V.3225 and V.3225L Manual

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ARC ELECTRONICS
800-926-0226 / 281-302-6333

http://www.arcelect.com/
arc@arcelect.com

Chapter 5
Asynchronous Operating Commands

GENERAL

This chapter describes the asynchronous operating commands used to select options, test, and operate the modem. These commands are based on the AT command set and extensions. Certain options are dependent on or are restricted by the mode of operation. For example, remote DCD is not available in the V.22 bis or Bell 103 modes of operation. Refer to Chapter 7 for V.25 bis synchronous operating commands.

> *Note: If AT commands are accidentally disabled, refer to the section called AT Command Set Recover later is this chapter.*

COMMAND CATEGORIES

The modem offers eight major categories of command statements:

- Response
- Dial
- Terminal Interface
- Test
- General
- Remote Configuration
- Protocol
- S-registers (Chapter 6)

OPERATION MODES

During asynchronous operation the modem functions in one of three modes:

- Offline Command Mode
- Online Command Mode
- Data Mode

Offline Command Mode

In offline command mode (generally referred to as command mode), the modem accepts commands from the computer or terminal. Commands can be entered separately or in strings to change modem options, rebuild profiles, store or change telephone numbers, and initiate or receive phone calls. There is no data communication link established in this mode.

Online Command Mode

This mode is entered from the data mode by issuing the escape command. The data communication link remains established but data transmission is suspended. The modem will now accept commands like it does in the offline command mode.

Data Mode

The modem goes to data mode (online) after it successfully connects with a compatible modem. In data mode, the modem sends and receives data, but will not accept or execute command instructions.

Example: The modem is in the command state. The D command and phone number are used to dial a remote modem. The local modem waits to receive a signal from the remote modem. The remote modem acknowledges the call by sending a carrier signal. When the local modem receives this carrier, it leaves the command state and goes online in the data mode. At this time, both modems are using the telephone line and a communication link is established.

In online command mode, the modem can have its own command set altered or use remote configuration to change a remote modem's command set.

SENDING COMMANDS TO THE MODEM

When the computer, modem, and monitor are on, an instruction can be sent to the modem telling it what function or activity to perform. The instruction, called a command statement, command string, or just command, is typed using the computer keyboard. The command statement temporarily resides in a section of memory called the command buffer.

Each command statement is made up of characters, numbers, and such keyboard symbols as the & and % signs. Commands must be written in a specific form so that the modem recognizes and follows the instruction.

Creating a Command Statement

Create a command statement using the following steps:

- Type AT. This is the Attention Code telling the unit a command statement follows.
- Type the command.
- Press the return key to "Enter" or send the command statement to the modem.

Here is an example of a command statement using the dial command (D).

ATD555-1212

This command statement can be read as:
Attention: Dial 555-1212.

Another example is: Enter ATZ. This means Attention: execute the Z command.

After you enter a command line the modem returns a response message indicating whether or not the command was accepted or giving the data requested by the command statement. To clear each command statement from the buffer perform one of the following:

- Turn the modem off.
- Enter AT
- Use the DTR reset feature.

Autobaud

The attention code (AT) is analyzed by the modem todetermine the transmission speed, parity, and bits per character used by the DTE. This autobaud process is repeated each time the AT command prefix is sent.

Guidelines for Creating Command Statements

When typing command statements, note the following:

- The attention code (AT) may be upper or lower case, but not a combination like aT.
- Return must be pressed to execute (Enter) a command.
- Command statements are limited to 40 characters.
- Use the backspace or delete key to erase the last character.

Even though the initial AT code must be all upper or lower case, characters that follow can be any mix of upper and lower case.

Monitor Display

As commands are typed they appear on the monitor so the operator can verify the input. This is called local character echo. The echo may be turned on or off using AT commands. Refer to Local Character Echo in the GENERAL COMMANDS section of this chapter for details.

Command Statement Buffer

The modem temporarily stores up to 40 characters in a buffer memory. If this limit is exceeded, the modem does not accept the command and sends an ERROR message. To correct this condition, retype the command using 40 characters or less. The AT characters and punctuation used in phone numbers do not take up space in the buffer. Also, blank characters used as spaces to help increase readability are not counted. For example, the modem reads the commands

ATD (212) 555-1212
ATD2125551212
ATD 212 555 1212

as having 11 characters each. Type the command in any of these forms.

Note: Phone numbers stored using AT commands are limited to 34 characters.

Backspace Key

Use the backspace key to change the command statement or correct errors. The backspace key allows the cursor to be moved back to the character(s) in error. The command can then be retyped from that point.

Example: ATD5551211 has been typed. To change the last 1 to 2, press the backspace key once, type 2, and press return to execute the command.

Repeating a Command A/

This command tells the modem to repeat the last command stored in its buffer. It automatically reexecutes the command without retyping. The return key does not need to be pressed.

Example: The ATD5551212 command has been executed, and the phone is busy. To repeat the instruction type A/ , but do not use AT before this

command as AT would empty the buffer and there would be no command to repeat.

Numbered Commands

Series of commands that start with the same letter are distinguished by a number following the letter called a command parameter.

For example, the M0 command selects speaker always off, M1 speaker on until carrier detected, and M2 selects speaker always on.

In all cases, the zero (0) may be omitted so the commands M and M0 are identical.

For clarity, this manual uses the nonzero form of commands. The modem treats both the same but zeros count against the buffer total.

Group Commands

A group of commands can be typed in a single command statement. Pressing the return key sends the entire command string to the modem, which executes each command individually in the order it appears in the command statement reading from left to right.

For example, the command statement ATQ0V0L3DT5551212 means

AT Attention.

Q0 Allow response messages to be sent.

V0 Select digit code responses.

L3 Select high volume.

DT Tone dial 555-1212.

The modem executes the AT command followed by the Q, V, L, D, and T commands. Command statement ATQ0V0L3DT5551212 can be read: ATQVL3DT5551212. Eliminating zeros reduces

the number of characters in a command statement, thereby simplifying typing and allowing more room in the buffer.

The dial D command initiates the dial process so no other commands, only dial modifiers, can follow the D command.

COMMAND TABLE

Table 5-1 is a listing of the AT commands used by the modem and provides the page number the command is described on.

Table 5-1
AT Commands

Control Command	General Description	Page Number
A/	Repeat last command	5-5
+ + +	Escape code	5-29
A	Go off hook in answer mode (answer immediately)	5-21
D	Dial	5-16
E	Local terminal echo	5-29
H	Hang up	5-30
I	EPROM check, product revision level and model	5-30
L	Speaker volume	5-30
M	Speaker ON/OFF control	5-31
O	Return online	5-31
Q	Response control	5-12
S	Read or write to S-register	6-4
V	Form of response messages	5-11
X	Call progress control	5-12
Y	Long space disconnect	5-31
Z	Reset	5-41
&C	DCD control	5-22
&D	DTR response	5-23
&F	Load active profile with factory settings	5-41
&G	Guard tones	5-32
&L	Line type (telephone)	5-32
&M	Async/sync data and sync dial method	5-32
&P	Pulse dial make/break ratio	5-33
&R	RTS to CTS delay	5-24
&S	DSR control	5-23
&T	Diagnostic tests	5-26

Table 5-1
AT Commands, continued

Control Command	General Description	Page Number
&V	View configuration profiles/receive signal parameters	5-41
&W	Store active profile	5-39
&X	Synchronous transmit clock source	5-34
&Z	Store phone number	5-42
%A	Auto-reliable fallback character	5-49
%B	Modem speed	5-34
%C	Data compression	5-49
%D	Disconnect buffer delay	5-35
%E	Automatic retrain	5-35
%P	Remote configuration security code	5-44
%T	Transmit test pattern	5-44
%T=	Initiate remote configuration	5-44
%V	Display the modem firmware version	5-35
%Z	Select permissive or programmable mode	5-36
\A	MNP block size	5-52
\B	Transmit a break/set break length	5-53
\C	Auto-reliable buffer	5-53
\G	Modem port flow control	5-46
\J	Constant speed interface on/off	5-46
\K	Break control	5-50
\N	Operating mode	5-45
\O	Originate MNP link	5-54
\Q	Serial port flow control	5-47
\R	Serial port ring indicate	5-24
\T	Inactivity timer	5-52
\U	Accept an MNP link	5-54
\V	Protocol result codes	5-52
\X	XON/XOFF flow through mode	5-48
\Y	Switch to MNP from normal mode	5-54

Table 5-1
AT Commands, continued

Control Command	General Description	Page Number
\Z	Switch to normal from MNP mode	5-55
*AN	Controls bilateral test functions	5-27
*AUn	Selects phone number to autodial	5-19
*CNx,n	Store phone number	5-42
*DA	Selects talk or data mode	5-36
*DB	Selects manual or automatic dial backup	5-25
*DG	controls bilateral test functions	5-27
*FB	DTE fallback control	5-25
*FT	Enables or disables fast train	5-37
*LA	DTE controlled local analog loopback	5-28
*LB	Wait for dial backup call (leased line)	5-27
*LC	Controls line current disconnect	5-27
*LD	Dial autodial number (leased line)	5-27
*ND	Displays the stored numbers	5-42
*NT	Enables/disables AT command set	5-38
*OR	Forces modem to answer or originate mode	5-38
*RC	Number code application	5-14
*RD	DTE controlled remote digital loopback	5-27
*RO	Retain/restore options at disconnect	5-43
*TLn	Leased line TX level	5-38
$S = x	Sets an empty password location to x	5-10
$C = x, y	Changes either password x = old, y = new	4-10
$C = x, -	Deletes password x from memory	4-10
$E = x	Enables security where x is either password	4-10
$E?	Displays the current status of security (on or off)	4-10
$D = x	Disables security where x is either password	4-10
$DR	Reset security	4-10
$D?	Displays the current status of security	4-10
$V	display product serial number	4-10

RESPONSE COMMANDS

The modem communicates with the operator through response messages. These appear on the monitor or a computer printout to show the result of the command or action executed. Response messages can appear as words or as numbers.

How Response Messages Work

When an instruction is executed, the modem sends a message to the monitor showing the results of the instruction.

Selecting Response Form V

V tells the modem which type of response message to show on the monitor. These messages indicate the present state of the modem and can appear as either digit or word messages. Some programming situations require digit response messages but word response messages are preferred because their meanings are easier to remember than digits.

Command	Operation
V	Enables digit response message
V1	Enables word response message*

** default*

Electing to Use Response Messages

The modem comes ready to send response messages which are recommended to monitor modem operation. You can change this by:

- Using the Q command
- Using the X command
- Using the \V command (Refer to Protocol Command section in this chapter.)

Response Commands, Cont.

Enabled/Disabled Response Displays Q

The Q command is used to enable or disable response messages. The modem still responds to commands when the response display is inhibited.

Command	Operation
Q	Response display on*
Q1	Response display off
Q2	Response display on in originate mode only

** default*

Dial Parameter and Connect Speed Displays X

The X command selects response code/message displays and dialing parameters such as call progress monitoring, busy signal or dial tone detection and blind dialing.

Command	Operation
X	Dial tone and busy signal detection not selected. CONNECT (code 1) response messages displayed for all speeds.
X1	Dial tone and busy signal detection not selected. Appropriate CONNECT response messages or codes displayed for data rate.
X2	Dial tone detection only selected. NO DIAL TONE message or code appears if dial tone is not detected within 5 seconds.
X3	Busy signal detection only selected. BUSY message or code appears if dialed number is busy.
X4	Dial tone and busy signal detection selected. The appropriate CONNECT message or code displayed.*

** default*

Response Commands, Cont.

X followed by a dial command causes the modem to go off hook, wait the amount of time set in register S6, and dial the number. If connection is made the modem returns a CONNECT (code 1) message to the screen regardless of the speed of connection. With a basic response, the modem will not detect a busy or no dial tone condition.

X1 followed by a dial command causes the modem to go off hook, wait the amount of time set in register S6, and dial the number. If connection is made the modem returns a appropriate CONNECT message or code to the screen. The modem will not detect a busy or no dial tone situation.

X2 followed by a dial command causes the modem to go off hook and wait for a dial tone before dialing. If a dial tone is not detected within 5 seconds, the modem sends a NO DIALTONE message and hangs up. The modem will not detect a busy situation in this mode.

X3 followed by a dial command causes the modem to go off hook, wait the amount of time set in register S6 and dial the number. If a busy signal is detected, the modem sends a BUSY message and hangs up. If the call is completed, the appropriate CONNECT message similar to X1 will be displayed. The modem will not detect a no dial tone situation.

X4 followed by a dial command causes the modem to go off hook and wait for a dial tone before dialing. If a dial tone is not detected within 5 seconds, the modem returns a NO DIALTONE message and hangs up. If a busy signal is detected, the modem returns a BUSY message and hangs up. If the call is completed, the appropriate CONNECT message similar to X1 will be displayed.

Response Commands, Cont.

The X4 command combines all the features of X2, and X3. The factory setting is X4.

Note: When an X2, X3, or X4 command is in effect, an appropriate CONNECT data rate message or code is displayed as for X1.

When a blind dial command (X, X1, X3) is in effect, the modem waits 2 seconds or the time set by S6 and then dials.

Number Code Application *RC

Some communications software packages use different number codes to indicate the data rate of the serial port. This option selects either of two commonly used number code sets.

Command	Code Set	Number	Operation
*RC	Standard	15	4800 bps
		18	9600 bps
*RC1	Alt	11	4800 bps
		12	9600 bps

*default is *RC*

Note: Asterisks in AT Commands are part of the command and do not indicate footnotes.

Response Commands, Cont.

Response Number Codes/Messages

Response number codes, messages and their corresponding meanings are listed in Table 5-2. The connect speeds indicated are the serial port rate (DTE), not the DCE speed.

Table 5-2
Response Codes/Messages

Code	Message	When Displayed
0	OK	Command received ok
1	CONNECT	300 bps while X1, X2, X3, or X4 command in effect. All DTE rates while X command in effect.
2	RING	Ring detected
3	NO CARRIER	Valid carrier is not detected after call attempt within period specified by register S7, or carrier lost for value of S10 or more.
4	ERROR	Command not recognized or too long
5	CONNECT 1200	Connection made at 1200 bps
6	NO DIAL TONE	No dial tone detected for 5 seconds (X2 or X4 command in effect)
7	BUSY	Dialed number busy (X3 or X4 command in effect)
10	CONNECT 2400	Connection made at 2400 bps
11, 15	CONNECT 4800	Connection made at 4800 bps
12, 18	CONNECT 9600	Connection made at 9600 bps
14	CONNECT 19200	Connection made at 19200 bps
20	CONNECT 300/REL	MNP 300 bps connection
22	CONNECT 1200/REL	MNP 1200 bps connection
23	CONNECT 2400/REL	MNP 2400 bps connection
24	CONNECT 4800/REL	MNP 4800 bps connection
25	CONNECT 9600/REL	MNP 9600 bps connection
26	CONNECT 19200/REL	MNP 19200 bps connection

Note: Indicated speed is DTE speed

DIAL COMMANDS

Dial commands let the modem originate a call to another modem. These commands can be used with either tone or pulse dial telephone systems.

Dialing
D

To Dial a number, for example 555-1212,

Enter AT D 555-1212

The modem dials the number, either pulse or tone, whichever is currently in effect, and takes the role of the originate modem.

Use spaces, hyphens, parentheses, or other punctuation except dial modifiers to make the command line easier to read and enter. For example, these are all treated the same:

AT D 1-800-555-1212
AT D 1 (800) 555-1212
ATD18005551212

The dial modifiers are shown in Table 5-3.

Table 5-3
Dial Modifiers

Modifier	Operation
T	Tone dialing*
P	Pulse dialing
,	Insert a long pause (2 seconds or value in S8)
W	Wait for 2nd dial tone
!	Flash (1/2 second)
R	Switch to answer mode after dialing
@	Wait for silence
;	Return to command mode after dialing
S	Dial stored command line or number

**default*

Dial Commands, Cont.

Tone Dialing
T

To Tone dial a number sequence, insert a T in the dial command.

Enter AT D T 323-1111

In this example, the modem tone dials the telephone number. The dialing method selected remains in effect until changed.

Pulse Dialing
P

To Pulse dial a number sequence, insert a P in the dial command

Enter AT D P 555-9902

Insert Long Pause
,

To Insert a long pause in the dialing sequence, use a comma. This inserts a 2 second delay (or the value in register S8).

Enter AT D P 9, 1-800-555-1000

Here the modem pulse dials a 9, pauses for the telephone system to switch to an outside line, then dials the phone number. Comma pauses may be inserted consecutively if desired.

Wait for Second Dial Tone
W

To Wait for second dial tone

Enter AT D 9 W 323-8000

Instead of using a comma pause for an outside line, you can wait up to 30 seconds (time specified by S7) for a second dial tone.

Dial Commands, Cont.

Switch Hook !

To flash the switchboard, enter an exclamation mark. This inserts a 1/2 second on hook condition, usually for transferring a call or similar use.

AT D T 9W 323-8000 ,!,, #7 377

In this example, the modem tone dials a 9, waits for the second dial tone, dials the phone number, pauses, flashes to start the transfer, pauses twice, then uses #7 to transfer the call to extension 377.

Switching to Answer Mode After Dialing R

To switch to answer mode after dialing, use an R at the end of the dial sequence.

AT D 555-2345 R

Use this command suffix to call an originate-only modem.

Wait for 5 Seconds of Silence @

To wait for 5 seconds of silence (no answer back tone) after accessing an electronic service, use the @ command.

AT D 399-4700 @ 2251 ;

In this example the modem dials the number and, after the connection, waits for 5 consecutive seconds of silence. The modem then sends service code 2251 and returns to command mode for further input.

For example, you might enter a dollar amount for a banking transaction by entering

AT D 1400 ;

This sends the sequence 1400 and then returns to the command mode for further entries, according to the requirements of the banking service.

Dial Commands, Cont.

Remaining in Command Mode ;

To remain in command mode after dialing, place a semicolon at the end of the dial string.

AT D 234-5678 ;

The modem will dial the telephone number entered but will not attempt to train when the remote service answers the call.

This is used to retain control so that further tones may be entered with

AT DTn ;

The semicolon should be placed at the end of each sequence of digits in order to remain in command mode (n=additional tones to be sent).

Dialing a Stored Telephone Command Line S

Use the S command to dial a previously stored command line.

ATDS - Dials number stored at location 1. ATDS and ATDS1 are the same.

To dial one of the multiple stored numbers, enter ATDSn where n is between 1 and 9.

AT D S9

In this example the number stored in location 9 is dialed.

AT*AUn - Selects stored number n (n=1 to 9) to be autodialed. This is the autodial number, which is used for dial backup or if DTR controlled dialer is enabled.

Dial Commands, Cont.

Voice Calls

To make a voice call, place modem in TALK mode by pressing the TALK / DATA button and dial the number with the telephone. If you wish to use the dial command for the call

Enter AT D (number) ;

Then place the modem in TALK mode to give the telephone control of the phone line. The semicolon character (;) recalls the command mode and prevents the modems from training. The remote site must be answered by the telset with the modem in talk mode.

Switch from Voice to Data

After dialing in TALK mode, place the modems in DATA mode by pressing the TALK / DATA button.

ANSWERING A CALL

There are three ways to answer a call for data connection.

- Manual
- AT command
- Autoanswer

The most common is autoanswer.

Manual Answer

When the phone rings, answer by changing the front panel switch from TALK to DATA after the first ring.

AT Command Answer A

The modem can be made to go off hook in the answer mode by entering ATA when the phone rings. This commands the modem to go to the answer mode and connect.

Autoanswer S0

Autoanswer is controlled by register S0. S0 determines which ring the modem answers on. S0 can be loaded with a value between 1 and 255 for autoanswer.

Entering ATS0=0 disables the autoanswer feature. Decide which ring the modem is to answer on and set S0 to that decimal value.

> ***Note:*** *If the &D2 option is active, the DTR signal must be on for autoanswer to work.*

When these steps have been taken, the modem automatically answers on the selected ring and connects with the calling modem. This allows two computer systems to exchange data via unattended modems. Actual data transfers may be controlled by the software used by both computers.

TERMINAL INTERFACE COMMANDS

This interface is the connection medium between the modem and its associated data terminal. Terminal interface commands control the action of the modem and the terminal in response to the signals being exchanged on the interface.

Data Carrier Detect &C

When using DCD to indicate a valid carrier, enter AT&C1. Some terminals and other devices require DCD on to communicate with the modem; if so, select &C.

Command	Operation
&C	DCD always on*
&C1	DCD is on when the modem recognizes remote modem carrier or, if enabled, when MNP negotiation is complete
&C2	DCD on except for 5 seconds after disconnect
&C3	DCD follows RTS on remote modem (Simulated switched carrier)

** default*

AT&C3 simulates switched carrier operation.

> ***Note:*** *For simulated switched carrier operation &C3 must be selected on both modems. Only available in V.32 direct or synchronous mode.*

Terminal Interface Commands, Cont.

Data Set Ready &S

These commands control the DSR signal generated by the modem to indicate that the modem is ready for operation. DSR must be on for some terminals and devices to communicate with the modem.

Command	Operation
&S	DSR always on*
&S1	DSR on when off hook in data mode
&S2	DSR off for 5 seconds after disconnect then returns to on
&S3	DSR follows OH (off hook)

** default*

Data Terminal Ready &D

In data mode DTR may be used for modem control.

Command	Operation
&D	Causes the modem to ignore DTR*
&D1	Causes the modem to go to command mode from data mode when DTR goes from on to off.
&D2	Commands the modem to disconnect when DTR goes from on to off and disables autoanswer while DTR is off.
&D3	Disconnects, recalls command mode, and resets the modem to a stored configuration when DTR goes from on to off. In dial line mode the modem will disconnect; in leased line mode the modem will retrain.

** default*

> ***Note:*** *If DTR Controls Dialer is selected, then &D1 and &D2 will cause an autodial after an off-to-on transition of DTR.*

Terminal Interface Commands, Cont.

Serial Port Ring Indicate \R

Determines indication mode of serial port ring indicate line (pin 22) and LCD display.

Command	Operation
\R	Causes the LCD ring indicate display and EIA-232 pin 22 to turn on (high) when the phone rings and remains on during the duration of the call.
\R1	Causes the LCD ring indicate display and EIA-232 pin 22 to turn on (high) when the phone rings and turns off (low) when the call is answered*.

** default*

Request to Send / Clear to Send &R

When the modem is operating in nonbuffered mode (direct mode) AT&R enables the RTS to CTS delay, determined by the value in S26. AT&R1 forces CTS high and the modem ignores RTS. With AT&R2 selected CTS goes high when carrier is detected. AT&R9 forces CTS to follow the state of RTS without delay.

Command	Operation
&R	Enables RTS to CTS delay
&R1	CTS forced on*
&R2	CTS follows DCD
&R3	CTS equals RTS

** default*

> *Note: RTS/CTS delay is not valid in buffered mode or with MNP enabled.*

Terminal Interface Commands, Cont.

> *Note: With AT&R2 selected, XON/XOFF is the only valid method of flow control and &C and &C1 are the only valid carrier detect options.*

DTE Fallback (Pin 23) *FB

If the DTE fallback (EIA-232, pin 23) input to the modem is not in use, set the option to ignore pin 23. To cause the modem to act on high / low levels of pin 23, enable this option. Negative level forces higher rate; positive forces lower rate.

Command	Operation
*FB	Ignore pin 23*
*FB1	Transition on pin 23 changes speed

** default*

TEST COMMANDS &T

Diagnostic tests are used to isolate faults in the communications path. Diagnostic tests will terminate after the period of time specified by S18. If S18 is set to 0, the timer is disabled and tests will run continuously. Tests may also be terminated by the AT&T command. When in test modes without test pattern, issue the escape sequence (+ + +) to return to command mode before terminating the test with the AT&T command.

Command	Operation
&T	Terminate any test
&T1	Initiate local analog loopback test
&T2	Initiate remote analog loopback test
&T3	Initiate local digital loopback test
&T4	Allows acceptance of remote requested digital loopback*
&T5	Disallows acceptance of remote requested digital loopback
&T6	Initiate remote digital loopback test
&T7	Initiate remote digital loopback with test pattern
&T8	Initiate local analog loopback test with test pattern
&T9	Initiate remote analog loopback with test pattern
%T	Transmit test pattern

** default*

Note: Local analog loopback with or without test pattern is the only test available in error control mode.

Test Commands, Cont.

Bilateral Test Enable/Disable *AN *DG

Enables or disables bilateral test functions.

Command	Operation
*AN *AN1	Bilateral analog loop disabled* Bilateral analog loop enabled
*DG *DG1	Bilateral digital loop disabled* Bilateral digital loop enabled

** default*

DTE Controlled Remote Digital Loopback (Pin 21) *RD

To enable DTE controlled remote digital loopback, enter AT*RD1. Enabled, the modem goes into remote digital loopback when it detects an off-to-on transition of pin 21 while in the online data mode. Test ends when it detects an on-to-off transition of pin 21 and then returns to online data mode. To disable this function enter AT*RD.

Command	Operation
*RD	Ignore pin 21*
*RD1	RDL enabled (pin 21)

** default*

Note: If the test timeout option is enabled and pin 21 remains high, the modem returns to online mode at the end of the test timeout period and then immediately reenters the test mode.

Test Commands, Cont.

DTE Controlled Local Analog Loopback (Pin 18) *LA

To enable DTE controlled local analog loopback test, enter AT*LA1. Enabled, the modem goes into local analog loopback when it detects an off-to-on transition of pin 18. Test ends when it detects an on-to-off transition of pin 18. To disable, enter AT*LA.

Command	Operation
*LA	Ignore pin 18*
*LA1	LAL enabled (pin 18)

** default*

Note: If the test timeout option is enabled and pin 18 remains high, the modem returns to idle mode at the end of the test timeout period and then immediately reenters the test mode.

GENERAL COMMANDS

This series of commands control various standard options that in most cases apply to any mode of operation.

Changing from Data Mode to Command Mode +++

To change from data mode to online command mode, press the escape character three times (+ is the default). Pause for the length of time set by register S12 (1 second is the default) before and after the +++ to ensure the modem recognizes the escape command.

This sequence temporarily suspends data mode transmissions and allows command mode operations without breaking the connection. The modem responds with OK when it detects the escape code. Return to data mode by entering ATO.

Note: The AT command set must be enabled.

Local Character Echo E

Type AT without a carriage return. If the screen shows AT the character echo is set correctly. Proceed with other commands as desired.

If the screen shows AATT enter the ATE command to correct the double characters or disable the local echo on the terminal.

If the screen shows no characters, type ATE1 to turn the echo on or enable local echo on the terminal.

Command	Operation
E	Echo off
E1	Echo on*

** default*

General Commands, Cont.

Hanging Up H

To terminate a call, enter the command ATH. This tells the modem to disconnect and go on hook. The modem must be in command mode to use this command.

V.32 Cleardown H2, H3

This disconnect option allows a training sequence before the actual hang up.

Command	Operation
H2	V.32 cleardown enabled
H3	V.32 cleardown disabled*

** default*

EPROM Check I

PC software packages may issue the ATI command to verify the modem will support all commands needed by the software package. The modem returns ASCII characters representing the model and revision level. To request the CRC to be calculated on the EPROM, enter ATI1. The modem returns four ASCII characters representing the CRC in hexadecimal form. Enter ATI3 to request the product version.

Command	Operation
I	Request product code
I1	Request EPROM CRC value
I3	Request product version

Speaker Volume L

ATL commands offer three volume levels.

Command	Operation
L, L1	Speaker volume low
L2	Speaker volume medium*
L3	Speaker volume high

** default*

General Commands, Cont.

Speaker Control M

ATM commands enable or disable the speaker for monitoring purposes.

Command	Operation
M	Disables the speaker
M1	Disables the speaker while receiving a carrier signal*
M2	Speaker always on
M3	Disables the speaker while receiving a carrier signal and modem is dialing

** default*

Return Online O

Use the O command when you are in the online command mode and want to return to data mode. It returns the modem to the same mode (originate or answer) that it was in before escaping to the (online) command mode.

Long Space Disconnect Y

One method of disconnecting two modems is called long space disconnect. When any disconnect condition is detected by the local modem, it will send 4 seconds of data space condition to the remote modem before disconnecting. This signals the remote modem to disconnect. The local modem will disconnect if it receives 1.6 or more seconds of data space condition from a remote modem. If break sequences of 1.6 or more seconds are to be sent, enter ATY to disable this feature and prevent unintentional disconnects.

> ***Note:** This options must be disabled if SDLC NRZI data is used.*

General Commands, Cont.

Command	Operation
Y	Long space disconnect off
Y1	Long space disconnect on*

** default*

Guard Tones &G

This option controls the generation of CCITT V.22 guard tones. These guard tones not used in the United States.

Command	Operation
&G	No guard tone*
&G1	550 Hz guard tone
&G2	1800 Hz guard tone

** default*

Dial/Leased Line &L

If operating on dial-up lines, enter AT&L. If operating on leased lines, enter AT&L1 for 2-wire or AT&L2 for 4-wire.

Command	Operation
&L	Dial (switched)*
&L1	Leased (private) 2-wire
&L2	Leased (private) 4-wire

** default*

Asynchronous/ Synchronous Mode Selection &M

The AT&M commands select synchronous or asynchronous operation and V.25 bis autodialing protocols. AT&M selects asynchronous mode.

AT&M1 selects synchronous mode 1. Calls are placed asynchronously. Operation switches to synchronous when connecting.

AT&M2 selects synchronous mode 2. The modem automatically dials a stored number when it detects an off-to-on transition of DTR. Use the AT&Dn

General Commands, Cont.

command to select the action to be taken on a DTR transition.

AT&M3 selects synchronous mode 3. Calls are placed manually.

AT&M4 selects synchronous mode 4. V.25 bis autodialer set for Bisync protocol.

AT&M5 selects synchronous mode 5. V.25 bis autodialer set for SDLC protocol.

Use register S30 to select EBCDIC/ASCII and NRZ/NRZI for data format.

Command	Operation
&M	Asynchronous mode*
&M1	Synchronous mode 1
&M2	Synchronous mode 2
&M3	Synchronous mode 3 (V.25 bis disabled)
&M4	Synchronous mode 4 with V.25 bis Bisync
&M5	Synchronous mode 5 with V.25 bis SDLC

** default*

Make/Break Dial Pulse Ratio &P

Using AT&P, the dial pulse is on for 39% and off for 61% of one cycle. Using AT&P1, the dial pulse is on for 33% and off for 67% of one cycle.

Command	Operation
&P	39% : 60% US and Canada*
&P1	33% : 67%

** default*

General Commands, Cont.

Synchronous Transmit Clock Source &X

The AT&X commands select internal, external, or receive clock as the transmit clock source.

Command	Operation
&X	Internal clock*
&X1	External clock
&X2	Receive clock

** default*

DCE Speed %B

AT%B sets the originating DCE speed to follow the DTE speed. Two modems will not connect at a speed faster than the lower DCE speed setting of the two modems. To allow the modem to transmit data at a speed different from DTE speed, enter AT%Bn (n=1 to 6).

Command	Operation
%B	Use DTE speed
%B1	300 bps
%B2	1200 bps
%B3	2400 bps
%B4	4800 bps
%B5	9600 bps
%B6	9600 trellis*

** default*

General Commands, Cont.

Disconnect Buffer Delay %D

Sets a delay during which the modem will process data in its transmit and receive buffers before disconnecting. When a condition exists which will cause a disconnect, the modem will attempt for n seconds to empty its buffers. When the buffers are empty or if n=0, the modem disconnects immediately.

Command	Operation
%D	Disconnect buffer delay disabled*
%Dn	Disconnect buffer delay value (seconds)

** default*

Auto Retrain %E

This option allows the modem to automatically retrain in response to poor received signal quality without a reconnection. The modem will always respond to a retrain request from the remote modem.

Command	Operation
%E	Disable auto retrain
%E1	Enable auto retrain*

** default*

Product Revision Level %V

The %V command displays the product revision level.

Product Serial Number $V

The $V command displays the product serial number.

General Commands, Cont.

Permissive/ Programmable %Z

For dial-up operation the modem transmitter output can be set for two different modes of operation. In permissive (RJ11 jack), transmit output level is set to -9 dBm. To set the modem for permissive mode enter AT%Z. In programmable (RJ45 jack) operation, the transmit level can be set by an external program resistor. This mode is selected with AT%Z1.

Command	Operation
%Z	RJ11 (permissive)*
%Z1	RJ45 (programmable)

** default*

> *Note: Asterisks in AT commands are part of the command and do not indicate footnotes.*

Talk / Data *DA

The AT*DA command selects talk or data mode.

Command	Operation
*DA	Switches modem to talk
*DA1	Switches modem to data

Dial Backup *DB

Determines whether dial backup mode will be manual or automatic.

Command	Operation
*DB	Manual dial backup operation*
*DB1	Automatic dial backup operation

** default*

General Commands, Cont.

V.32 Fast Train *FT

The V.32 fast train option is used to reduce training time when operating over high quality, limited distance dial or 2-wire leased lines.

Command	Operation
*FT	Disable fast train*
*FT1	Enable fast train

** default*

Return to Leased Line From Dial Backup *LB

On dial-up lines, *LB causes the modem to return to leased line operation from dial backup. On leased lines with forced answer enabled, *LB causes the modem to wait for a dial backup call.

Line Current Disconnect *LC

Dial line operation only. The modem can be configured to disconnect upon interruption of telephone line current.

Command	Operation
*LC	Line current disconnect off
*LC1	Line current disconnect short (8 ms)
*LC2	Line current disconnect long (90 ms)*

** default*

Manual Dial Backup *LD

Leased line operation only. *LD dials the autodial number if the modem is in originate mode with manual dial backup selected.

General Commands, Cont.

Disable AT Command Set *NT

AT*NT disables the AT command set.

AT*NT1 allows a remote modem to enable AT command operation of another modem via remote configuration.

Recover AT commands via LCD if needed. Refer to AT Command Recovery for "L" Models section in Appendix C if needed.

Command	Operation
*NT	Disable AT command set
*NT1	Enable AT command set*

** default*

Answer / Originate *OR

Forces modem to answer or originate mode. This option is used with 2 or 4-wire leased line operation with error correction and/or dial backup.

Command	Operation
*OR	Force originate*
*OR1	Force answer

** default*

Leased Line Transmit Level *TLn

Command	Operation
*TLn	Sets leased line TX level to n where n is a number between 0 and 15 corresponding to a TX level of 0 to -15 dBm

** default is 0 dBm*

CONFIGURATION COMMANDS

These commands recall various profiles and insert them into the active profile, store the active profile and telephone numbers in nonvolatile memory, and designate the powerup profile. Remote configuration is discussed at the end of this section.

Modem Powerup Configuration &W

The &W command stores the current modem configuration (or profile) options in nonvolatile memory. The stored configuration is retained in memory, even when power is off, until &W is issued with a new configuration or a factory configuration is restored with the &Fn command.

To Store the current configuration

Enter AT&W

When the modem is reset with the Z command or power is turned on, the stored configuration becomes the current configuration. Once a proven configuration is established, this command saves time.

To Reset the modem

Enter ATZ

Enter the ATZ command to reset the modem and reinstate the powerup configuration stored in the modem memory.

Figure 5-1 illustrates configuration storage and recall.

Configuration Commands, Cont.

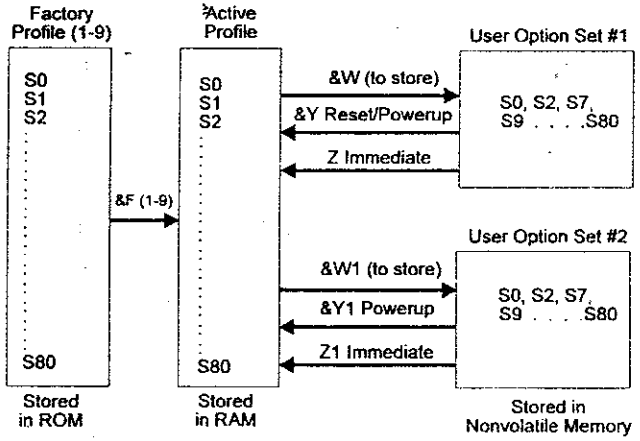

Figure 5-1
Configuration Storage and Recall

To View the active configurations

Enter AT&V

The terminal displays the active configuration in the form of S-register values.

To Insert a factory configuration

Enter AT&Fn (n=1-4)

The AT&Fn command loads one of four factory settings into the active profile.

Configuration Commands, Cont.

Reset to Stored Configuration Z

To Reset the modem to stored configuration profile

Enter ATZ

Command	Operation
Z	Reset to last stored configuration

Load Factory Options &F

The AT&Fn command is used to load the factory option sets. Refer to Appendix D for a complete list of each set.

Command	Operation
&F, &F1	Load factory option 1 (async dial-up with MNP)*
&F2	Load factory option 2 (async dial-up without MNP)
&F3	Load factory option 3 (sync dial-up without MNP)
&F4	Load factory option 4 (sync 4-wire leased line without MNP)

** default*

View Configuration Profiles/Received Signal Parameters &V

Allows the user to view the current configuration profile in the form of S-register values. &V1 displays the received signal parameters.

Command	Operation
&V	Displays configuration profiles
&V1	Displays received signal parameters

Configuration Commands, Cont.

Storing a Telephone Command Line &Z

Nine stored phone number locations of up to 31 characters each are available in nonvolatile memory. Normally, one phone number per location is accommodated. However, a phone number longer than 31 characters will overflow into the next location. Any spaces remaining in the overflowed location cannot be used for another number. The stored phone number is retained until replaced by another number. Modem power can be turned off without affecting stored information.

Two commands can store phone numbers:

AT&Zn - Stores telephone number n, including dial modifiers, at location 1 (up to 31 digits).

AT*CNx,n - Stores telephone number n, including dial modifiers, at location x (x=1 to 9).

> *Note: Neither the AT prefix nor the D command should follow the &Z.*

AT*ND - Displays the stored numbers (1-9).

> *Note: Phone numbers stored using AT commands are limited to 34 characters.*

Configuration Commands, Cont.

Retaining/ Restoring Options *RO

This option is used when the modem is shared by two or more DTEs. When options are retained, the current configuration is not altered at disconnect. With options restored, the modem returns to the previously stored configuration on disconnect.

When selected for options to be restored, the following commands return OK but are not executed:

AT*CN	Store telephone number
AT&Z	Store telephone number
AT&F	Recall factory configuration
AT&W	Store current configuration

Command	Operation
*RO	Retain options at disconnect*
*RO1	Restore options at disconnect

** default*

REMOTE CONFIGURATION

Security Code %P=

A security code is used to prevent unauthorized access to remote configuration mode. The security code is user programmable and can be set to any value from 0 to 99999999 using the AT%P= <desired code> command.

Example: If the remote modem security code is 12345, then the local modem must include this code in the initialization string before the remote modem will respond. Default security code= <Blank>.

Command	Operation
%P=	Sets security code to value entered after equals character. Example: %P= <0 to 99999999>
%P?	Request local security code to be displayed
%P=D	When the security code equals D, access for remote configuration by a remote modem is not possible

Remote Configuration %T=

This mode of operation allows the modem user to view or modify the option set of a remote modem. Entering AT%T= (security code of remote) will initiate remote configuration.

Refer to Chapter 4 for description.

Command	Operation
%T=	This command followed by the correct security code establishes remote configuration mode
&T	Exits remote configuration mode

PROTOCOL COMMANDS

These modes and conditions are selected by AT commands. Table 5-4 illustrates mode and condition availabilities.

Table 5-4
Operating Modes and Conditions

Operating Mode	Error Correction	Data Compression	Flow Control	Data	Constant Speed Interface
Normal	Disabled	Disabled	Allowed	Buffered	On or off
Direct	Disabled	Disabled	Not allowed	Not buffered	DTE = DCE (slaved)
Reliable (MNP)	Enabled	On or off	Allowed	Buffered	On
Auto-reliable (MNP)	Enabled	On or off	Allowed	Buffered	On

Operating Mode \N

Sets the operating mode that the modem uses while in data mode. An AT\Nn command issued during command mode while a connection is in progress will not affect the current connection but will be acted on for subsequent connections. Refer to Chapter 8 for descriptions.

Command	Operation
\N	Normal mode (no error control) data is buffered
\N1	Direct mode (no error control) data is not buffered
\N2	Reliable mode (MNP only)
\N3	Auto-reliable mode (try MNP then fallback to normal async)

** default*

Protocol Commands, Cont.

Serial Port (DTE) bps Adjust

The ATJ command allows DCE and DTE to operate at different speeds. The ATJ1 command forces serial port (DTE) speed to follow data link speed in any mode.

If the modem is in direct mode (J1) and a DCE link is established at a speed other than that of the original DTE autobaud speed, the modem will issue the CONNECT message for the new DTE speed at the original rate. All subsequent data will be sent to the DTE at the new DCE speed.

Command	Operation
J	Disable slaved DTE/DCE (constant speed DTE on)*
J1	Enable slaved DTE/DCE (constant speed DTE off)

** default*

Data Link Flow Control \G

Enables or disables flow control used to pace data sent from the remote modem to the local modem during a normal connection. When AT\G1 is set, the modem uses XON/XOFF to start/stop data transmission from the remote modem. This command is ignored during a reliable connection.

Command	Operation
\G	Disable modem port flow control*
\G1	Enable modem port XON/XOFF flow control

** default*

Protocol Commands, Cont.

Serial Port Flow Control \Q

Sets the type of flow control used by the serial port. If the serial port speed exceeds that of the modem connection, characters may be sent by the DTE to the modem faster than it can send them to the remote modem. The modem holds characters in an internal buffer until they can be transmitted. When this buffer is full the modem uses flow control to cause the DTE to stop sending characters. As the modem continues to transmit data and the buffer empties, flow control is again used to cause the DTE to resume sending data.

AT\Q disables flow control.

When AT\Q1 is set, the modem generates and accepts XON/XOFF characters to start and stop the data flow. These characters have the same parity as the DTE setup taken from the last AT command.

AT\Q2 allows use of CTS off to stop the data from the DTE and CTS on to restart it.

AT\Q3 forces the modem to act on CTS like \Q2. In addition RTS on/off is used to facilitate starting and stopping data from the modem to the DTE.

Command	Operation
\Q	Disable DTE flow control
\Q1	Enable XON/XOFF flow control*
\Q2	Enable CTS flow control
\Q3	Enable bilateral CTS/RTS flow control

** default*

Protocol Commands, Cont.

XON/XOFF Pass Through \X

This option is active when flow control of the modem by the DTE has been selected for XON/XOFF and the connect mode is reliable or normal. It enables or disables the sending of local flow control characters (XON/XOFF) to the remote modem. In reliable mode the modem treats incoming XON/XOFF characters from the remote modem as data characters. In normal mode the modem will look at the \G command and act accordingly.

> ***Caution:*** *With \X1 in effect local flow control characters will be sent to the remote system. These characters may turn on the flow of data from the remote system before the modem is ready to receive more data, possibly resulting in a loss of data.*

Command	Operation
\X	Process but do not pass XON/XOFF characters to remote DCE*
\X1	Process and pass XON/XOFF characters to remote DCE

** default*

Protocol Commands, Cont.

MNP Data Compression %C

To enable data compression while running MNP protocol, enter AT%C1. To disable data compression, enter AT%C.

Command	Operation
%C	Data compression disabled
%C1	Data compression enabled*

** default*

Auto-Reliable Fallback Character %An

Selects the ASCII character to be recognized as the auto-reliable fallback character by the answering modem. During negotiation of protocol in auto-reliable mode, the answering modem switches from reliable to normal mode upon receipt of the auto-reliable fallback character from the calling modem and passes the character to the serial port.

To Set the auto-reliable fallback character

Enter AT%An where n=1 - 127 decimal representing an ASCII character

The default of 0 disables auto-reliable fallback character.

Command	Operation
%An	Sets ASCII character to be recognized as the auto-reliable fallback character

> ***Note:*** *The modem must be optioned for auto-reliable mode (AT\N3).*

Protocol Commands, Cont.

Break Control \Kn

Use AT\Kn (n=0-5) to indicate the action taken by the modem when a break is encountered.

Command	Operation
\K	Break option 0
\K1	Break option 1
\K2	Break option 2
\K3	Break option 3
\K4	Break option 4
\K5	Break option 5*

** default*

Conditions under which breaks may occur are explained below with descriptions of the modem's response under the different \K command break options.

A break is sent to the serial port while the modem is in connect state during a reliable or normal connection (no protocol, data buffered).

Command	Effect
\K, \K2, \K4	Enter command mode but do not send break to the remote modem
\K1	Empty the data buffers and send break to the remote modem
\K3	Immediately send break to the remote modem
\K5	Send break to the remote modem in sequence with any data received from the serial port

Protocol Commands, Cont.

A break is sent to the serial port while the modem is in connect state during a direct connection (no protocol, data not buffered).

Command	Effect
\K, \K2, \K4	Immediately send a break to the remote modem and enter command state when break is through
\K1, \K3, \K5	Immediately send a break to the remote modem

A break is received from the remote modem while the modem is in connect state during a normal connection (no protocol, data buffered).

Command	Effect
\K, \K1	Empty the data buffers and send a break to the serial port
\K2, \K3	Immediately send a break to the serial port
\K4, \K5	Send a break to the serial port in sequence with any data received from remote modem

A transmit break command is issued while the modem is in command state during a reliable (MNP) or normal connection (no protocol, data buffered).

Command	Effect
\K, \K1	Empty the data buffers and send a break to the remote modem
\K2, \K3	Immediately send a break to the remote modem
\K4, \K5	Send a break to the remote modem in sequence with any data received from the serial port

Protocol Commands, Cont.

Maximum MNP Block Size \A

Sets the maximum transmit block size for reliable connections. Use this command to force the modem to transmit smaller blocks when in a reliable link connection. The modem sends a block up to the size specified by the AT\A command.

Command	Operation
\A	Maximum transmit block size = 64 characters
\A1	Maximum transmit block size = 128 characters
\A2	Maximum transmit block size = 192 characters
\A3	Maximum transmit block size = 256 characters*

** default*

MNP Inactivity Timer \T

Specifies the number of minutes the modem will stay online in a reliable mode without transmitting or receiving data. When time is set to 0, it is disabled. The timer is active only during a reliable connection.

Command	Operation
\T	Disable inactivity timer*
\Tn	Set inactivity to n (n = 1-90) minutes

** default*

Protocol Result Codes \V

Enables or disables protocol result codes. See Table 5-2.

Command	Operation
\V	Disable protocol result codes*
\V1	Enable protocol result codes

** default*

Protocol Commands, Cont.

Transmit Break/ Set Break Length \B

AT\B commands the local modem to send a break signal to the remote modem. In all modes except direct, S-register 79 determines the length of the break sent to the DTE by the modem receiving a break signal over the link. S79 may be set directly or via AT\Bn where n=1-255 in 20 ms increments. The default is 35 (700 ms).

Command	Operation
\B	Sends a break signal to the remote modem (Does not modify S79)
\Bn	Sets S79 to length of break desired. n = 1-255 in 20 ms increments Default is 35 (700 ms)

Set Auto-Reliable Buffer \C

Determines whether or not the answering modem will buffer data received from the non-reliable originate modem during the 4 second interval the answer modem attempts to establish a reliable link. Use these commands when the modem is in the auto-reliable mode and is expected to process a non-reliable call. Refer to Chapter 8 for information on reliable mode.

Command	Operation
\C	Disable auto reliable data buffer*
\C1	Buffer data for 4 seconds or 200 characters

** default*

Protocol Commands, Cont.

Originate MNP Link \O

The AT\O command forces the local modem to return online and initiate a MNP link regardless of whether it originated or answered the call. For this command to succeed, the remote modem must have received the AT\U command. The modem sends two link requests (18 seconds) and if the remote modem does not respond the modem returns to normal mode.

Command	Operation
\O	Originate a reliable link

Accept an MNP Link \U

Forces the modem to return online and accept a reliable link independent of whether the modem originated or answered the call. For this command to succeed, the remote modem must have received the AT\O command.

This command will cause the modem to wait indefinitely for the remote modem to issue the "originate MNP link" command.

Command	Operation
\U	Accept an MNP link

Switch from Normal to MNP \Y

Entering \Y causes the modem to return online and attempt a reliable link while connected in normal or direct mode. The modem will initiate / accept a link based on which mode, originate / answer, it was in for the call. The remote modem must switch to reliable mode for this command to succeed. The modem will return to a normal connection if a reliable link is not established in 18 sec.

Command	Operation
\Y	Switch from normal to MNP

Protocol Commands, Cont.

Switch from MNP to Normal \Z

This command causes the modem to return online and switch from a reliable connection to a normal connection.

Command	Operation
\Z	Switch from MNP to normal

Note: If \J1 and \C are set, the \Z command forces the modem to the direct mode.