None	R	no	111
S18*	Modern test timer	0	R/W	yes	111
S21*	Bit-mapped options	None	R	no	112
S22*	Bit-mapped options	None	R	no	112
S23*	Bit-mapped options	None	R	no	113
S25*	Detect DTR change	5	R/W	yes	113
S27*	Bit-mapped options	None	R	yes	113
S30*	Disconnect Inactivity	0	R/W	no	114
S31*	Bit-mapped options	None	R	no	114
S32*	X2 mode enable	32	R/W	yes	114
R/W	Sleep mode timer	10	R/W	yes	115
S37*	Maximum line speed attempted	0	R/W	yes	115

(\*) Value Saved in NVRAM (R) Read-only register  
(R/W) Read/write register

### S-Register Definitions

#### S0 Number of Rings to Auto-Answer on

Sets the number of the rings required before the modem automatically answer a call. Setting this register to zero disables auto-answer mode.

Range: 0-255 rings

Default: 0 Auto-answer mode disabled

#### S1 Ring Counter

S1 is incremented each time the modem detects a ring signal on the telephone line. S1 is cleared if no rings occur over an eight second interval.

Range: 0-255 rings

Default: 0 rings

#### S2 Escape Character

S2 specifies an ASCII value for the Hayes or TIES escape character. The factory default is '+' or ASII decimal 43. The escape character may range between 0-127. Any value over 127 disables the escape sequence.

Range: 0-127, ASCII decimal

Default: 43(+)

50

#### Carriage Return Character

Range: 0-127, ASCII decimal

Default: 13 (carriage Return)

#### S4 Line Feed Character

Range: 0-127, ASCII decimal

Default: 10 (Line Feed)

#### S5 Backspace Character

Range: 0-32,127

Default: 8 (Backspace)

#### S6 Wait Before Blind Dialing

Range: 2-255 seconds

Default: 2

#### S7 Wait for Carrier / Dial Tone

Range: 1-255 seconds

Default: 60

#### S8 Pause Time for Dial Modifier

Sets the time, in seconds, that the modem must pause when the " " dial modifier is encountered in the dial string.

Range: 0-255 seconds

Default: 2

#### S9 Carrier Detect Recovery Time

Range: 1-255 tenths of a second

Default: 6 (0.6 second)

### S10 Lost Carrier Hang Up Delay

sets the time, in tenths of a second, that the modem waits before hanging up after a loss of carrier.

Range: 1-255 tenths of a second  
Default: 14 (1.4 seconds)

### S11 DTMF Dialing Speed

Sets the duration of tones in DTMF dialing.

Range: 50-255 milliseconds  
Default: 70 (70 milliseconds)

### S12 Guard Time

S12 is used to specify guard and detect times used for the Hayes and TIES escape sequences.

For the Hayes Escape Sequence, S12 specifies the minimum-delay timer (or guard time) before and after the three escape characters that is required for the modem to detect the Hayes Escape Sequence.

For TIES, S12 specifies the maximum time limit that must elapse after receiving the three escape characters (and no other characters) before sending an OK message to the DTE.

Range: 0-255 1/50 of a second  
Default: 50 (1 second)

### S13 Reserved

### S14 Bit Mapped Options

S14 is a read-only register that indicates AT command settings.

Default:	170	Reserved
Bit 0		Reserved
Bit 1	0	E0 is selected
	1*	E1 is selected
Bit 2	0*	Q0 is selected
	1	Q1 is selected

Bit 3 0 V0 is selected

1\* V1 is selected

Bit 4 Reserved

Bit 5 0 T (tone) dial is selected

1\* P (pulse) dial is selected

Bit 6 Reserved

Bit 7 0 Answer

1\* Originate

### S15 Reserved

### S16 Modern Test Options

Indicates the last in progress status.

Default: 0  
Bit 0 0\* Local analog loopback disabled

Bit 1 1 local analog loopback enabled (&T1)

0\* Reserved

Bit 2 0\* Local digital loopback disabled

1 local digital loopback enabled (&T3)

Bit 3 0\* Remote digital loopback of

1 Remote digital loopback in progress (&T6)

Bit 4 0\* RDL not active

1 RDL request from distant end is in service

Bit 5 0\* Remote digital loopback with self-test disabled

1 Remote digital loopback with self-test enabled (&T7)

Bit 6 0\* Analog loopback with self-test disabled

1 Analog loopback with self-test enabled (&T8)

Bit 7 0 Reserved

### S17 Reserved

### S18 Modern Test Timer

S18 specifies the length of time that the modem conducts one of the data modem loopback tests (&Tr). After timing out, the modem returns to command mode. Setting S18 to '0' disables the modem test timer; the loopback test must

be terminated by issuing the appropriate escape sequence followed by an AT&T0 or ATH.

Range: 0-255 seconds  
Default: 0 seconds

**S19 Reserved**

**S20 Reserved**

**S21 Bit Mapped Options**

Indicates the status of command options.

Default: 48(30h)(00110000b)

S21 is a read-only register that indicates AT command settings.

Bits 00*	1	&J0 is selected
Bits 1	1	&J1 is selected
Bits 20	Reserved	
		&R0 is selected
	1	&R1 is selected
Bits 4-3	00	&D0 is selected
	01	&D1 is selected
	10*	&D2 is selected
	11	&D3 is selected
Bits 50	1*	&C0 is selected
		&C1 is selected
Bits 60*	1	&S0 is selected
	1	&S1 is selected
Bits 70*	1	Y0 is selected
	1	Y1 is selected

**S22 Bit Mapped Option**

Indicates the status of command options.

Default: 118(76h)(01110110b)

S22 is a read-only register that indicates AT command settings.

Bits 1-0	00	L0 is selected
	01	L1 is selected

Bits 3-2	10*	L2 is selected
	11	L3 is selected
	00	M0 is selected
	01*	M1 is selected
	10	M2 is selected
	11	M3 is selected

Bits 6-4	000	X0 is selected
	001	Reserved
	010	Reserved
	011	Reserved
	100	X1 is selected
	101	X2 is selected
	110	X3 is selected
	111*	X4 is selected

Bits 70*	1	&P0 is selected
	1	&P1 is selected

**S23 Bit Mapped Options**

Indicates the status of command options.

Default: none

Bit 0	0	&T5 is selected
	1*	&T4 is selected
Bit 3-1	000	0-300 bps communications rate
	001	1200 bps
	010	2400 bps
	011	4800 bps
	100	7200 bps
	101	9600 bps
	110	19,200 bps
	111	*38.4 bps
Bit 5,4	00*	Even parity
	01	Space parity/no parity
	10	Odd parity
	11	Mark
Bit 7,6	00	&G0 is selected

- 01 &G1 is selected
- 10 &G2 is selected
- 11 Reserved

**S25 Detect DTR Change**

S25 defines the minimum amount of time that DTR has to remain by &Dn command. A change in DTR that persists for a shorter time than the value specified in S25 is ignored by the modem (see the &Dn command).

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

Default: 5

**S27 Bit-Mapped Options**

Indicates the status of command options.

Default: 64(40h)(01000000b)

Bit 3,1,0 000\* &Q0 is selected

- 001 reserved
  - 010 reserved
  - 011 reserved
  - 100 reserved
  - 101 reserved
  - 110 reserved
  - 111 reserved
- Reserved
- Bit 2,4,5
- 00 B0 is selected
  - 01\* B1 is selected
  - 10 B2 is selected
  - 11 B3 is selected

**S30 Disconnect Inactivity Timer**

This S-register sets the length of time (in minutes) that the modem stays online/off-hook before disconnecting when no data is being transmitted or received. In data and fax modes, any data transmitted or received between the DTE-DCE interface resets the timer. In all other modes (except Telephone-Emulation mode), any data transmitted resets the timer. In Telephone-Emulation

mode, S30 is ignored (that is, the modem does not disconnect).  
 Range: 0-255 minutes  
 Default: 0 (Disabled).

**S31 Bit Mapped Options**

Default: none

S31 is a read-only register that indicates AT command settings.

- Bit 0 0 N0 is selected  
1\* N1 is selected
- Bit 1 0\* &U0 is selected  
1 &U1 is selected
- Bit 2 Reserved
- Bit 3 0 -C0 is selected  
1\* -C1 is selected
- Bit 4 0 %E0 is selected  
1\* %E1 is selected
- Bit 5 0 %G1 is selected  
1\* %G1 is selected
- Bit 6,7 Reserved

**S32 x2 Mode Enable**

Bit 5 of the S32 register enables the x2 mode. When x2 is disabled, the modem defaults to V.34 mode. See the +MS=m command on

- Default:32
- Bit 0 Reserved
  - Bit 1 Reserved
  - Bit 2 Reserved
  - Bit 3 Reserved
  - Bit 4 Reserved
  - Bit 5 0 V.34 mode is enabled  
1\* x2 mode is enabled
  - Bit 6,7 Reserved

**S33 Sleep Mode Timer**

S33 determines when the modem enters sleep or power-down mode.

When enabled (S33 ≠ 0), the controller enters sleep mode whenever the modem has been inactive for a user-programmable time delay(S33). The modem is considered to be in an inactive state when:

- 1) No internal processing is being performed;
- 2) No activity occurs between the host and the modem within a specified time period;
- 3) The modem is off-line.

The modem exits sleep mode whenever the host reads or writes to the modem register when a ring signal is detected.

sleep mode is disabled by setting S33 to '0'.

Range: 0-90 seconds

Default:10

### S37 Maximum Line Speed Attempted

Maximum Line Speed Attempted: This S-register selects the maximum line speed allowable (that is, the modem attempts to connect at this speed or falls back to a lower speed). Settings for Bn, +MS=m, Nn, and S37 determine the allowable modem connections. S37 provides the same information as the +MS=m<max rate>parameter. Changing the +MS=m<max rate>parameter automatically changes the value of S37. For example, setting +MS=m<max rate> to 0 sets S37 to 0. Note that S37 has no effect during V.32 bis retraining/retraining/rate negotiation(see section 3.8 on page 31 for more details).

Default:0

n=0-35	DTE rate
n=0	Reserved
n=1	Reserved
n=2	Reserved
n=3	300
n=4	Reserved
n=5	200
n=6	2400
n=7	4800
n=8	7200
n=9	9600

n=10	12,200
n=11	14,400
n=12	16,800
n=13	19,200
n=14	21,600
n=15	24,000
n=16	26,400
n=17	28,800
n=18	31,200 (reserved for future products)
n=19	33,600 (reserved for future products)
n=20	36,000
n=21	33,333
n=22	37,333
n=23	41,333
n=24	42,666
n=25	44,000
n=26	45,333
n=27	46,666
n=28	48,000
n=29	49,333
n=30	50,666
n=31	52,000
n=32	53,333
n=33	54,666
n=34	56,000
n=35	57,333

## CHAPTER 4 AT COMMAND SET SUMMARY

### Basic Data AT Commands

Note	Command	Function	Default	Range	Reported by & Vn
**	A/	Repeat last command	none	-	no
	A	Answer	none	-	no
*	Bn	Select ITU-T or Bell	1	0-3	yes
	B0	Selects ITU-T V.22 at 1200 bps and ITU-T V.21 at 300 bps			
	B1	Selects Bell 212A at 1200 bps and Bell 103J at 300 bps			
	B2	Selects ITU-T V.23 only. The originating modem transmits at 75 bps (and receives at 1200 bps); the answering modem receives at 75 bps (and transmits at 1200 bps)			
	B3	Selects ITU-T V.23 only. The originating modem transmits at 1200 bps (and receives at 75 bps); the answering modem receives at 1200 bps (and transmits at 75 bps)			
	Cn	Carrier control option	1	0,1	no
	C0	Transmit carrier always off			
	C1	Normal transmit carrier			
	D	Dial command	none	-	no
*	En	Command mode echo	1	0,1	yes

	E0	Disables echo			
	E1	Enables echo			
	FN	Online echo	1	0,1	no
	F0	Enables online echo			
	F1	Disables online echo			
	Hn	Switch hook control	0	0,1	no
	H0	Hangs up the telephone line			
	H1	picks up the telephone line			
	IN	Identification/checksum option	0	0-14 20-24	no
	10	Reports product code			
	11	Reports modern chip firmware version			
	12	Verifies ROM checksum			
	13	Reports chipset name			
	14	Reserved			
	15	Reserved for modem chip hardware configuration			
	16	Country code			
	17	Version of board manufacturer firmware			
	18	Features of modem firmware			
	110	Modern board configuration-bits set by board manufacturer			
	111	Modern board configuration-bits set by board manufacturer			
	114	SAFE device			
	120	Cirrus Logic silicon version			
	121	Cirrus Logic firmware version			
	122	Cirrus Logic manufacturer name			

	123	Cirrus Logic product model					
*	Ln	Speaker volume control	2	0-3		yes	
	L0	Low speaker volume					
	L1	Low speaker volume					
	L2	Medium speaker volume					
	L3	High speaker volume					
	Mn	Speaker control	1	0-3		Yes	
*	M0	Speaker always off					
	M1	Speaker on until carrier present					
	M2	Speaker always on					
	M3	Speaker off during dialing; Speaker on until carrier present					
*	Nn	Select data rate handshake	1	0,1		Yes	
	N0	Handshake only at DTE-to-modem data rate					
	N1	Begins handshake at Date-to-modem data rate and falls to highest compatible rate					
	On	Go online	0	0,1		No	
	O0	Retrains equalizer and then returns to Data mode					
	O1	Retrains equalizer and then returns to Data mode					
*	P	Select pulse dialing	None	-		Yes	
*	Qn	Result code display control	0	0,1		Yes	
	Q0	Enables result codes					
	Q1	Disables result codes					
	Sn	Select an S-register	None	0-37		No	
	Sn=x	Write to an S-register	None	N=0-37 X=0-255		no	
	Sn?	Read from an S-register	None	0-37		No	
*	T	Select tone dialing	None	-		No	

*	Vn	Result code form	1	0,1	Yes	
	V0	Choose numeric form				
	V1	Choose verbose (text)form				
*	Wn	Response code data rate	0	0-4	Yes	
	W0	Reports DTE speed				
	W1	Reports DTE speed				
	W2	Reports DTE speed				
	W3	Reports DTE speed and information on error correction and data compression				
	W4	Reports protocol, data compression, and DTE data rate				
*	Xn	Result code type	4	0-4	Yes	
	X0	Enables result codes 0-4; disables detection of busy and dial tone				
	X1	Enable result codes 0-5, 10, and above; disables busy and dial tone detection				
	X2	Enables result codes 0-6 and 10 and above; disables busy detection and enables dial tone detection				
	X3	Enables result codes 0-5,7, and 10 and above; enables busy detection and disables dial tone detection				
	X4	Enables result codes 0-7				



		and 10 and above; enables busy and dial tone detection			
*	&Yn	Long space disconnect	0	0,1	Yes
	Y0	Disables long space disconnect			
	Y1	Enables long space disconnect			
	Zn	Recall stored profile	0	0,1	No
	Z0	Resets modem and recalls user profile 3			
	Z1	Resets modem and recalls user profile 1			
*	&Cn	DCD (data carrier detect) option	1	0,	Yes
	&C0	Ignores remote modem status; DCD always on			
	&C1	DCD set according to remote modem status			
	&Dn	STR(data terminal ready) option	2	0-3	Yes
	&D0	In Async mode, modem ignores DTR			
	&D1	Modem switches from data mode to command mode when an on-to-off transition of DTR occurs			
	&D2	When DTR switches off, the modem goes on-hook and disables Auto-answer mode; when DTR switches on, auto-answer is enabled			
	&D3	Turing off DTR re-initializes modem and resets values except UART registers			

*	&F	Load factory defaults	None	-	No
*	&GN	Guard tone option (1200 bps and 2400 bps only)	0	0-2	Yes
	&C0	Disables guard tone			
	&G1	Enables 550-Hz guard tone			
	&G2	Enables 1800-Hz guard tone			
*	&Jn	Auxiliary relay control	0	0,1	Yes
	&J0	Auxiliary relay never operated			
	&J1	Activates auxiliary relay when modem is off-hook			
	&Kn	Select serial flow control	3	0,3,4	Yes
	&K0	Disables flow control			
	&K3	Bidirectional hardware flow control			
	&K4	XON/XOFF software flow control			
*	&M0	Communication mode option-modem supports only Async mode	0	0	No
*	&Pn	Dial pulse ratio	0	0,1	Yes
	&P0	Sets 10-pps pulse dial with 39%/61% make-break			
	&P1	Sets 10-pps pulse dial with 33%/67% make-break			
*	&Q0	Communication mode option-modem supports only Async mode	0	0	Yes
*	&Sn	DSR (data set ready) option	0	0,1	Yes
	&S0	DSR is always active			
	&S	DSR active only during handshaking and when carrier is lost			
	&Tn	Self test commands (not x2)	0	0-8	No

		(mode)				
*T0	Terminates test in progress					
&T1	Initiates local analog loopback					
&T4	Grants RDL request from remote modem					
&T5	Denies RDL request from remote modem					
&T6	Initiates remote digital loopback					
&T7	Starts remote digital loopback with self-test					
&T8	Initiates local analog loopback with self-test					
* &Un	Disable Trellis coding	0	0.1	Yes		
&U0	Enables Trellis coding with QAM as fallback					
&U1	QAM modulation only					
&Vn	View active and stored profiles	0	0.1,3	No		
&V0	View stored profile 0					
&V1	View stored profile 1					
&V3	View relay and general-purpose input-output status					
&Wn	Stored active profile	0	0.1	No		
&W0	Store in user profile 0					
&W1	Store in user profile 1					
* &Yn	Select stored profile on power up	0	0.1	Yes		
&Y0	Recall stored profile 0 on power-up					
&Y1	Recall stored profile 0 on power-up					
&Zn=x	Store telephone number (up to 30 digits) to location 'n' (0-	None	N=0-3 X=0-9	NO		

USER'S MANUAL

	3)		ABCD #*TPR W@,!
* %En	Auto-retrain control	1	0.1
%E0	Disables auto-retrain		Yes
%E1	Enables auto-retrain		
* %Gn	Rate re-negotiation	0	0.1
%G0	Disabled		Yes
%G1	Enabled		
* -Cn	Generate data modem calling tone	1	0-2
			Yes

\* Value saved in NV-RAM.

\*\* Command not proceeded by an 'AT'.

V.42/V.42 bis MNPR AT Commands

-C0	Calling tone disabled				
-C1	1300-Hz calling tone enabled				
-C2	V.8 calling tone and 1300-Hz calling tone				
+GMI?	Identify modem manufacturer	None	-	No	
+GMM?	Identify product model	None	-	No	
+GMFR?	Identify product revision	None	-	No	
+MS=m	Modulation selections	VX2.1,3	See Note	No	
		00,0			
<b>Note</b>	<b>Command</b>	<b>Function</b>	<b>Default</b>	<b>Range</b>	<b>Reported by &amp;Vn</b>
*	%An	Set auto-reliable fallback character	1	0-127	Yes
*	%Cn	MNP 5 data compression control	1	0.1	Yes
	%C0	No compression			
	%C1	Enables MNP5 data			

CHAPTER 4 AT COMMAND SET SUMMARY

		compression				
*	\An	MNP block size				
	\A0	Maximum 64 characters	3	0-3	Yes	
	\A1	Maximum 128 characters				
	\A2	Maximum 192 characters				
	\A3	Maximum 256 characters				
*	\Bn	Transmit break	None	0-9	No	
*	\Cn	Set auto-reliable buffer	0	0-2	Yes	
	\C0	No data buffering				
	\C1	Four-second buffer until 200 characters in the buffer or detection of a YN character				
	\C2	No buffering. Connects non-V.42 modems to V.42 modem				
*	\Gn	Set modem port flow control	0	0,1	Yes	
	\G0	Disables port flow control				
	\C1	Sets port flow control to XON/XOFF				
*	\In	BPS RATE ADJUST CONTROL	0	0,1	Yes	
	\I0	Disables rate adjust				
	\I1	Enables rate adjust				
*	\Kn	Set break control	5	0-5	Yes	
	In connect state, transmits break to remote (if in Reliable mode):					
	\K0,2,4	Enters Command mode, no break sent				
	\K1	Destructive/expedited				
	\K3	Nondestructive/expedited				
	\K5	Nondestructive/non-expedited				
	In connect state, receives break at modem port (if in Reliable mode):					
	\K0,1	Destructive/expedited				
	\K2,3	Nondestructive/expedited				

	\K4,5	Nondestructive/expedited				
	In connect state, receives break at modem port (if in Reliable mode):					
	\K0,2,4	Immediately sends break and enters command state				
	\K1,3,5	Immediately sends the break through				
	In connect state, receives break at modem port and sends to serial port::					
	\K0,1	Destructive/expedited				
	\K2,3	Nondestructive/expedited				
	\K4,5	Nondestructive/non-expedited				
*	\Kn	Set operating mode	3	0-4	Yes	
	\N0,1 <sup>4</sup>	Selects buffer (normal) mode with speed buffering				
	\N2	Selects MNP Reliable mode				
	\N3	Selects V.42 Auto-reliable mode				
	\N4	Selects V.42 Reliable mode				
	\O	Originate reliable link	None	-	No	
*	\Qn	Set serial port flow control	3	0-3	Yes	
	\Q0	Disables flow control				
	\Q1	XON/XOFF software flow control				
	\Q2	Unidirectional hardware flow control				
	\Q3	Bidirectional hardware flow control				
*	\T0	Disables inactivity timer	0	0-90	Yes	
	\U	Accept reliable link	None	-	No	
*	\Xn	Set XON/XOFF pass-through	0	0,1	Yes	
	\X0	Processes flow control characters				
	\X1	Processes flow control				

	characters and passes to local or remote				
"Y	Switch to Reliable mode	None	-	No	No
"Z	Switch to Normal mode	None	-	No	No
*-Jn	Set V.42 detect phase	1	0,1	Yes	Yes
-J0	Disables the V.42 detect phase				
-J1	Enables the V.42 detect phase				
*"Hn	V.42 bis compression control	3	0-3	Yes	Yes
"H0	Disables V.42 bis				
"H1	Enables V.42 bis only when transmitting data				
"H2	Enables V.42 bis only when receiving data				
"H3	Enables V.42 bis for both transmitting and receiving data				
"On	V.42 bis string length	32	6-250	Yes	Yes

\* Value saved in NVRAM.  
**Fax Identity Commands**

Command	Function	Default	Range	Reported by & Vn
*FMDL?	Identifies product model	None	-	No
*FMFR?	Identifies modem manufacturer	None	-	No
*FMI?	Identifies modem manufacturer	None	-	No
*FMM?	Identifies product model	None	-	No
*FMR?	Identifies product version number	None	-	No
*FREVP?	Identifies product version number	None	-	No

**Fax Identity Commands**

Command	Function	Default	Range	Reported by & Vn
+FAE=n	Fax/data auto recognition	0	0,1	No
+FCLASS=1	Mode selection	0	0,1,8,8,0	Yes
+FRH=n	Receive HDLC data	None	3	No
+FRM=n	Receive data	None	24,48,72,73,74,96,97,98,121	No
+FRS=n	Wait for silence	None	,122,145,146,1-255	No
+FTH=n	Transmit HDLC data	None	3	No
+FTM=n	Transmit data	None	24,48,72,73,74,96,97,98,121,122,145,146	No
+FTS=n	Stop transmission and pause	None	0-255	No

**S-Registers Summary**

Note	Register	Function	Default	Range	Units	Reported by & Vn
*	S0	No. of rings to auto-answer on	0	0-255	Ring	Yes
*	S1	Ring count	0	0-255	Ring	Yes

*	S2	Escape character	43	0-127	ASCII	Yes
*	S3	Carriage return character	13	0-127	ASCII	Yes
*	S4	Line feed character	10	0-127	ASCII	Yes
*	S5	Backspace character	8	0-32,127	ASCII	Yes
*	S6	Wait before dialing	2	2-255	Second	Yes
*	S7	Wait for carrier	60	1-255	Second	Yes
*	S8	Pause time for dial modifier	2	0-255	Second	Yes
*	S9	Carrier recovery time	6	1-255	0.1 Second	Yes
*	S10	Lost carrier hang up delay	14	1-255	0.1 second	Yes
*	S11	DTMF dialing speed	70	50-255	second	Yes
*	S12	Guard Time	50	0-255	ms (0.02 second)	Yes
*	S14	Bit-mapped options	170	-	-	No
*	S16	Modern test options	0	-	-	No
*	S18	Modern test timer	0	0-255	Second	Yes
*	S21	Bit-mapped options	48	-	-	No
*	S22	Bit-mapped options	118	-	-	No
*	S23	Bit-mapped options	None	-	-	No
*	S25	Detect DTR change	5	0-255	0.01 second	Yes
*	S27	Bit-mapped options	64	-	-	No
*	S30	Disconnect inactivity timer	0	0-255	Minute	Yes
*	S31	Bit-mapped options	None	-	-	No
*	S32	X2 mode enable	32	0-255	-	Yes
*	S33	Sleep mode timer	10	0-90	Second	Yes
*	S37	Maximum line speed attempted	0	0-35	-	Yes

\*Value saved in NVFRAM.

## Dial Modifiers

Command	Function
0 to 9	Dialing digits
A,B,C,D,*,#	Tone dial characters
P	Pulse dial
R	Reverse Originate mode
S=n	Dial NVFRAM telephone number
T	Tone dial
W	Wait for dial tone
	Pause
	Flash hook
@	Wait for quiet answer
;	Return to command state
-( )	Ignored by modem

## CHAPTER 5 APPLICATION EXAMPLES

### [Dialing a Remote Modem]

**Command line: ATDP9W7002, (886)-1234567 <CR>**

This command line instructs the modem to dial a remote modem through a PBX. The modem first uses pulse dialing to dial 9 (the access code of the PBX), waits for outside dial tone, and then uses 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 8861234567.

### [Dial s Stored Number]

**Command line: AT&Z2=T03, 123456<CR>**

**Command line: ATDS=2<CR>**

The first command line stores the dial string T03, 123456 to the 3rd location in NVRAM. Afterward you can use the second command line to dial this stored number. The dial string T03, 123456 will appear on the screen to indicate the number being dialed.

### [Manual Answer an Incoming Call]

**Command line: ATA<CR>**

The factory setting of the S-Register S0 is S0=0. This command 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

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.

### [Auto Answer an Incoming Call]

**Command line: ATS0=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 instructs 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.

**[Force V.42 bis data compression with LAP-M error correction]**

**Command line: ATVN4%C2-K0**

**[Force V.42 bis data compression with MNP error correction]**

**Command line: ATVN5%C2**

**[Force MNP 5 data compression with MNP error correction]**

**Command line: ATVN5%C1**

If the remote is unable to negotiate the desire rate mode, the modem will disconnect and respond with NO CARRIER.

**[Auto negotiate data compression and error correction]]]]**

**Command line: AT&F**

or

**Command line: ATVN3%C3**

In this mode, the modem prefers LAP-M over MNP 10, MNP 10 over MNP 4, and V.42 bis over MNP 5. If error correction is not negotiated, the modem will connect in normal mode.

## CHAPTER 6 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/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. 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 port 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 6.1. 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.

### [You Can Not 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.

### [Finding the Source of Transmission Errors]

A failure in modem communication is usually characterized by unacceptable high error rates or a total inability to communicate. It may be the fault of the local computer or terminal, the local modem, the telephone line, the remote modem or terminal.

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## CHAPTER 7 FIRMWARE SOFT UPGRADES

This V.90 56Kbps Fax/Modem PC card offers the capability of firmware upgrade for the users. Use the download program provided in the driver disk, one can easily upgrade the new firmware into the flash memory in our Fax/Modem card.

Run the LOAD.EXE under the DOS system, the program guide will be launched which can help the users to know how to use the program.

For example, the users can type as follow :

**"C:>LOAD -MAUTO -C2 filename.bin"**  
to download the filename.bin into the flash memory through the COM2 port in auto detection mode.