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326X Series Modem Reference Guide

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AT Commands

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AT, AT& and AT✳ Command Descriptions

This chapter provides an alphabetic list of the AT commands that you can execute from the control terminal and the modem front panel.

AT commands and options are described in the following sequence:

- A pull-out main menu figure (Figure 1-1) illustrating all AT, AT& and AT✳ command settings, front panel options, and option settings

- A front panel option figure in the left margin describing how to select a command on the modem front panel

- Industry-standard AT and AT& commands that begin with AT

- Motorola-enhanced AT commands, which begin with AT✳

- A list of the menu's front panel options, if any, that have AT-equivalent control terminal commands

NOTES:

1) For descriptions of front panel options and option settings that do not have AT command equivalents, see Chapter 2, Front Panel Operation. Chapter 2 is organized to follow the structure of the front panel menu tree; the main menu is divided into submenu sections, describing the appropriate options and settings. For a list of AT commands that do not have front panel equivalents, see "Non-Configuration AT Commands" in Chapter 5, Using the AT Automatic Calling Interface, of the *326X Series Modem User's Guide*.

2) Throughout this guide, all references to the 326X Series Modem apply to the 326X V.32 bis, 326X*FAST*, and 326X*FAST*-SDC Modems, unless specifically stated otherwise.

Figure 1-1. 326X Series Main Menu

Selecting Options and Settings

The figure in the left margin that precedes each AT command illustrates the main-menu option, the right-arrow (▶) button indicating that you must press the across key until the described option appears, and the resulting submenu option. For example, the first AT command in the following list is ATD, Dialing an Unstored Telephone Number. In the figure accompanying this entry, you see:

- The main-menu option to access: Data 9600 T/D?
- The front panel control key ▶ to press to display the submenu
- The ATD Command prompt: Enter Then Dial

Each front panel option has a default setting. Some front panel defaults are determined by the assigned factory-preset option sets. These preset defaults are exclusive to the particular option set. The other factory options are not exclusive to a particular option set and they always have the same default setting, regardless of which factory-preset option set you are using.

For options that belong to option sets, a number or the word "all" in parentheses appears underneath the selection. A number tells you which option set(s) the setting is a default for. If the word "all" appears under a setting, it means that the setting is the default setting for all four option sets.

As an example, the option setting portion of the DTR Control (AT&D) option appears as follows:

Option Setting
High
(1, 4L)
Escape
Discon
(4D)
Reset
Tail
(2)[1]
108.1
(3)[1]
108.2
(2, 3)

[1]Default for the 326XFAST-SDC Modem

The defaults for the DTR Control option for the 326X V.32 bis and 326X*FAST* modem are:

- *High* for Option sets 1 and 4 (the "L" next to the 4 indicates that High is the default for Option Set 4 for leased line modems (models 3261, 3263, 3266, 3268)
- *Discon* for Option set 4 (the "D" next to the 4 indicates that Discon is the default for Option set 4 for dial modems (models 3260, 3262, 3265, 3267)
- *108.2* for Option sets 2 and 3

The defaults for the DTR Control option for the 326X*FAST*-SDC modem are:

- *High* for Option sets 1 and 4 (the "L" next to the 4 indicates that High is the default for Option Set 4 for leased line modems (models 3261, 3263, 3266, 3268)
- *Tail* for Option set 2
- *108.1* for Option set 3

In this example, since High is the default for Option sets 1 and 4L for all products (326X V.32 bis, 326X*FAST*, and 326X*FAST*-SDC), no product-specific distinction is made. Where one setting (for example, 108.1) is the default for Option set 3 in the 326X*FAST*-SDC product, a footnote indicates the difference.

Unless specified by a "D" or an "L," defaults apply to all models. For options that do not belong to option sets, the default setting is designated by the word "default" in parentheses underneath the setting.

The following sections describe industry-standard AT commands that begin with AT.

NOTES:

1) The conventions described for identifying front panel option settings and defaults apply to the 326X V.32 bis, 326X*FAST*, and 326X*FAST*-SDC Modems. Option settings that vary are clearly marked indicating to which product the default setting applies.

2) Throughout this chapter, AT commands are listed in table format. In the "AT Command Setting" column, the AT reference has been omitted; however, be sure to enter the entire AT command. For example:

    AT✲ZCO

D, DS, ✳DS

ATD (Dialing an Unstored Telephone Number)

DATA 9600 T/D? ▌▶ • • •
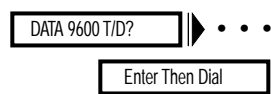
Enter Then Dial

The ATD (Enter Then Dial) command allows you to dial a telephone number (up to 50 characters) without storing it in your modem's telephone book.

The ATD Command

You can dial a telephone number directly from your keyboard. To do this, enter the ATD command followed by the telephone number and a carriage return.
For example:

ATD5551234<CR>

The Front Panel

See the "Performing Numeric Entry" section in Chapter 2 of this guide for details on how to use numeric entry.

ATDS, AT✳DS (Dialing a Stored Telephone Number)

DATA 9600 T/D? ▌▶ • • •
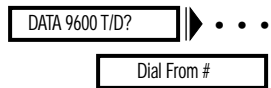
Dial From #

The ATDS and AT✳DS (Dial From #) commands dial a number stored in one of the modem's nine "telephone book" addresses. **NOTE**: Enter a telephone number into your modem's telephone book before attempting to use this option. See "AT&Z, AT✳CN (Enter Phone Numbers)" for information on entering phone numbers.

Option Setting   AT Command Setting

Option Setting	AT Command Setting
1 – 9	1 – 9
Option Setting	AT Command Setting

The ATDS or AT✳DS Command

To dial a stored telephone number using AT commands, enter:

ATDS

or

AT✳DS

followed by the telephone book address number and a carriage return <CR>. If you enter the ATDS or AT✳DS command without a number following it, the modem dials the number stored in address 1. **NOTE:** The ATDS and AT✳DS commands can also be entered in the format ATDS=n or AT✳DS=n.

The Front Panel

To use the front panel to dial a telephone number stored in the modem's telephone book:

1) Step across the Status/Option Sets/Dialing menu by pressing ▌▶ until you see:

Dial from #=n

2) Press the ▼ to select the telephone book address for the number you want to dial and press ◎. The modem dials the telephone number stored in the designated telephone book address.

ATE (Asynchronous Echo)

ACU OPT'S ▸ • • •
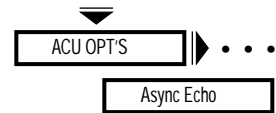
Async Echo

The ATE (Async Echo) command enables the modem to echo all commands received from an asynchronous DTE.

Option Setting	AT Command Setting	Description
Off	0	The modem does not echo asynchronous commands to the DTE.
On (all)	1	The modem echoes asynchronous commands to the DTE.

ATH (Busy Out Test)
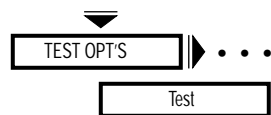
TEST OPT'S ▸ • • •

Test

The ATH command enables you to initiate a Busy Out test.

Option Setting	AT Command Setting	Description
Busy Out	1	Makes the modem appear busy to incoming calls. To configure the modem to use the Busy Out feature, refer to the AT✳LT (DTE Pin 25) option description in this chapter
End Test	0	If Busy Out is enabled, ATH0 will disconnect the busy out condition. Also, if the modem is in "escape mode" (the modem has transitioned to command state from the data state—online or test), the ATH0 command disconnects the modem.

Refer to Chapter 4, of this guide or the AT&T option description within this chapter, for a detailed description of how to initiate and terminate the Busy Out test.

ATL (Speaker Volume)

TELCO OPT'S ▸ • • •
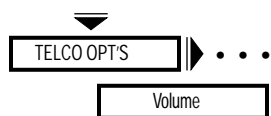
Volume

The ATL (Volume) option sets the speaker volume in the modem.

Option Setting	AT Command Setting	Description
Medium (all)	2	Medium
Loud	3	Loud
Soft	0,1	Soft

M, O1

ATM (Speaker Control)

TELCO OPT'S ▶ • • •
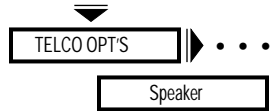
Speaker

The ATM (Speaker) option controls the operation of the modem's speaker.

Option Setting	AT Command Setting	Description
Dialing (all)	1	The speaker comes on while dialing and training but stays off when the modem enters data mode.
On	2	The speaker is always on.
Security	3	The speaker goes on when dialing is completed and goes off when the modem enters data mode.
Off	0	The speaker is always off.

ATO1 (Retrain)

TEST OPT'S ▶ • • •
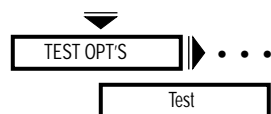
Test

ATO1 allows you to return to data mode and initiate a retrain with the remote modem. Refer to Chapter 4, Testing Your Modem, or the AT&T option description within this chapter for a description of how to initiate a retrain.

Option Setting	AT Command Setting	Description
	0	Return to data mode.
Retrain	1	Allows you to initiate a retrain with the remote modem.

ATP, ATT, AT✳PT (Dial Type)

DIALING OPT'S ▶ • • •
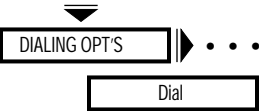
Dial

The ATP, ATT and AT✳PT (Dial) commands determine how the modem dials telephone numbers: in tone, pulse, or auto tone/pulse. The modem refers to this option setting if it does not encounter any T or P modifiers in the telephone number.

Option Setting	AT Command Setting	Description
Tone	ATT AT✳PT0	The modem uses tone (DTMF) dialing unless otherwise specified by the T or P dial modifiers in a telephone number.
Pulse	ATP AT✳PT1	The modem uses pulse dialing unless otherwise specified by the T or P dial modifiers in a telephone number.
Auto	AT✳PT2	The auto-call unit attempts to tone dial when initiating a call. If tone dialing is not possible, pulse dialing is used.
		For this feature to work correctly, the first character in a dial string must be a digit, and not a dial modifier. A T or P in the dial string overrides this setting for that dial string.
		NOTE: Do not use the Auto setting if you are in a PBX environment. If a dial tone is detected after the first digit, the phone number will be redialed as a pulse which may not be recognizable by the PBX.

ATQ (Result Codes)

ACU OPT'S ▶ • • •
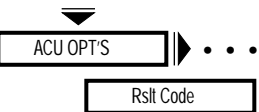
Rslt Code

The ATQ (Rslt Code) command selects whether result codes (including Call Progress messages) are displayed.

Option Setting	AT Command Setting	Description
Enable (all)	0	Result codes are displayed at the DTE.
Disable	1	Result codes are not displayed at the DTE.
Orig	2	Result codes are output to the DTE only when operating as an originate modem.

S, T, V

ATS (S-Register)

Data 9600 T/D?

S-Reg xxx=nnn
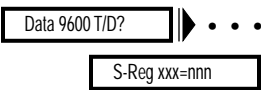
The ATS (S-Reg xxx) command allows you to view and set the various S-Registers that are supported by the 326X Series Modems. S-Registers contain values that determine and reflect how the modem operates and executes commands. You can view and change S-Register values via the AT commands described in this section or through the front panel option. If an invalid S-Register is entered, the modem responds with an OK, but no action occurs.

See the "Performing Numeric Entry" section in Chapter 2 for details on how to use numeric entry to enter the appropriate S-Register. For a full description of S-Registers, see the "S-Registers" section in Chapter 5 of the *326X Series Modem User's Guide*.

ATT (Dial Type)

See the ATP command description described earlier.

ATV (Result Code Format)

ACU OPT'S
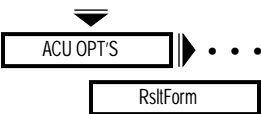
RsltForm

The ATV (RsltForm) command selects the format of result codes that are sent to your DTE.

Option Setting	AT Command Setting	Description
Numeric	0	Result codes are sent to your DTE as numbers (short form).
Verbose (all)	1	Result codes are sent to your DTE as full words (long form). Refer to Appendix A of the *326X Series Modem User's Guide* for a summary of result codes.

ATX (Call Progress)

ACU OPT'S ▶ • • •
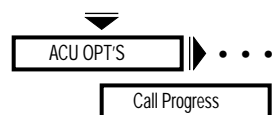
Call Progress

The ATX (Call Progress) command determines whether the modem waits for call progress signals or blind dials when establishing calls.

Option Setting	AT Command Setting	Description
0	0	The modem uses only NO CARRIER and CONNECT result codes.
1	1	The modem uses only NO CARRIER, CONNECT, and CONNECT <Rate> result codes.
2	2	The modem waits for dial tone and uses only NO CARRIER, CONNECT, CONNECT <Rate> and NO DIALTONE result codes.
3	3	The modem detects busy signal and uses only NO CARRIER, CONNECT, CONNECT <Rate>, and BUSY result codes.
4	4	The modem waits for dial tone and detects busy signal. Only NO CARRIER, CONNECT, CONNECT <Rate>, BUSY, and NO DIAL TONE result codes are used.

NOTE: These settings are country-specific. Consult Appendix C, Country-Specific Information, in the *326X Series Modem User's Guide* for the settings that are valid in your country.

The following section discusses how each ATX (Call Progress) command setting works.

ATX0 or 1 (Call Progress=0 and 1)
The modem goes off-hook, waits for the amount of time specified by the Blind Dial option, and blind dials whether or not dial tone is present. After processing all of the characters in the dial string, including dial modifiers, the modem looks for data carrier for the amount of time specified by the AT✳TT (Call Timeout) command. If the modem does *not* detect data carrier before the time specified by the AT✳TT (Call Timeout) command expires, it hangs up and displays:

    NO CARRIER

If the modem does detect data carrier, it displays either:

    CONNECT

(for setting **0**) or a speed-specific connect message (for setting **1**). If your modem is using error correction and the AT✳XC1 or AT✳XC2 (Rel Msg=Short or Long) command, the modem also displays the suffix:

    RELIABLE

or

    RELIABLE EC=(xxx) DC=(yyy)

X

ATX2 (Call Progress=2)

The modem goes off-hook and looks for dial tone. If it detects dial tone, the modem dials. If the modem does *not* detect dial tone, it hangs up and displays:

   NO DIALTONE

After processing all of the characters in the dial string, including dial modifiers, the modem looks for data carrier for the amount of time specified by the AT✻TT (Call Timeout) command. If data carrier is not detected before the time specified by the Call Timeout option expires, the modem hangs up and displays:

   NO CARRIER

If data carrier is detected, the modem displays a speed-specific connect message. If the modem is configured for error correction, and AT✻XC1 or AT✻XC2 (Rel Msg=Short or Long)) is selected, the modem also displays the suffix:

   RELIABLE

or

   RELIABLE EC=(xxx) DC=(yyy)

ATX3 (Call Progress=3)

The modem goes off-hook, waits for the amount of time specified by the AT✻BD (Blind Dial) command, and then blind dials. After processing all of the characters in the dial string, including dial modifiers, the modem starts the AT✻TT (Call Timeout) command timer and looks for a busy signal, ringback, and data carrier. If a busy signal is detected before the time specified by the AT✻TT (Call Timeout) command expires, the modem hangs up and displays:

   BUSY

The length of time between finishing dialing and displaying the BUSY message is the amount of time the modem takes to detect the busy signal. If data carrier is not detected before the time specified by the AT✻TT (Call Timeout) command expires, the modem hangs up and displays:

   NO CARRIER

The length of time between finishing dialing and displaying the NO CARRIER message is the amount of time specified by the AT✻TT (Call Timeout) command. If data carrier is detected, the modem displays a speed-specific connect message. If error correction is enabled and AT✻XC1 or AT✻XC2 (Rel Msg=Short or Long) commands are selected, the modem also displays the suffix:

   RELIABLE

or

   RELIABLE EC=(xxx) DC=(yyy)

ATX4 (Call Progress=4)

The modem goes off-hook and looks for dial tone. If a dial tone is detected, the modem dials. If not, the modem hangs up and displays:

NO DIALTONE

After processing all of the characters in the dial string, including dial modifiers, the modem looks for a busy signal, ringback, and data carrier. If the modem detects a busy signal before the time specified by the AT✳TT (Call Timeout) command expires, the modem hangs up and displays:

BUSY

The length of time between finishing dialing and displaying the BUSY message is the amount of time it takes the modem to detect the busy signal. If the modem does not detect data carrier before the time specified by the AT✳TT (Call Timeout) command expires, the modem hangs up and displays:

NO CARRIER

The length of time between finishing dialing and displaying the NO CARRIER message is the amount of time it takes the modem to detect ringback, plus the amount of time specified by the AT✳TT (Call Timeout) command. If data carrier is detected, the modem displays a speed-specific connect message. If the modem is configured for error correction and AT✳XC1 or AT✳XC2 (Rel Msg=Short or Long), the modem displays the suffix:

RELIABLE

or

RELIABLE EC=(xxx) DC=(yyy)

Y, Z

ATY (Longspace Disconnect)

MODULATIONOPT'S ▶ • • •
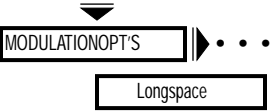
Longspace

The ATY (Longspace) command enables the long-space disconnect function. Refer to the AT✳MD command.

Option Setting	AT Command Setting	Description
Off (all)	0	The modem does not disconnect when it receives space that exceeds 1.6 seconds in duration. When terminating a call, the modem does not send continuous space for 4 seconds.
On	1	The modem disconnects when it receives space that exceeds 1.6 seconds in duration. When terminating a call, the modem sends continuous space for 4 seconds.

ATZ (Selecting an Option Set)

DATA 9600 T/D? ▶ • • •

Select Options

The ATZ (Select Options) command chooses which of the four option sets, stored in nonvolatile memory, is used by the modem. When you use Select Options or the ATZ command, the new option set takes effect immediately. For a description of each action set, see Chapter 4, Configuring Your Modem, in the *326X Series Modem User's Guide*.

Option Setting	AT Command Setting	Modem Uses
1	0, 1	Option Set 1
2	2	Option Set 2
3	3	Option Set 3
4	4	Option Set 4

NOTE: The modem disconnects from the line when the ATZ command is entered. Also, any test in progress is immediately terminated. Since any AT command that follows the ATZ command is ignored by the modem, make sure that the ATZ command is the last one entered in an AT command string. Use the AT&Y command to select with which option set the modem powers up.

AT& Commands

The following sections describe industry-standard AT commands that begin with AT&.

AT&C (DCD Control)
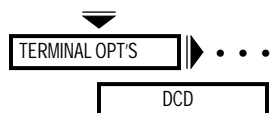
The AT&C (DCD) command determines how the modem sets the DCD signal. The modem signals the DTE with DCD on EIA/TIA 232-D Pin 8 (V.24 Circuit 109).

Option Setting	AT Command Setting	Description
High (1)	0	DCD is always on.
Normal (2, 3, 4)	1	DCD is off during dialing and also while the modem is training with the remote modem. DCD is on in data mode. When the modem is disconnected from the telephone line, DCD is off.
ACU On	2	DCD is on when the modem is disconnected so that terminals requiring this signal can use the ACU. During dialing, DCD goes off until both local and remote modems train and are ready to pass data. DCD is on in data mode. DCD drops on a disconnect momentarily.
Remote	3	This setting applies to simulated half-duplex applications and works only if the remote modem also supports RTS/DCD signaling. When the remote DTE turns RTS on, DCD is forced on at the local modem. The local modem can receive data only during this period. Once the remote DTE drops RTS, DCD at the local modem follows. The Rem RTS/DCD option allows you to choose the type of RTS/DCD signaling.
		For the Remote setting to work properly, set the remote modem's AT✶RS (RTS) command to AT✶RS2 (Remote). Also, make certain that the Direct data transfer mode is in use, and that neither the V.21 nor the Bell 103 modulation mode is in use. If the direct data transfer mode is *not* in use, or the V.21 or Bell 103 modulation mode *is* in use, DCD behaves as if DCD=Normal.
Wink	4	DCD is always on; however, it will drop after disconnect and remain low momentarily.

&D

AT&D (DTR Control)

TERMINAL OPT'S ▶ • • •
DTR

The AT&D (DTR) command determines how the modem interprets the DTR signal. The local DTE uses DTR (Pin 20) to signal the modem.

───── **Option Setting** ─────

326X V.32 bis Modem	326XFAST Modem	326XFAST-SDC Modem	AT Command Setting	Description
High (1, 4L)	High (1, 4L)	High (1, 4L)	0	The modem ignores DTR from the DTE. The modem reads DTR as always high. Use this setting if the DTE does not provide DTR, or if you plan to use DTR/CTS flow control with the error-correction feature.
Escape	Escape	Escape	1	When ACU Select=AT and AT Fortbm=Async (AT&M), the modem enters the AT escape mode when an on-to-off DTR transition is detected while modem is in data or test mode.
Discon (4D)	Discon (4D)	Discon	2	The modem hangs up and enters command mode when an on-to-off DTR transition is detected, while the modem is in data, test, or escape mode. If DTR is low, the modem does not auto-answer.
Reset	Reset	Reset	3	This setting is similar to Discon except that an on-to-off DTR transition also causes the modem to reinitialize its memory (the equivalent of executing the ATZ command). If DTR is low, the modem auto-answers.

The option set to which the modem resets is determined by AT&Y (Power Up In option). If the AT&Y (Power Up In) command is set for 1, 2, 3, or 4, the designated option set is loaded. If Old is selected, the currently selected option set is reloaded.

If DTR is dropped during a test (such as RDL, LAL, LDL, RDL Pattern, etc.), the modem disconnects from the line and resets memory to the selected option set.

NOTE: A reset can change the value of the AT&D (DTR) command setting from Reset to another setting.

326X V.32 bis Modem	326XFAST Modem	326XFAST-SDC Modem	AT Command Setting	Description
Tail	Tail	Tail (2)[1]	4	This setting is similar to 108.1 except that the modem auto-answers an incoming call even if DTR is off. Use the Tail option if you plan to use the modem in a tail circuit to a high-speed leased line modem or to other devices using DTR and DSR. When DTR transitions from off to on, the modem connects to the telephone line and dials if the Default Dial option is enabled. Use the Tail option if you have an intelligent terminal which must dial out and answer calls without continually monitoring for a ringing signal.
108.1	108.1	108.1 (3)	5	The DTR signal emulates the function of the Talk/Data (◎ at the Home position) key on the modem front panel. An off-to-on DTR transition instructs the modem to connect to the telephone line. If the modem detects an incoming call, the call is connected. If the modem does not detect an incoming call and you have enabled the AT✳DA (Default Dial) command, the modem dials the number specified. If the AT✳DA (Default Dial) command is disabled, the modem refers to the AT✳MM (Modulation Mode option in the MODULATION OPT'S menu.) If set to answer, the modem goes off-hook and sends an answer-back tone. An on-to-off DTR transition disconnects the modem from the telephone line. If DTR is low, the modem does not auto-answer.
108.2 (2, 3)	108.2 (2, 3)	108.2	6	When the modem is disconnected from the telephone line and the DTE turns DTR on, the modem responds to all V.25 bis and all AT commands. When the DTE turns DTR off, the modem does not respond to dialing and answering AT commands, but responds to all other AT commands. Also with DTR off, the modem ignores all V.25 bis commands. The DTR signal must remain on throughout the course of a connection. An on-to-off DTR transition disconnects the modem from the telephone line. If DTR is low, the modem does not auto-answer.

&F, &G

AT&F (Reinitialize Memory)

DATA 9600 T/D? ▶ • • •

Reinit Memory?

The AT&F (Reinit Memory?) command is used to reset your modem to the factory-default option settings. The four factory default option sets are restored, and all stored telephone numbers are deleted.

The AT&F Command
Enter:

> **AT&F<CR>**

The modem front panel displays:

> 326x Initial

and the terminal displays:

> OK

The factory-programmed option sets are now in place.

The Front Panel
When you press ◎ the modem first asks you:

> Reinit All Mem?

Be sure you want to reinitialize the modem's memory before you press ◎ again. The modem displays:

> 326x Initial

indicating that the original factory-programmed option sets are now in place.

AT&G (Guard Tone)

▼

MODULATIONOPT'S ▶ • • •
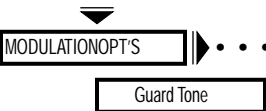
Guard Tone

The AT&G (Guard Tone) command determines what type of guard tone the modem uses in V.22 bis operation. The proper guard tone (AT&G) option setting is required by your PTT. Leave this option set to Off unless your PTT requires the use of guard tone.

Option Setting	AT Command Setting	Description
Off	0	The modem does not use a guard tone.
550	1	The modem uses a guard tone of 550 Hz.
1800	2	The modem uses a guard tone of 1800 Hz.

NOTE: These settings are country-specific. Consult Appendix C, Country-Specific Information, in the *326X Series Modem User's Guide* for the settings that are valid in your country.

AT&I (Display Modem ID)

DATA 9600 T/D? ▶ • • •

DTE 19.2 RELIABL

The AT&I (Display Modem ID) command allows you to view on your control terminal screen non-action information that identifies your modem. This information is referred to as the short form status snapshot display.

The following command option list describes short form modem identification information.

AT Command Setting	Description
0	Software part number
1	Factory product code
2	Country code
3	Product code
4	Network control address *(optional)*
5	Serial number

The Front Panel

You can also view modem status snapshot by using the front panel. Press ▶ until DTE 19.2 RELIABL appears, and press ▼ until Display Modem Id appears.

AT&J (Dial Line Jack Types)

TELCO OPT'S ▶ • • •
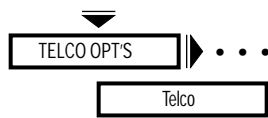
Telco

The AT&J (Telco) command allows you to make the correct registered jack selection that is compatible with your equipment. The Federal Communications Commission (FCC) is a telecommunications and standards organization that specifies a series of registered jacks for use with a dial line network (sometimes referred to as PSTN). These jacks are designated as RJxxx-type jacks, where RJ means Registered Jack and xxx specifies the series of the jack.

For example, RJ11 indicates that the jack is a registered jack from series 11. Sometimes the jack designation is followed by a letter (RJ11C) that indicates the jack housing style. Jacks specified under FCC Part 68 fit into one of the following categories: Permissive (voice) or Programmable (data).

Option Setting	AT Command Setting	Description
RJ11C	0	This 6-pin modular jack type is the most common permissive data mode (voice) jack arrangement found in the home or office and operates on a single-line bridged tip-and-ring voice or low-speed data application service.
RJ45S	2	This 8-pin modular jack type is the most common programmable data mode (data) jack arrangement and permits the use of an exclusion-key telephone. This jack also operates on a single-line bridged tip-and-ring voice or low-speed data application service.
RJ16CS	3	This 6-pin modular jack type is a special permissive data mode jack arrangement that allows use of an exclusion-key telephone.
RJ4MB	4	This 8-pin modular programmable data mode jack arrangement supports Make Busy operation. Using this jack type, you can make the modem appear to be off-hook to the central telephone office.

NOTE: These settings are country-specific.Consult Appendix C, Country-Specific Information, in the *326X Series Modem User's Guide* for the settings that are valid in your country.

AT&L (Line Type)
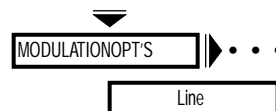
The AT&L (Line) command sets the type of telephone line used by the modem. If you change this option while the modem has a dial-line connection, the change does not take effect until you disconnect the line. When the modem is configured for any one of the AT✶RE option settings except 108.ACU or 116.ACU, if a call fails, the originating modem disconnects from the dial line and returns to the leased line unless the Auto Redial or Link Phone # options are enabled.

Option Setting	AT Command Setting	Description
Dial (1, 2, 3, 4D)	0	The modem communicates over dial lines in dial applications only.
2W Lease (4L)	1	The modem communicates over a 2-wire leased line. The ACUs (AT and V.25 bis) are not functional when the modem is connected to a leased line.
4W Lease	2	The modem communicates over a 4-wire leased line. The ACUs (AT and V.25 bis) are not functional when the modem is connected to a leased line.

&M

AT&M (AT Data Format)
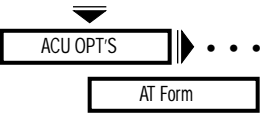
The AT&M (AT Form) command determines the format of data when the ACU Select option is set to AT.

NOTE: To enable 326X*FAST*-SDC (if not using one of the predefined option sets), once you have selected the AT ACU, make sure you select one of the synchronous data formats (Sync Data, DTR Dial, or Man Dial) described below. Also make sure you select one of the reliable data transfer modes (Reliable, Auto Reliable, or Speed Auto Reliable) using the Mode (AT✳SM) option.

Option Setting	AT Command Setting	Description
Async (all)	0	The modem is compatible with asynchronous DTEs and uses the AT command set and auto-call functions.
Sync Data	1	This setting is intended for terminals capable of communicating either synchronously or asynchronously over the same serial port. When disconnected from the dial line, communication between the modem and DTE is asynchronous. The AT command set and auto-call functions are used to establish calls. Once in data mode, the modem exchanges data synchronously with the remote modem. An on-to-off DTR transition causes the modem to disconnect from the dial line. This option is designed for use with the AT✳DT (DTR Delay option in the TERMINAL OPT'S menu) command. The AT✳DT command controls the length of time that your modem holds DTR high (the amount of time you have to switch from an asynchronous to a synchronous terminal). If DTR transitions from on to off while you are switching to a synchronous terminal, your modem disconnects from the dial line.
DTR Dial	2	When an off-to-on DTR transition is detected, the modem automatically dials the number stored in the memory location designated by the Default Dial option setting. Once connected, the modems transmit data synchronously. If DTR transitions from on to off, the modem hangs up and returns to the asynchronous command mode. If DTR is low, the modem does not auto-answer.
Man Dial	3	DTR signals toggle between talk and data modes. With DTR off, numbers can be dialed from a telephone. Once an answer tone is heard, the telephone is hung up, and DTR is raised; the modems connect and send data synchronously. If DTR is dropped, the modems disconnect.

AT&P (Pulse Cycle)

DIALING OPT'S ▶ • • •
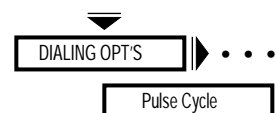
Pulse Cycle

The AT&P (Pulse Cycle) command determines the "make" percentage of the dialing pulse make/break ratio.

Option Setting	AT Command Setting	Description
40%	0	The make/break ratio is 40:60.
33%	1	The make/break ratio is 33.5:66.5.
38%	2	The make/break ratio is 38.5:61.5.

NOTE: These settings are country-specific. Consult Appendix C, Country-Specific Information, in the *326X Series Modem User's Guide* for the settings that are valid in your country.

&R, ✳CT

AT&R, AT✳CT (CTS Control)

TERMINAL OPT'S ▶ • • •

CTS
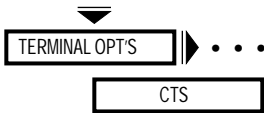
The AT&R and AT✳CT (CTS) commands determine how the modem sets the CTS signal. The modem signals the DTE with the CTS on EIA/TIA 232-D Pin 5 (V.24 Circuit 106). The CTS signal discussed below is the state of the CTS signal after the setting of the modem's RTS option has been followed. In order for CTS to follow the RTS signal from the DTE, set the RTS option to Normal.

Option Setting	AT Command Setting	Description
High	AT✳CT0 AT&R1	CTS remains on at all times. Use this setting if you plan to use RTS/CTS or DTR/CTS flow control.
Normal (2, 3, 4)	AT✳CT1	The modem controls CTS as required in normal handshaking. For V.25 bis ACU operation, CTS follows DTR in command state; CTS is off during training/ retraining and follows RTS in data mode. For AT ACU operation, CTS follows RTS in command state; CTS is off in training/retraining and follows RTS in data mode. If an ACU is not selected, CTS is low.
ACU On	AT✳CT2	CTS is on in ACU mode, goes off during training/ retraining, and follows RTS in data mode.
AsynSync (1)	AT✳CT3 AT&R0	CTS is on in asynchronous mode. CTS is off in synchronous, ACU mode. If the data transfer mode is synchronous, CTS is off during training/ retraining and follows RTS in data mode. When CTS follows RTS in data mode, the setting of the RTS/CTS Delay option applies (if Mode=Direct).
RTS	AT✳CT4	CTS follows RTS. Use this selection if your application requires CTS to immediately follow RTS. When CTS=RTS, the RTS/CTS Delay (AT✳DL) option is not available. If one of these flow control methods is used: Flow=RTS/CTS or Flow=DTR/CTS, then CTS *does not* follow RTS in a flow-off condition.

AT&S, AT∗MR (DSR Control)

TERMINAL OPT'S ▸ • • •

DSR
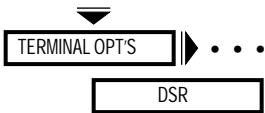
The AT&S and AT∗MR (DSR) commands determine how the modem sets the DSR signal. The modem signals the DTE with the DSR on EIA/TIA 232-D Pin 6 (V.24 Circuit 107).

Option Setting	AT Command Setting	Description
High (1)	AT∗MR1 AT&S0	DSR is always on.
Normal (3, 4) (2)[1]	AT∗MR0 AT&S1	DSR is controlled by the modem. DSR is on when the modem recognizes that it is communicating with a compatible modem.
DTR	AT∗MR2	DSR follows DTR.
Drop on Disc (2)	AT∗MR3	The same as the Normal setting except that when a disconnection is initiated from the local end, DSR is dropped immediately.
Sim LL	AT∗MR4	The same as the DTR setting except DSR is dropped when the remote modem requests a disconnect.

[1] Default with the 326X*FAST*-SDC Modem

AT&T (Test)
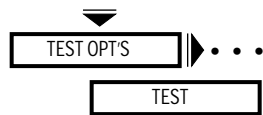
TEST OPT'S ▶ • • •

TEST

The AT&T (Test) command is used to initiate and terminate tests. See Chapter 4 of this guide for a complete description of each test.

Option Setting	AT Command Setting	Description
End Test (all)	0	Ends the test currently in progress for each test listed below (except for the Retrain test).
LAL	1	Initiates a local analog loopback test.
RDL	6	Initiates a remote digital loopback test.
LDL	3	Initiates a local digital loopback test.
Pattern		Initiates an end-to-end pattern test.
LAL Pat	8	Initiates a local analog loopback pattern test.
RDL Pat	7	Initiates a remote digital loopback pattern test.
Busy Out	ATH1 ATH0	Makes the modem appear busy to incoming calls. To configure the modem to use the Busy Out feature, refer to AT✳LT (DTE Pion 25) option description in this chapter.
		If Busy Out is enabled, ATH0 will disconnect the busy out condition. If the modem is in "escape mode" (the modem has transitioned to command state from the data state—online or test), the ATH0 command disconnects the modem. Selecting End Test will also disconnect the busy out condition.
Retrain	ATO1	Initiates a retrain with the remote modem.

NOTES: (1) For maximum reliability, run the RDL, LDL, and RDL Pat tests at a data rate of 19.2 kbps or lower. (2) These settings are country-specific. Consult Appendix C, Country-Specific Information, in the *326X Series Modem User's Guide* for the settings that are valid in your country. (3) When operating in the 326X*FAST*-SDC mode, the modem fallsback to Direct mode (Mode=Direct) to run "on-line" loopback tests. Refer to "326X*FAST* Synchronous Data Compression Testing" in Chapter 4, Testing Your Modem, for additional information.

AT&T4, AT&T5 (Accept RDL)

TEST OPT'S ▶ • • •
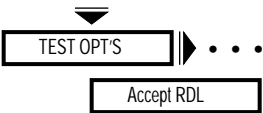
Accept RDL

The AT&T4 and AT&T5 (Accept RDL) commands control whether the local modem can be placed in a remote digital loopback test by a remote modem.

Option Setting	AT Command Setting	Description
On (all)	4	The local modem can be put into a remote digital loopback test.
Off	5	The modem cannot be put into a remote digital loopback test.

AT&V, AT∗ST (Modem Status Display)

DATA 9600 T/D? ▶ • • •

DTE 19.2 RELIABL
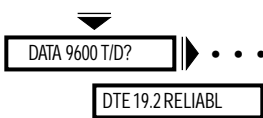
The AT&V and AT∗ST (Modem Status) commands allow you to view, via your control terminal, modem status information in either long or short form, using the AT∗ST and AT&V commands.

Option Setting	AT Command Setting	Description
DTE/DCE 19.2 EC DC Tx= kb 0% Rx= kb 0% DCD RTS CTS DSR DTR AOP DLP ALP DR=0 TI=0 O D Display Modem Id CQMS	0	*Long Form:* The AT∗ST0 and AT&V commands select the long-form status snapshot display. This display consists of several screens and provides a summary of: Operating Status; DTE/DCE Rate/Status; Error correction, Data Compression Status; EIA/TIA 232-D (CCITT V.24) Signal Status, Disconnect Reasons; display the modem's software revision (Display Modem ID); and CQMS Parameter Status. Also, the long-form snapshot summarizes the settings of all front panel options and their corresponding AT commands (only the suffix of the AT command is given; the "AT" is omitted), nonconfiguration (action) AT commands, and the setting of each S-Register. **NOTE**: Tx= kb 0% is displayed only for the 326X*FAST*-SDC Modem.
	1	*Short Form:* The AT∗ST1 and AT&V commands select the short-form status snapshot display. The short-form display provides a summary of AT command settings and S-Register values (for a detailed discussion of S-Registers, see "S-Registers" section in Chapter 5 of the *326X Series Modem User's Guide*. In short-form, only the suffixes and settings of each nonaction AT command are shown, and S-Register values are displayed in the following format: S010:024 This means that S-Register 10 is set to decimal value 24.

The Front Panel. Your front panel provides some or all of the following information: Operating Status; DTE/DCE Rate/Status; Error Correction, Data Compression, and Transmit and Receive Throughput and Link Utilization Status; EIA/TIA 232-D (CCITT V.24) Signal Status; and CQMS Parameter Status.

Operating Status Messages

Operating Status messages display the operating status of the modem. **NOTE:** The modem automatically displays one of the operating status messages in Table 1-1 if a front panel key is not pressed within five minutes. The R indicates a restoral connection and H indicates a hold of the dial line. You can also view Operating Status messages by pressing ▨ until you reach the Home position.

Table 1-1.
Operating Status Messages

Message			Description
Data <rate>		T/D?	The modem is transmitting at <rate> bps.
Data <rate>	R	T/D?	The modem is in dial restoral mode, and transmitting at <rate> bps.
Data <rate>	H	T/D?	The modem is holding the dial line while it tests the leased line, and transmitting at <rate> bps.
Dialing		T/D?	The modem is dialing a telephone number.
Disconnect		T/D?	The modem is not connected to the telephone line.
LAL <rate>		T/D?	The modem is in a local analog loopback test, at <rate> bps.
LAL Training		T/D?	The modem is executing a training sequence for a local analog loopback test.
Test <rate>		T/D?	The modem is running a test at <rate> bps.
Bad LAL		T/D?	The modem failed a local analog loopback test.
Busyout		T/D?	The modem appears busy to incoming calls.
Dial Wait		T/D?	The modem is waiting before dialing a number.
Link Wait		T/D?	A call attempt failed and the modem is waiting before dialing the linked telephone number.
Redial Wait		T/D?	A call attempt failed and the modem is waiting the specified interval before redialing.
Callbk Wait		T/D?	The modem is waiting to call back another modem.
Ranging		T/D?	The modem is connected to the telephone line and attempting first training sequence with the remote modem.
Training		T/D?	The modem is training.
Retraining		T/D?	The remote modem has requested a retraining sequence.
Synchronizing		T/D?	A handshake has failed. The modem is pausing before attempting to resynchronize by retraining.
Tone Detect		T/D?	The modem is waiting for access security tones from the remote modem.
Disc Wait		T/D?	The modem is disconnecting.
Disc/Rx Wait		T/D?	The modem is performing a receive buffer delay.
Disc Tx Wait		T/D?	The modem is performing a transmit buffer delay.
Off Hook		T/D?	The modem is off hook.
WAIT <rate>		T/D?	The modem is negotiating a reliable connection.

The reference to <rate> in Table 1-1 refers to the range of DCE data rates that are supported by the 326X Series Modem. The following data rates may be displayed:

24,000[1]	1200
21,600[1]	300[3]
19,200[1]	
16,800[1]	
14,400[1]	
12,000[1]	
9600U[2]	
9600[1]	
7200[1]	
4800	
2400	

[1]The modem is transmitting at a specified data rate using trellis-coded modulation.

[2]The modem is transmitting at 9600 bps without using trellis-coded modulation.

[3]The modem is transmitting at 300 bps using a frequency-shift keyed (FSK) modulation mode.

DTE Rate/Status Summary

Pressing ▶ from the Operating Status display brings you to the DTE Rate/Status line. The DTE rate represents the speed at which the local modem and DTE are communicating. The following definitions apply:

DTE Rate/ Display	DTE-to-Modem Rate (bps)
Ext	When Clock=External, Ext is displayed indicating the modem is accepting clock from the DTE. **NOTE**: Ext is displayed when the modem is configured for synchronous operation (direct synchronous mode or SDC mode).
128.0	128, 000
115.2	115, 200
96.0	96, 000
76.8	76, 800
72.0	72, 000
64.0	64, 000
57.6	57, 600
56.0	56, 000
48.0	48, 000
38.4	38, 400
28.8	28, 800
26.4	26, 400
24.0	24, 000
21.6	21, 600
19.2	19, 200
16.8	16, 800
14.4	14, 400
12.0	12, 000
9.6	9600
7.2	7200
4.8	4800
2.4	2400
1.2	1200
.3	300

The DTE Status IDs are explained below.

Error-Correction Status	Description
RELIABL	The modem is online and operating in an asynchronous error-correcting data transfer mode.
SYNREL	The modem is online and operating in a synchronous error-correcting data transfer mode (SDC Mode)
DIRECT	The modem is online and operating in the direct data transfer mode.
NORMAL	The modem is online and operating in the normal data transfer mode.
COMMAND	The modem is in command mode, and does not have a connection.
FAILREL	Reliable negotiation failed.
ATTEMPT	The modem is attempting to establish a reliable connection.

Error-Correction and Data-Compression Status

Pressing ▼ from the DTE Status display brings you to the Error Correction and Data Compression Status display. The following definitions apply.

EC Message	Description
LM	The modems are connected and using LAPM error correction.
M1 – M4	The modems are connected and using MNP error-correction level 1, 2, 3, or 4.
NONE	No error correction is being used.

DC Message	Description
V42bis	The modems are connected and using V.42 bis data compression.
MNP5	The modems are connected and using MNP Level 5 error correction.
NONE	No data compression is being used.

Transmit and Receive Throughput and Link Utilization Status Display

Pressing ▼ again brings you to the Transmit (Tx) and Receive (Rx) Throughput and Link Utilization Status displays:

> Tx=xxx.x kb yyy%
>
> Rx=xxx.x kb yyy%

These displays provide the modem's throughput rate (in kilobits) and the total percent of the analog channel currently being used for transmitting and receiving data.

The throughput rate is a running average of the data bit rate through the modem based on the most recent data transmitted to and received from the DTE.

Link utilization is based on the amount of data traffic transmitted and received over the analog channel. Link utilization is displayed in terms of the percentage of the channel that is being used.

Upon disconnection, the Transmit and Receive Throughput and Link Utilization Status display shows the throughput and link utilization at the time of disconnection.

These displays help to identify where delays in data transmission exist, whether within the modem or whether an insufficient amount of data is available for transmission. For example, if the display indicates a 40 kb throughput, with a 10% link utilization, then there is not enough data available for transmission. Alternately, if a 40 kb throughput is displayed, with 100% link utilization, then data throughput has been optimized.

NOTE: If Mode=Direct (AT✲SM), these displays appear blank.

EIA/TIA 232-D (CCITT V.24) Signal Status

Pressing ▼ from the Throughput Status brings you to the EIA/TIA 232-D (CCITT V.24) Signal Status lines (see Table 1-2 for definitions). **NOTE:** To the right of each EIA/TIA signal, in the front panel display window, is a box symbol. If the box is filled in, it indicates that the signal is on. If the box is empty, the signal is off.

Table 1-2.
EIA/TIA 232-D (CCITT V.24) Signal Status Messages

Abbreviation	Signal Name	Description
DCD	Data Carrier Detect	On. The modem is receiving carrier from the remote modem.
RTS	Request to Send	On. The DTE is requesting to send data to the modem.
CTS	Clear to Send	On. The modem is ready to accept data from the DTE.
DSR	Data Set Ready	On. The modem is ready to exchange data.
DTR	Data Terminal Ready	On. The DTE is ready to exchange data.
AOP	Answer/Originate	On. The DTE is requesting the modem to enter answer mode.
DLP	Remote Digital Loopback Test	On. The DTE is requesting a remote digital loopback test (V.24 Circuit 140, Pin 21).
ALP	Local Analog Loopback Test	On. The DTE is requesting a local analog loopback test (V.24 Circuit 141, Pin 18).

Status Summary Line

Pressing ▼ from the EIA/TIA 232-D Signal Status display brings you to the Status Summary Line (see Table 1-3 for definitions). Table 1-3 displays disconnect reasons, test indicator, answer or originate, and dial and leased line status.

Table 1-3.
Status Summary Line

Message	*Definition*
DR	Disconnect Reason. Indicates reason for last disconnect or failed call.
	1 = DTR dropped
	2 = ATH command issued
	3 = Remote modem disconnected
	4 = Manager request
	5 = Configuration change caused disconnect
	6 = Restoral – Manager
	7 = End Restoral – Manager
	8 = MI/MIC signal transition to off
	9 = Talk/Data (at the Home position) pushed
	10 = DTR end restoral
	11 = End Restoral – 116
	12 = Offline test initiated
	13 = Training failure
	14 = Security failure – Invalid Password
	15 = Security callback
	16 = End Restoral – Auto
	17 = Error correction link
	18 = Already connected
	19 = Dial aborted
	20 = Busy tone detected
	21 = No dial tone detected
	22 = Longspace detected
	23 = Dial aborted due to an incoming call
	24 = DTR not in proper state
	25 = Number on Forbidden or Delayed list
	26 = Retrain threshold exceeded
	27 = Answer/Originate mode changed (Pin 11)
	28 = No stored number to dial
	29 = Test in progress
	30 = Callback in progress

Table 1-3.
Status Summary Line (Continued)

Message	Definition
	31 = FSK and synchronous data modes incompatible
	32 = Semicolon detected in dial string
	33 = Answer-back tone detect timeout, no ringback tone
	34 = Answer-back tone detect timeout, ringback tone detected
	35 = Answer-back tone detect timeout, no call progress
	36 = Answer-back tone detect timeout, no answer
	37 = Answer-back tone detect timeout, busy after ringback
	38 = Denied manager down
	39 = Error-correction link retransmission limit
	40 = Error-correction link remote requested
	41 = Error-correction link no valid packet received
	42 = Error-correction link establishment error
	43 = Error-correction link accept or timeout
	44 = Error-correction link negotiation failure
	45 = Error-correction link protocol violation
	46 = Error-correction link bad parameter
	47 = Error-correction link data compression error
	48 = FSK and reliable data modes not valid
	49 = Restoral – DTR
	50 = Restoral – Circuit 116
	51 = Restoral – Auto
	52 = Restoral – Answer
	53 = Restoral – Talk/Data
	54 = End Restoral – Talk/Data
	55 = End Restoral – Dial to Lease Timeout
	56 = Lease Line Test
	57 = Lease Line Test – Manager
	58 = Lease Line Test Failed
	59 = External Option Set selected
	60 = Option Set selected – ATZ

Table 1-3.
Status Summary Line (Continued)

Message	Definition
	61 = Lease Line Test Passed
	62 = Security – No Callback Number provided
	63 = Security Failure – Manager timeout
	64 = Security Failure – Invalid Callback Number
	65 = Security Failure – Interdigit timeout
	66 = DTE Inactive
	67 = Restoral – ACU
	68 = End Restoral – ACU
	69 = Restoral – DTR ACU
	70 = End Restoral – DTR ACU
	71 = Restoral – ACU.116
	72 = End Restoral – ACU.116
	73 = LPDA2 Disconnect
	74 = Remote disconnected without sending PSTN
	75 = Configuration change cause disconnect
	76 = Retraining time exceeded
	77 = Remote Access Reset
TI	Test Indicator. The number displayed after TI tells you which test is in progress. The numbers correspond to the following messages:
	0 = No Test/End Test
	1 = Local Digital Loopback Test
	2 = Remote Digital Loopback Test
	3 = Local Analog Loopback Test
	4 = Reserved
	5 = Busy Out
	6 = Local Analog Loopback Pattern Test
	7 = Remote Digital Loopback Pattern Test
	8 = Pattern Test
	9 = Retrain
A or O	Answer/Originate
	A = Modem is in Answer mode
	O = Modem is in Originate mode
D or L	Dial/Leased
	D = Modem is using a dial telephone line
	L = Modem is using a leased telephone line

Display Modem ID

This display enables you to determine your unit's current revision of software. To display the software revision level:

1) Step across the Status/Option Sets/Dialing Menu by pressing ▶ until you reach the Operating Status Display. A typical Operating Status display is:

   DTE 19.2 RELIABL

2) Press ▼ until you see

   Display Modem ID

3) Press ◎. The modem displays

   SWPart=xxxxxxxx

4) The rightmost two digits indicate the software revision level.

Alternately, you can enter

   AT&I0

from the control terminal. The terminal displays the 8-digit software part number:

   xxxxxxxx

the software revision number is indicated by the rightmost two digits.

CQMS Parameter Status

Pressing ▨, then ▶ twice from the Status Summary Line displays CQMS Parameter Status. Pressing ▼ scrolls you through the CQMS Parameter Status displays (see Table 1-4 for definitions that apply).

CQMS Status information is important in order to make proper operating decisions. Dial modem data traffic typically travels across a mix of facilities provided by local and long distance carriers. This fact has significant implications on how you can troubleshoot apparent line problems.

The entry point into the carrier network is the (switched dial) line sent from the local carrier. Standard lines are typically used for voice and telephone traffic. While voice-grade lines can be used for data traffic, it is better to contract for data-quality lines. Data-quality lines offer improved line quality specifications guaranteed by the local carrier.

When one dial modem connects to another modem, the connection spans different telephone facilities. The connection between the dialing modem and the telephone company central office (CO) is referred to as the local loop. COs are connected by intra-office exchange connections or by inter-LATA long distance connections, depending on the distance of the call. At the remote answering modem, there is a central office-to-modem remote local loop connection.

For a given dial modem dialing various remote modems, the only connection that remains constant from call to call is the local loop. When one modem dials another modem multiple times, the local and remote local loops remain the same. All other connections are likely to vary from call to call.

Good quality on one call is no guarantee of equal quality on the next call, even if the call is to the same location. Poor quality for one call does not mean the line of the next call will be equally poor.

When monitoring line quality, it is important to spot trends and persistent conditions. Examples are provided below.

- Consistent poor connections for all local calls can indicate poor quality on the local loop. Signs of this are consistent V.32 bis calls which cannot maintain 14.4 kbps speeds. Persistent signal-to-noise ratios above a baseline established at the time of installation are indications of poor line quality.

- A sudden shift from generally good local calls to generally poor local calls can indicate that the local telco has moved the local loop, and the quality of the new loop is inferior.

- Consistently poor connections to one destination can indicate poor quality at the remote local loop. Signs of this are consistent V.32 bis calls which cannot maintain 14.4 kbps speeds.

In all cases, it is important that you begin operation by obtaining a baseline of "normal" good quality service of typical connections. With this, deviations from the normal can be spotted. Also, to help you locate persistent trends, use CQMS value information in conjunction with current and historic network information. Once the baseline is determined for your network, the thresholds for each parameter can be used to identify abnormal line performance. For example, if all local calls connect as expected, yet the long distance calls show a higher rate of errors, the CO-to-CO or remote local loop connections may be degraded.

The 326X Series CQMS parameters measure end-to-end performance, monitoring the transmission signal for noise and other distortions (non-linear and transient impairments are not measured by the 326X. This information is continuously updated to reflect current line conditions for both local and remote devices.

NOTES:

1) The CQMS values are estimates of line parameters and expected performance, to be used for planning *only*, and are not intended to be warranties of product performance.

2) If your modem is not currently connected to another modem, the CQMS values that are displayed are of the last call.

Table 1-4.
CQMS Parameters

Front Panel Display	Description
PhaseJitter	Measured in degrees, phase jitter is a continuous "fluttering" of the incoming analog signal from either its timing signal or from the referenced phase of the main data carrying signal. The phase jitter parameter measures the change in phase of the analog signal from the referenced phase of the main data-carrying signal. The shift in phase is often caused by alternating current components. Modulation of the carrier with another signal during transmission causes the change of phase or frequency. Range: 0 - 45 degrees, with 0 meaning there is no phase jitter.
Frq Offset	Measured in Hz, frequency offset is a measure of the incoming signal's deviation from normal carrier frequency. This condition is caused by two data carrier systems being out of tune with each other. Frequency offset is also called frequency shift. All operating modes cancel out any frequency offset on the line. For example, if 1 Hz of frequency offset is detected on the line, all received signals are adjusted by 1 Hz.
Tx Level	Measured in dBm, transmit level is a measure of the power of the transmitted signal. Transmit level displays the strength of the signal the 326X Series is transmitting (in decibels, relative to 1 mW). It measures the power level of the signal leaving the device's transmitter.
Rx Level	Measured in dBm, receive level is a measure of the power of the received signal. This parameter displays the strength of the signal the 326X Series is receiving (in decibels, relative to 1 mW). Receive level measures the power level of the signal entering the device's receiver. Acceptable receive level varies with the carrier detect selection.
Retrains	This parameter displays the number of training sequences that have occurred between the local and remote device for each single line connection. The 326X Series may retrain due to a user-initiated retrain request using the Test option, a user-initiated retrain request using the Max Rate and Min Rate options, and a modem-initiated retrain request, due to poor signal quality, to attempt to relearn the channel or fallback in data rate by enabling ARS if necessary. A retrain is counted if it is initiated locally or remotely, i.e., both the local and remote 326X Series retrain counters are incremented.
	Note that the retrain counter for automatic restoral operation is a separate, undisplayed counter. The restoral retrain counter is a moving window, based on the settings of the Leased to Dial option.
Echo Delay	Measured in milliseconds (from 1 to 9999 ms), this is the far-end echo round-trip delay time. This value is displayed only when the C.Fast, V.32 bis, or V.32 modulation mode is being used. Otherwise, the displayed value is zero. Echo delay displays how far away in time the far-end echo is, i.e., the round trip delay of the physical link layer.

Table 1-4.
CQMS Parameters (Continued)

Front Panel Display	Description
Far Echo Lvl	Measured in decibels (from -6 to -72 dBm), this is the strength of the echo signal generated between the local modem and the remote modem CO connection. This value is displayed only when the C.Fast, V.32 bis or V.32 modulation mode is being used. Otherwise, the displayed value is zero. **NOTE:** If the far end echo level is 35 dB below its receive level, the Phase Roll CQMS parameter has no meaning.
Nr Echo Lvl	Measured in decibels (from -6 to -72 dBm), this is the strength of the echo signal generated on the local loop (i.e., between the local modem and the local CO). This value is displayed only when the C.Fast, V.32 bis, or V.32 modulation mode is being used. Otherwise, the displayed value is zero.
Phase Roll	Measured in Hz (from 0.0 to 9.4 Hz), this is a measure of the frequency offset of the echo. This value is displayed only when the C.Fast, V.32 bis, or V.32 modulation mode is being used. Otherwise, the displayed value is zero. It is the difference in the transmit and receive path's frequency offset. **NOTE:** If the value of the far end echo level parameter is 35 dB below its receive level, Phase Roll has no meaning.
Eqlzr SNR	Equalizer Signal-to-Noise ratio displays the Signal-To-Noise Ratio (SNR) measured in decibels (from 0 dBm to 38 dBm). The SNR measures the signal strength compared to the signal dispersion caused by circuit noise. Circuit noise is any random signal disturbances in a communications link, such as electromagnetic interference, which tend to degrade line performance. This signal is measured after it has passed through the receiver's equalizer. It is not the SNR of the telephone line, since the equalizer reduces the effects of certain types of channel distortion. Determination of a good or bad SNR varies depending on modulation mode and data rate, in addition to one's definition of good and bad (specifically, which BER is acceptable for a specific application).
SQ	Signal Quality displays the relative quality of the received signal (0-9), where Good=9, and Poor=0. Signal quality is a single representation of a variety of line impairments. An approximate BER to SQ table follows, independent of the data rate. SQ<3, the bit error rate is approximately greater than (worse than) 10^{-2} SQ=3, the bit error rate is approximately 10^{-2} SQ=4, the bit error rate is approximately 10^{-4} SQ>4, the bit error rate is approximately less than (better than) 10^{-5}
EP	Error Probability displays the probability of an error in the data stream (in percent). Error probability, which acts as a confirmation of line deterioration, increases as the amount of distortion increases. The percentage increases as the amount of noise and/or distortion increases. An error probability value between 0% and 20% is considered good; a value between 21% and 40% is considered fair; and a value between 41% and 70% is representative of marginal line quality.

AT&W (Save Changes: Creating New Option Sets)

DATA 9600 T/D?
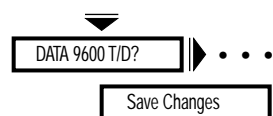
Save Changes

The AT&W (Save Changes) command saves an option set that you have created in the modem's nonvolatile memory. The first part of this section describes how to save an option set using the AT&W command; the second part describes how to save an option set from your modem's front panel.

Option Setting	AT Command Setting	Description
1	0, 1	Save as Option Set 1
(all)		
2	2	Save as Option Set 2
3	3	Save as Option Set 3
4	4	Save as Option Set 4

When using the AT command or the front panel to select options, if you do not save your modifications, the modem does not enter them into nonvolatile memory. However, the modem operates according to these modifications until you do one of the following:

- Choose another option set using the Select Options feature, the ATZ command, or AT&D3 command.

- Reinitialize the modem's memory using the Reinit Memory? option or the AT&F command.

- Power down the modem.

If you do want to save messages, do not turn off modem power until the "Save Completed!" message appears. Any modifications that you make are not placed in nonvolatile memory until "Save Completed!" appears.

The AT&W Command

The AT&W command allows you to create customized option sets.

To create a customized option set using the AT&W command:

1) Using the ATZn command, select the option set that most closely suits your application. The option set number you want to modify is represented by the "n."

2) Use the AT commands described in this chapter to change the setting of each option you want to modify. For example, to change RTS/CTS delay from its delay time according to S-Register 26, to a new setting of 15 ms, enter:

   AT✳DL1<CR>

   The modem responds with:

   OK

3) Once you have made all the changes to create your option set, enter the AT&Wn command. The "n" that you choose specifies the address (the option set) where the new customized option set is stored.

The front panel displays:

Saving Options

4) After a few seconds, your modifications are stored in the modem's nonvolatile memory, and the modem front panel displays:

Save Completed!

The new customized option set you have created replaces in nonvolatile memory the option set previously stored in that option set address.

The Front Panel

To create a customized option set:

1) Using the Select Options function, select the option set that most closely suits your application (see Chapter 4, Configuring Your Modem, of the *326X Series Modem User's Guide* for an in-depth discussion of option sets).

2) Display the individual option(s) you want to modify using ▼ and ▶. For example, if you want to change the Max Rate setting from 2400 to 7200, display:

Max Rate:7200

3) Press ◎. The display flashes three times and the colon changes to an equal sign. The new option is now temporarily saved and the modem displays:

Max Rate=7200

4) Step across the Status/Option Sets/Dialing menu by pressing ▶ until you see:

Save Changes=n

5) Use the ▼ key to display the option set number where you want the changes saved, and then press ◎. The modem displays:

Saving Options

6) After a few seconds, the modifications are stored in the modem's nonvolatile memory, and the modem displays:

Save Completed!

AT&X (Clock)

MODULATIONOPT'S ▶ • • •
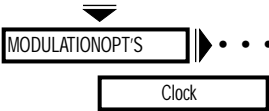
Clock

The AT&X (Clock) command sets modem timing and applies to synchronous applications only. For most dial applications, use internal timing. If you change this option during a connection, the change takes effect immediately.

Option Setting	AT Command Setting	Description
Internal (all)	0	Internal Transmitter Timing. The modem uses Internal clocking: timing signals are passed on EIA/TIA 232-D Pin 15 (V.24 Circuit 114). Internal timing is used for most applications.
External (2)[1]	1	External Transmitter Timing. The modem uses External timing: timing signals are passed on EIA/TIA 232-D Pin 24 (V.24 Circuit 113).
Loopback	2	Loopback Transmitter Timing. The modem uses Loopback timing: timing signals are passed on EIA/TIA 232-D Pin 17 (V.24 Circuit 115). **NOTE:** This selection is not available if you are operating in the 326X*FAST* Synchronous Data Compression mode. If you select Loopback with synchronous data compression enabled, the modem uses Internal timing instead.

[1]Default with 326X*FAST*-SDC Modem.

AT&Y (Power Up in Option Set)

DATA 9600 T/D? ▶ • • •
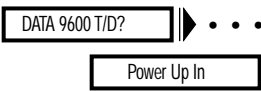
Power Up In

The AT&Y (Power Up In) command assigns the option set your modem uses when you power up. It is also used when you are resetting the modem memory (AT&D3).

Option Setting	AT Command Setting	Description
Old (all)	0	When you turn on the modem, it automatically uses the last saved option set that was selected when the modem was turned off.
1 – 4	1 – 4	When you turn on the modem, it automatically uses the option set corresponding to the number selected.

AT&Z, AT✻CN (Enter Telephone Numbers)

DATA 9600 T/D? ▐▶ • • •

Enter Phone #

The AT&Z and AT✻CN (Enter Phone #) commands store a telephone number (up to 50 characters) in one of the modem's nine "telephone book" addresses.

Option Setting	*AT Command Setting*	*Description*
1 – 9	1 – 9	Your modem stores the telephone number in the designated telephone book memory location.

The AT&Z or AT✻CN Command

To store a telephone number in one of the modem's nine telephone book addresses, enter the AT&Z or AT✻CN command, the telephone book address (1-9), a comma, and the telephone number you want to store. For example, to store the number 1-222-555-4444 in memory location 3, enter:

AT✻CN3,12225554444<CR>

If you enter the AT&Z or AT✻CN command without specifying a memory location, the modem stores the number in address 1. If no telephone number follows the AT✻CN or AT&Z command, the specified memory location's telephone number is deleted. Therefore, if you enter:

AT✻CN<CR>

or

AT&Z<CR>

the telephone number stored in memory location 1 is deleted.

The Front Panel

See the "Performing Numeric Entry" section in Chapter 2 for details on how to use numeric entry.

See "Dial Modifiers for Special Dialing Requirements" in Appendix A of the *326X Series modem User's Guide* for a description of allowable characters.

AT∗ Commands

The following sections describe Motorola-enhanced AT commands, which begin with AT∗.

AT∗AA (Answer)

ACU OPT'S ▶ • • •
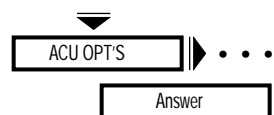
Answer

The AT∗AA (Answer) command controls whether the modem answers calls automatically or manually.

Option Setting	AT Command Setting	Description
Manual	0	An incoming call must be answered manually.
Ring #1	1	The modem automatically answers an incoming call after the first ring.
Ring #2	2	The modem automatically answers an incoming call after the second ring.
Ring #4	3	The modem automatically answers an incoming call after the fourth ring.
Ring #8	4	The modem automatically answers an incoming call after the eighth ring.
Using S0	5	The modem answers an incoming call according to the setting of S-Register S0.

NOTE: These settings are country-specific. Consult Appendix C, Country-Specific Information, in the *326X Series Modem User's Guide* for the settings that are valid in your country.

✳AP

AT✳AP (Adaptive Rate)

MODULATIONOPT'S ▶ • • •
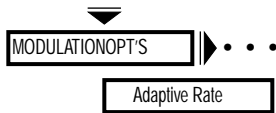
Adaptive Rate

The AT✳AP (Adaptive Rate) command determines whether the adaptive rate feature is used.

The Adaptive Rate option, when enabled, selects the optimum data rate on the first connection, and then constantly monitors signal quality and changes speeds as necessary to optimize user data throughput. Based on the signal quality, the modem shifts speeds up or down, to choose the appropriate transmission rate to minimize the error rate and maximize throughput and efficiency.

ARS operates in the following modulation modes, and corresponding data rates:

- *C.Fast:* 24.0, 21.6, 19.2, 16.8, 14.4, 12.0, and 9.6 kbps
- *V.32 bis:* 14.4, 12.0, 9.6, and 7.2 kbps
- *V.32/V.32 Uncoded:* 9.6 and 4.8 kbps
- *V.22:* 2.4 and 1.2 kbps

When line conditions deteriorate (i.e., poor signal quality), the modem retrains and determines the rate that the line can support. Under poor line conditions, the modem may fall back by more than one rate. For example, if operating at a data rate of 24.0 kbps, under poor line conditions, the modem may retrain to 19.2 kbps instead of 21.6 kbps. ARS fallback is based on the High BER setting of the AT✳RT (Retrain) option. When the modem falls back, a longer retrain occurs.

When line conditions improve, based upon the identification of good signal quality, the modem falls forward (increases the data rate) one rate at a time. The minimum time required to fall forward is 4 minutes. When the modem falls forward, a quick retrain occurs.

NOTE: The AT✳RT (Retrain) command *must* be enabled (set to Low BER or High BER) if you use the adaptive rate setting.

The 326X*FAST*/326X*FAST*-SDC product uses a line probing feature during the initial training sequence. Line probing selects the maximum data rate that the line can support, as well as the optimal baud rate and carrier frequency at which to run. Due to this, while operating in C.Fast modulation modes, the 326X Series Modem may require a longer training sequence.

If you choose to operate the 326X Series Modem in the C.Fast modulation mode with the ARS option (AT∗AP) disabled, the modem may not (depending on line conditions) retrain at the maximum data rate. If the line probe feature selects a baud rate that cannot support the maximum data rate, the modem will retrain and establish the connection at the maximum data rate allowable by the baud rate that the line probe feature selected.

NOTE: When external timing is selected, configure the modem so that the minimum rate is equal to the maximum rate. This will force the selection of the data rate to the rate you selected.

Option Setting	AT Command Setting	Description
On (all)	1	The modem continuously monitors the signal quality of the telephone line and negotiates the highest possible rate within one of the following modulation modes: C.Fast, V.32 bis, V.32, or V.22 bis. You must enable the AT∗RT (Retrain) command if you plan to use the adaptive rate setting. Close rear panel Switch 1 (down) so that the modem can inform the terminal of rate changes (see Table 2-2, Rear Panel Switches, in Chapter 2, Installing Your Modem in the *326X Series Modem User's Guide*).
Off	0	The modem does not use the adaptive rate feature.

AT∗AS (Answer in Restoral)

RESTORAL OPT'S ▶ • • •

Ans Rest

The AT∗AS (Ans Rest) command controls whether the modem answers a call on the dial line while connected to the leased line.

Option Setting	AT Command Setting	Description
LL Fail (all)	0	When connected on the leased line, the modem answers an incoming call only if the leased line fails.
Always	1	A dial call is always answered. As soon as the dial call is answered, the leased line connection is dropped (with auto-answering, the leased line is dropped after the correct number of rings). If training on the dial line fails, the modem returns to the leased line.

✳AY, ✳BD

AT✳AY (Auto Type)

MODULATIONOPT'S ▶ • • •
Auto Type
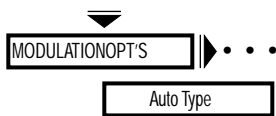
The AT✳AY (Auto Type) command determines how the modem negotiates modulation modes with the calling modem if it is answering calls, and one of the "Auto" modulation modes (C.Fast Auto, V32bis Auto or Auto V32) is selected.

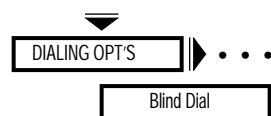| Option Setting	AT Command Setting	Description
Codex	1	During answer-back tone, the modem attempts to negotiate a connection in the V.32 modulation mode. After sending answer-back tone, the modem continues to attempt to negotiate a connection in the V.32 modulation mode. If unsuccessful, the modem tries to negotiate a connection in the V.22 bis modulation mode. **NOTE:** Use this setting if the calling modem is a Motorola 2264 or 2266 Modem with software revision 3.0 or below.
CCITT (all)	0	The modem operates in accordance with Annex A (Automode) to the V.32 bis specification. During answer-back tone, the modem attempts to negotiate a connection in the V.32 modulation mode. As soon as answer-back tone ends, if a V.32 tone has not been detected during ABT, the modem attempts to negotiate a connection in the V.22 bis modulation mode.

AT✳BD (Blind Dial)

DIALING OPT'S ▶ • • •
Blind Dial

The AT✳BD (Blind Dial) command determines the time interval that the modem waits before dialing. Once the time interval has expired, the modem dials. It does not wait for a dial tone.

Option Setting	AT Command Setting	Description
2	0	The modem waits 2 seconds before dialing.
4	1	The modem waits 4 seconds before dialing.
S6	2	The modem waits the amount of time specified by S-Register 6 before dialing.

NOTE: These settings are country-specific. Consult Appendix C, Country-Specific Information, in the *326X Series Modem User's Guide* for the settings that are valid in your country.

AT∗BK (Break Handling)

EC/DC OPT'S ▶ • • •
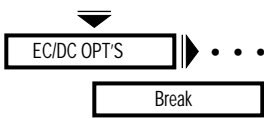
Break

The AT∗BK (Break) command controls how the modem handles the break signal in the reliable and auto-reliable data transfer modes. During a Normal mode connection, the modem handles breaks as standard, regardless of this option setting. During a Reliable, Auto-Reliable, or Speed Auto-Reliable connection, breaks are handled according to the option setting of the modem where the break originated. Break signals are sent to the DTE for a duration of one second.

| Option Setting	AT Command Setting	Description
Destruct (all)	0	The modem uses destructive and expedited break handling. It passes the break to the remote site immediately and deletes all data from its buffers. **NOTE:** Destructive breaks reinitialize data compression tables for MNP-5 and V.42 bis.
Expedited	1	The modem uses nondestructive and expedited break handling. It passes the break to the remote site immediately without deleting data from its buffers.
Standard	2	The modem uses standard break handling. It passes the break to the remote site in sequence with any transmit data from its buffers.

AT∗CA (Answer/Originate Mode)

MODULATIONOPT'S ▶ • • •
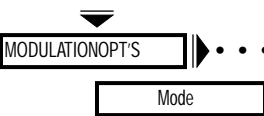
Mode

The AT∗CA (Mode) command determines whether the modem operates as an answer or originating modem. Use this option in manual answer, manual dial, leased line restoral or leased line applications where one modem is set to originate and the other to answer. If you change this option during a connection, it does not take effect until the next call. All option settings are overridden when dialing or answering an incoming call. **NOTE:** With a leased-line connection, the change takes effect immediately.

Option Setting	AT Command Setting	Description
Originate (1, 3)	0	Originate. The modem operates as an originating modem in a manual answer/dial application.
Answer (2, 4)	1	Answer. The modem operates as an answer modem in a manual answer/dial application.
External	2	External. The signal from the DTE on EIA/TIA 232-D Pin 11 determines whether the modem is in answer or originate mode. If the signal is off, the modem is in originate mode; if the signal is on, the modem is in answer mode.
Auto A in O	3	Auto answer in originate. The modem configures itself as an originating modem after auto-answering a call. In leased-line operation, the modem functions as if it is set to originate calls. **NOTE:** The functions provided by this setting only apply when your modem auto-answers.

✱CD, ✱CM, ✱CN, &Z, ✱CT, &R

## AT✱CD (DCD Loss Disconnect)

TERMINAL OPT'S ▶ • • •
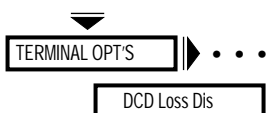
DCD Loss Dis

The AT✱CD (DCD Loss Dis) command determines how long the modem waits before it disconnects due to loss of carrier (DCD). If the S10 setting is selected and set to 255 or Off, the modem attempts to retrain indefinitely.

For C.Fast, V.32 bis, and V.32, the AT✱CD (DCD Loss Dis) command determines how long the modem waits for a retrain to complete. For the 3 and 7 seconds selections, the time is forced to 15 seconds. If the S10 setting is selected and set to 255 or Off, the modem never disconnects due to a carrier loss.

Option Setting	AT Command Setting	Description
Off	0	The modem will not disconnect due to loss of carrier.
3s	1	The modem hangs up if it loses carrier for 3 seconds.
7s	2	The modem hangs up if it loses carrier for 7 seconds.
S10 (all)	3	The modem checks the value stored in S-Register 10 to determine when it disconnects due to loss of carrier. See "S-Registers" in Chapter 5 of the *326X Series Modem User's Guide*, for more information about S-Register 10.

NOTE: These settings are country-specific. Consult Appendix C, Country-Specific Information, in the *326X Series Modem User's Guide* for the settings that are valid in your country.

AT✱CM (Connect Message)

ACU OPT'S ▶ • • •

Con Msg
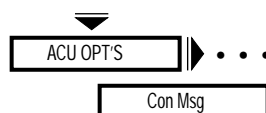
The AT✱CM command allows you to select whether you want to display the current DTE or DCE rate after the connect message. Refer to "DTE Rate/Status Summary" section on page 1-34 for possible DTE/DCE rates.

| Option Setting	AT Command Setting	Description
DTE Rate (default)	CM0	Selecting DTE Rate results in the current DTE rate being displayed on your terminal after the connect message.
DCE Rate	CM1	Selecting DCE Rate results in the current DCE rate being displayed on your terminal after the connect message.

AT✱CN, AT&Z (Entering Telephone Numbers)

See the AT&Z command description.

AT✱CT, AT&R (C, TS)

See the AT&R command description.

AT✳DA (Default Dialing)

ACU OPT'S ▶ • • •
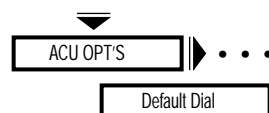
Default Dial

The AT✳DA (Default Dialing) command controls the Default Dial feature. When the Default Dial option is enabled, the modem dials the telephone number in the specified address if one of the following conditions occurs. This option also determines the telephone number dialed during restoral.

Option Setting	AT Command Setting	Description
Off (1, 2, 3, 4 D)	0	The default dial feature is disabled.
1 – 9 (4L) (2, 3)[1]	1 – 9	The modem direct dials the telephone number stored in the memory address selected (memory addresses 1 – 9) when one of the following conditions occurs:

- The DTR option in the modem is set to 108.1 or Tail, and the DTE turns the DTR signal from off to on.

- The DTR option in the modem is set to 108.2, Esc, Discon, Reset, or High, the DTR signal is on, and either the front panel Talk/Data key (◎ at the Home position) is pressed, or control of the dial is switched to the modem with an exclusion key telephone.

- ACU Select=AT, AT Form=DTR Dial, and the DTR signal transitions from off to on.

[1] Default with the 326X*FAST*-SDC Modem

✳DB

AT✳DB (Buffer Delay)

EC/DC OPT'S ▸ • • •
Delay
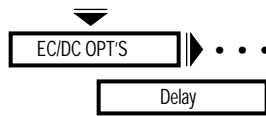
The AT✳DB (Delay) command allows you to configure the modem for a disconnect delay to provide time for clearing buffers. S-Register 38 determines how long the modem processes buffered data when a disconnect is initiated. The range for S-Register 38 is between 0 and 255.

The disconnect buffer delay feature applies when data is transmitted from DTE to DCE or from DCE to DTE. When this feature is enabled, depending on which disconnect type you have selected, the modem delays to clear its TX or RX buffer.

The TX buffer delay applies to the following disconnect types: DTR, ATH, LPDA2. The following commands apply to the termination of connections restored on the dial line: DTR, ATH, and 116.

The RX buffer delay applies to the following disconnect types: error correction link disconnects, PSTN cleardowns, and Longspace. When a delay is in progress, talk/data, as well as a disconnect in the opposite direction, causes an immediate disconnect.

NOTES:

1) When the modem is configured for Mode=Direct, there is no buffering of data.

2) This option does not apply when the modem is in a test mode.

Option Setting	AT Command Setting	Description
Off (all)	AT✳DB	The Off setting disables the Delay option.
Buf Or S38 (3)[1]	AT✳DB1	This setting starts the buffer delay timer immediately upon detection of the disconnect request. When the timer is operating, the modem continues to process either the transmit or receive buffers. The modem disconnects when the buffers are empty or the timer expires, whichever occurs first. **NOTE:** When the modem is set for Direct mode, no buffering of data exists and the disconnect is immediate.
Buf & S38	AT✳DB2	This setting prevents the timer from starting until either the transmit or receive buffers have emptied. The modem disconnects. Once the timer expires, when the modem is set to Direct mode, data is not buffered and the timer starts immediately.
S38	AT✳DB3	This setting allows the timer to start immediately upon detection of the disconnect request. This disconnect request continues to process either its transmit or receive buffers. The modem disconnects when the timer expires, regardless of the state of the buffers. **NOTE:** When the modem is set for Direct mode, no buffering of data exists. However, the modem delays a disconnect until the timer expires.

[1] Default with the 326X*FAST*-SDC Modem

AT∗DC (Data Compression)

EC/DC OPT'S ▮▶ • • •

DC
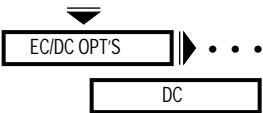
The AT∗DC (DC) command determines the data-compression technique used by your modem. **NOTE**: This option does not apply when the 326X*FAST*-SDC Modem is configured for synchronous data compression operation.

Option Setting	AT Command Setting	Description
Disable	0	Data compression is not attempted.
Enable	1	Data compression is attempted.
(all)		If your modem is using LAPM error correction, it uses V.42 bis data compression if DC=Enabled. **NOTE:** In an application with 326X*FAST* Synchronous Data Compression enabled, LAPM error correction and V.42 bis data compression *only* are used.
		If your modem is using MNP error correction, it attempts to negotiate V.42 bis and MNP-5 data compression with the remote modem.
		Depending on which data compression type can be accommodated by the remote modem, V.42 bis or MNP-5 is used. Otherwise, no data compression is used.

AT∗DD (Dial Wait)

DIALING OPT'S ▮▶ • • •
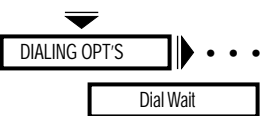
Dial Wait

The AT∗DD (Dial Wait) command instructs the modem to stop and wait for a dial tone. The modifiers are as follows:

- W
- w
- :

Option Setting	AT Command Setting	Dial Wait
2	0	2 seconds
3	1	3 seconds
4	2	4 seconds
6	3	6 seconds
12	4	12 seconds
15	5	15 seconds
20	6	20 seconds
30	7	30 seconds
40	8	40 seconds
S7	9	Dial wait is determined by setting S-Register 7. (See "S-Registers" in Chapter 5 of the *326X Series Modem User's Guide*).

NOTE: These settings are country-specific. Consult Appendix C, Country-Specific Information, in the *326X Series Modem User's Guide* for the settings that are valid in your country.

✳DE

AT✳DE (DTE Rate)

TERMINAL OPT'S ▶ • • •
DTE Rate
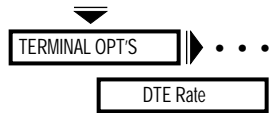
This option governs the speed at which the modem communicates with the DTE during data, ACU, and escape modes.

————Option Setting————

| 326X V.32 bis Modem	326XFAST Modem	326XFAST-SDC Modem	AT Command Setting	Description
Auto (1)	Auto (1)	Auto (1)	22	Modem uses the autobaud feature to determine the rate at which to operate. For a detailed description of the autobaud feature, see "Autobaud Feature" in Chapter 5 of the *326X Series Modem User's Guide*. **NOTE:** The Autobaud feature is not supported in synchronous operating modes. When configured for synchronous operation, if you select Auto, the DTE will be driven at the previous DTE rate selected (the factory default is 9600 bps).
	128.0	128.0	28	The DTE port is configured for 128, 000 bps
	115.2	115.2	21	The DTE port is configured for 115, 200 bps
	96.0	96.0	20	The DTE port is configured for 96, 000 bps
	76.8	76.8	19	The DTE port is configured for 76, 800 bps
	72.0	72.0	18	The DTE port is configured for 72, 000 bps
	64.0	64.0	17	The DTE port is configured for 64, 000 bps
57.6	57.6	57.6	16	The DTE port is configured for 57, 600 bps
		56.0 (2, 3, 4L) U.S./Can Only	24	The DTE port is configured for 56, 000 bps
		48.0 (2, 3, 4L) All Other Countries	23	The DTE port is configured for 48, 000 bps
38.4	38.4	38.4	15	The DTE port is configured for 38, 400 bps
	28.8	28.8	26	The DTE port is configured for 28, 800 bps
	26.4	26.4	25	The DTE port is configured for 26, 400 bps
	24.0 (2, 3, 4L)	24.0	14	The DTE port is configured for 24, 000 bps
	21.6	21.6	13	The DTE port is configured for 21, 600 bps
19.2 (4D)	19.2 (4D)	19.2	12	The DTE port is configured for 19, 200 bps
16.8	16.8	16.8	11	The DTE port is configured for 16, 800 bps
14.4 (2, 3, 4L)	14.4	14.4	10	The DTE port is configured for 14, 400 bps
12.0	12.0	12.0	9	The DTE port is configured for 12, 000 bps
9600	9600	9600	8	The DTE port is configured for 9600 bps
7200	7200	7200	7	The DTE port is configured for 7200 bps
4800	4800	4800	6	The DTE port is configured for 4800 bps
2400	2400	2400	5	The DTE port is configured for 2400 bps
1200	1200	1200	4	The DTE port is configured for 1200 bps (2400 bps is the lowest speed available with the 326X*FAST*-SDC Modem)
300	300	300	2	The DTE port is configured for 300 bps (2400 bps is the lowest speed available with the 326X*FAST*-SDC Modem)

AT✳DF (Data Format)

EC/DC OPT'S ▶ • • •
Data Form
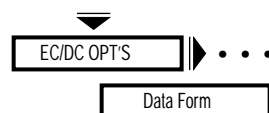
This option allows you to specify the data encoding format to be used during SDC connections. **NOTE**: This option applies only to SDC data mode. It *does not* apply to synchronous ACU's (V.25 bis or LPDA2) while disconnected. In the online mode, LPDA2 commands must follow the format of this option.

Option Setting	AT Command Setting	Description
NRZ (all)	0	The modem uses the NRZ data encoding format.
NRZI	1	The modem uses the NRZI data encoding format.

AT✳DI (Leased to Dial Option)

RESTORAL OPT'S ▶ • • •
L to D
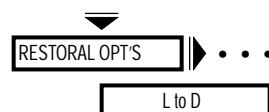
In an automatic restoral application, the originating modem uses the setting of its AT✳DI (L to D, Leased to Dial) command setting as a trigger for automatic restoral. The L to D option selects a threshold for the number of retrains that occurs over a period of time. The originating modem initiates restoral if the number of retrains that occur over the designated time exceeds the threshold set by the L to D option.

The default setting for the L to D option is Low/Fast (AT✳DI0). This is the most sensitive setting for this option and allows the modem to initiate restoral when signal quality deteriorates slightly. Leave this option set to Low/Fast to determine if it is sensitive enough for your application.

If you find that the Low/Fast setting is not sufficiently sensitive, set the AT✳RT (Retrain) command to Low BER to make the modem more sensitive to poor signal quality. If you find that the modem is too sensitive to poor signal quality, set the Retrain option to High BER and change the setting of the L to D option to a less sensitive setting.

Table 1-5 lists the number of retrains that must occur over a specified time for each setting of the AT✳DI command.

Table 1-5.
L to D Option Settings

Option Setting	AT Command Setting	Setting	C.Fast/V.32 bis/V.32 Modulation Modes		All Other Modulation Modes	
			# of Retrains	Time in Minutes	# of Retrains	Time in Minutes
Low/Fast (all)	0	High	3	5	6	5
Low/Slow	1	Medium	6	10	12	10
High/Fast	2	Medium	5	5	10	5
High/Slow	3	Low	10	10	20	10

✻DL, ✻DP

AT✻DL (RTS/CTS Delay)

TERMINAL OPT'S ▸ • • •
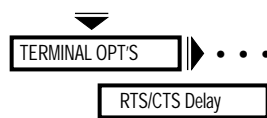
RTS/CTS Delay

The AT✻DL (RTS/CTS Delay) command sets the interval for the delay time between RTS and CTS. These settings only apply when operating in the asynchronous Direct or synchronous data modes.

Option Setting	AT Command Setting	Description
0 (all)	0	There is no RTS/CTS delay.
15	1	There is a 15-ms minimum delay before the modem sends the CTS signal to the DTE after receiving RTS from the DTE.
60	2	There is a 60-ms minimum delay before the modem sends the CTS signal to the DTE after receiving RTS from the DTE.
90	3	There is a 90-ms minimum delay before the modem sends the CTS signal to the DTE after receiving RTS from the DTE.
S26	4	RTS/CTS delay is determined by the value of S-Register 26.

## AT✻DP (Pause Delay)

DIALING OPT'S ▸ • • •
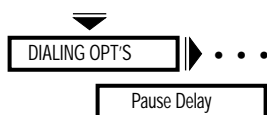
Pause Delay

The AT✻DP (Pause Delay) command forces the modem to pause when the modifiers are encountered in a dial string or on the command line. The modifiers are as follows:

- <
- k
- K

Option Setting	AT Command Setting	Description
3	0	Pause delay is 3 seconds.
6	1	Pause delay is 6 seconds.
9	2	Pause delay is 9 seconds.
12	3	Pause delay is 12 seconds.
S8	4	Pause delay is determined by S-Register 8. (See "S-Registers" in Chapter 5 of the *326X Series Modem User's Guide*).

NOTE: These settings are country-specific. Consult Appendix C, Country-Specific Information, in the *326X Series Modem User's Guide* for the settings that are valid in your country.

AT∗DR (Auto Redial)

Data 9600 T/D?
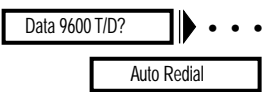
Auto Redial

The AT∗DR (Auto Redial) command determines how many times the modem redials a failed call. The modem waits for a country-specific time between redials and displays:

> Redial Wait

If you enable the AT∗LN (Link Phone #) command, the modem dials all of the linked numbers before redialing.

Option Setting	AT Command Setting	Description
Off (all)	0	The modem does not redial an unsuccessful call.
1 – 15	1 – 15	The modem redials an unsuccessful call "n" times.

NOTE: These settings are country-specific. Consult Appendix C, Country-Specific Information, in the *326X Series Modem User's Guide* for the settings that are valid in your country.

AT∗DS, ATDS (Dial a Stored Telephone Number)

See the ATDS command description.

AT∗DT (DTR Delay)

TERMINAL OPT'S

DTR
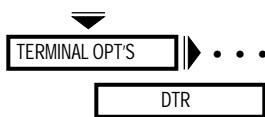
The AT∗DT (DTR Delay) command determines the amount of time that the modem waits after connecting to the dial line before examining the DTR signal from the DTE. If the DTR signal is low, the modem disconnects. This feature is used when the AT Form option is set to SyncData or the V25 Form option is set to AsynSync. The delay time period allows you to switch an asynchronous terminal to a synchronous terminal.

Option Setting	AT Command Setting	Description
S25 (all)	0	The modem waits the amount of time specified by S-Register 25 before examining DTR.
10 sec	1	The modem waits 10 seconds before examining DTR.
15 sec	2	The modem waits 15 seconds before examining DTR.

✳EC

AT✳EC (Error Correction)
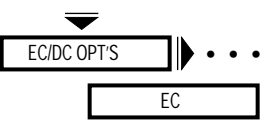
The AT✳EC (EC) command determines which error-correction protocol is used. **NOTE:** This option does not apply when the 326X*FAST*-SDC Modem is configured for synchronous data compression operation. If both the local and remote 326X*FAST*-SDC Modems are configured for SDC operation, LAPM error correction with V.42 bis data compression *only* is used; no other setting is available.

| Option Setting	AT Command Setting	Description
V.42 (all)	0	The modems negotiate the use of LAPM or MNP error correction. First, the two modems attempt to negotiate using LAPM. If unsuccessful, they attempt to negotiate using MNP.
		If still unsuccessful, and the Mode option is set to Auto Reliable or Speed-Dependent Auto Reliable, the modems use normal mode. If the Mode option is set to Reliable, the modems disconnect.
LAPM	1	The modems attempt to negotiate LAPM error correction**.**
		In asynchronous applications, if a connection is unsuccessful and the Mode option is set to Reliable, the local modem disconnects. If the Mode option is set to Auto Reliable, the modems use Normal mode. If the Mode option is set to Speed-Dependent Auto Reliable, and a connection is established at 1200 bps or less, Normal mode is used.
MNP	2	The modems attempt to negotiate MNP error correction.
		If unsuccessful and the Mode option is set to Auto Rel, the modems use normal mode. If the Mode option is set to Rel, the modems disconnect.

AT✻FC (Fast Call)

MODULATIONOPT'S ▶ • • •

Fast Call

The AT✻FC (Fast Call) command reduces the time for selected phases of the connect sequence.

Option Setting	AT Command Setting	Description
Off (all)	0	This option disables the Fast Call feature.
Lvl1	1	The 2.15 secured billing delay in the answer modem is eliminated in all modulation modes except Bell 212, V.21, and Bell 103. The length of time ABT is sent is reduced by 1 second in all modulation modes.
Lvl2	2	Lvl2 applies to V.32 (coded or uncoded)/V.32 bis/326X*FAST* modulation modes only. It includes the Lvl1 functionality and shortens the training time in the answer and originate modems by approximately 2 seconds.
Lvl3 (2, 3, 4L)[1]	3	Lvl3 includes the Lvl1 and Lvl2 functionality and eliminates error-correction negotiation, saving approximately an additional one half of a second. For proper operation, be sure to enable this option and ensure that the AT✻SM (Mode), AT✻EC (Error Correction), and the AT✻DC (Data Compression) options (EC/DC OPT'S category) are set *the same* in both the answer and originate modems.
		If your local and remote 326X*FAST*-SDC Modems are configured for synchronous data compression operation, by selecting Fast Call Lvl3, the modems use LAPM error correction with V.42 bis data compression *only.* For proper operation, be sure to enable this option in both the local and remote modems, and ensure that the AT✻SM (Mode) is set *the same* in both the answer and originate modems.

[1]Default with the 326X*FAST*-SDC Modem

✳FL

AT✳FL (Flow Control)

TERMINAL OPT'S ▶ • • •
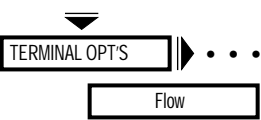
Flow

The AT✳FL (Flow) command allows the modems and DTEs in a link to control the flow of data when buffers near their capacity. Use some type of flow control when operating in the Normal or Reliable mode. Check the DTE's manual to ensure that the DTE supports the type of flow control you select.

Option Setting	AT Command Setting	Description
Off	0	Flow control is disabled.
XON/XOFF (all)	1	The local modem and DTE operate flow control by passing characters embedded in the data stream between them. The XOFF character signals the transmitting device to stop sending data. The XON character allows the halted device to start sending data. **NOTE:** XON/XOFF flow control is not supported in the 326X*FAST* synchronous data compression mode. If synchronous data compression is enabled, and you select XON/XOFF, the modem behaves as if flow control were disabled.
DTR/CTS	2	In asynchronous applications, the local modem and DTE use DTR/CTS signals to operate flow control. The terminal uses DTR and the modem uses CTS to signal when the buffers are full. An on-to-off transition signals the transmitting device to stop sending data; an off-to-on transition signals that data can flow. This setting overrides the CTS option setting when the modem is in Normal or Reliable mode. If you plan to use DTR/CTS flow control, set the AT&D (DTR under the TERMINAL OPT'S menu) command to High.

In applications operating in 326X*FAST* synchronous data compression mode, DTR/CTS flow control functions the same as asynchronous applications with the following exception: flow control is unidirectional from the local modem to the DTE through the CTS signal; the modem uses CTS to signal when the buffers are full. The DTR signal has no impact on flow control in synchronous applications. |

RTS/CTS	3	In asynchronous applications, the local modem and DTE use RTS/CTS signals to operate flow control. The terminal uses RTS to signal when its buffers are full. The modem uses CTS to signal when its buffers are full. An on-to-off transition signals the transmitting device to stop sending data; an off-to-on transition signals that data can flow. This setting overrides the AT&R or AT✻CT (CTS) command when the modem is in data mode.
		In applications operating in 326X*FAST* Synchronous Data Compression mode, RTS/CTS flow control functions the same as asynchronous applications with the following exception: flow control is uni-directional from the local modem to the DTE through the CTS signal; the modem uses CTS to signal when the buffers are full. The RTS signal has no impact on flow control in synchronous applications.
XON/XOFF PT	4	XON/XOFF Pass-Through Flow Control. The local modem and DTE operate flow control by passing characters embedded in the data stream between them. The characters are then passed through (PT) to the remote site to be acted upon. The XOFF character signals the transmitting device to stop sending data; the XON character allows the receiving device to start sending data. Check your DTE's manual to verify if the DTE recognizes XON/XOFF flow control.
		NOTES: (1) Pass-through flow control must be used with caution when Mode=Normal and Modem Flow=On because XON/XOFF characters are acted on by the remote modem at its DCE port. (2) Pass-through flow control *is not* applicable in 326X*FAST* Synchronous Data Compression mode. If synchronous data compression is enabled, and you select XON/XOFF PT, the modem behaves as if flow control were disabled.
TxClk (2, 3, 4L)[1]	5	Transmit Clock. This selection applies only if the modem is operating in SDC mode. When the Tx Clk flow control option is selected, the modem uses a transmit clock for flow control based on available buffer space. The transmit clock is stopped when the buffers are full, inhibiting the flow of data from the DTE. It is started again when buffer space is available. **NOTE:** This option is operational only when internal timing has been selected (Clock=Internal, AT&X).

[1] Default with the 326X*FAST*-SDC Modem

✻HD

AT✻HD (Hold Dial Line)

RESTORAL OPT'S ▶ • • •
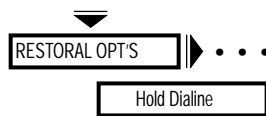
Hold Dialine

The AT✻HD (Hold Dialine) command forces the modem to hold a dial restoral connection while testing a leased line connection. This command applies to modems configured for restoral.

While operating in dial restoral, the modem periodically returns to the leased line (according to the time interval specified in the Dial to Leased option), to test the line in an attempt to reestablish the leased line connection. If, during 21 seconds, the modem fails to qualify the leased line, data transmission resumes on the held dial line. If the modem successfully establishes a valid connection on the leased line (within 21 seconds), it holds the dial restoral connection for the period of time set in the Hold Dialine option. The modem passes data on the leased line while holding the dial line.

If a retrain occurs while the modem is testing the leased line, the test is terminated and the modem returns to the dial line.

After the timer expires, if the leased line is qualified, the dial line is dropped and data transmission resumes on the leased line.

If the leased line qualification fails (the leased line cannot be qualified after 21 seconds, or if a retrain is initiated), another attempt to qualify the leased line is made according to the time specified in the Dial to Leased option.

NOTE: When operating with peer-to-peer, or alternate destination restoral, the Hold Dialine option should be set the same in both modems involved with restoral. In peer-to-peer restoral, two leased line modems are involved in restoral. In alternate destination restoral, the remote leased line modem and a local dial modem are involved in restoral. Figures 1-2(A) and 1-2(B) illustrate examples of peer-to-peer and alternate destination restoral, respectively.
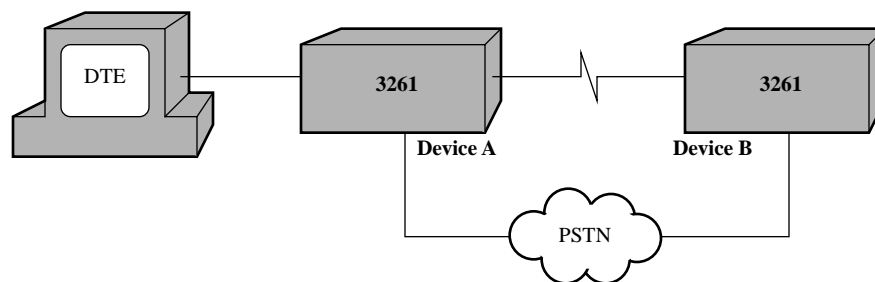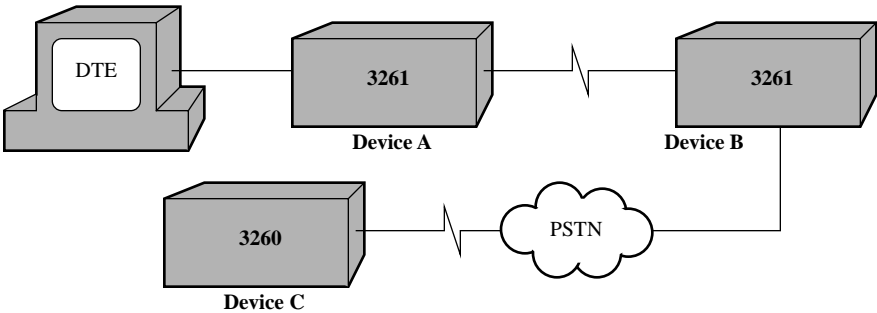

Figure 1-2(A). 326X, Peer-to-Peer Restoral

**Figure 1-2(B). 326X, Alternate Destination Restoral**

Option Setting	AT Command Setting	Description
Off (all)	0	The Hold Dialine option is disabled; a dial modem configured for restoral disconnects from the dial line normally. A leased line modem configured for restoral disconnects from the dial line as soon as it connects to the leased line.
1 min	1	A dial modem configured for restoral holds the dial line for 1 minute. A leased line modem configured for restoral holds the dial line for 1 minute while testing the leased line.
2 min	2	A dial modem configured for restoral holds the dial line for 2 minutes. A leased line modem configured for restoral holds the dial line for 2 minutes while testing the leased line.
3 min	3	A dial modem configured for restoral holds the dial line for 3 minutes. A leased line modem configured for restoral holds the dial line for 3 minutes while testing the leased line.
4 min	4	A dial modem configured for restoral holds the dial line for 4 minutes. A leased line modem configured for restoral holds the dial line for 4 minutes while testing the leased line.
5 min (4L)[1]	5	A dial modem configured for restoral holds the dial line for 5 minutes. A leased line modem configured for restoral holds the dial line for 5 minutes while testing the leased line.

1 Default with the 326X*FAST*-SDC Modem

∗LA, ∗LC

AT∗LA (DTE Circuit 141)

TERMINAL OPT'S ▸ • • •
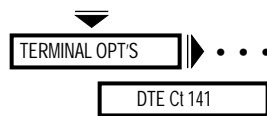
DTE Ct 141

The AT∗LA (DTE Ct 141) command controls whether or not the local DTE can send the modem into a local analog loopback by sending a signal on V.24 Circuit 141 (Pin 18) to the modem. The DTE must support Circuit 141 in order to use this option. **NOTE:** A local analog loopback test initiated via DTE Circuit 141 is overridden by front panel or AT test commands.

Option Setting	AT Command Setting	Description
Off (all)	0	The modem does not respond to a signal on Circuit 141 (Pin 18).
On	1	An off-to-on transition on Circuit 141 (Pin 18) causes the modem to initiate a local analog loopback test.
		An on-to-off transition on V.24 Circuit 141 (Pin 18) takes the modem out of a local analog loopback test.

AT∗LC (Line Compensation)

TELCO OPT'S ▸ • • •
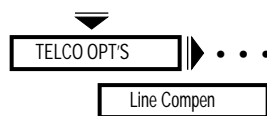
Line Compen

The AT∗LC (Line Compensation) command enables the modem to compensate for the effects of low loss in the End Office-to-End Office connections. This may occur when you are making a local call and using round trip delays less than 10 ms. Line compensation corrects the effects of low loss in the inter-CO connections on the received signal on short connections. **NOTE:** The AT∗LC command applies only when the modem is set for V.32/V.32 bis operating mode.

Option Setting	AT Command Setting	Description
Off (all)	0	Disables the Line Compensation option.
On	1	Enables the Line Compensation option.

AT✱LD (DTE Circuit 140)

TERMINAL OPT'S ▶ • • •
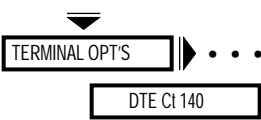
DTE Ct 140

The AT✱LD (DTE Ct 140) command controls whether or not the local DTE can put the modem into a remote digital loopback by sending a signal on V.24 Circuit 140 (Pin 21) to the modem. The DTE must support V.24 Circuit 140 to use this option. **NOTE:** A remote digital loopback test initiated via DTE Circuit 140 will be overridden by front panel or AT test commands.

Option Setting	AT Command Setting	Description
Off (all)	0	The modem does not respond to a signal on V.24 Circuit 140 (Pin 21).
On	1	An off-to-on transition on V.24 Circuit 140 (Pin 21) sends the modem into a remote digital loopback test. An on-to-off transition on V.24 Circuit 140 (Pin 21) takes the modem out of a remote digital loopback test.

AT✱LE (Dial to Leased Option, Automatic Disconnect)

RESTORAL OPT'S ▶ • • •
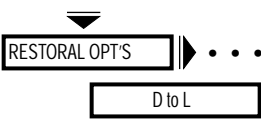
D to L

The AT✱LE (D to L) command allows the modem to automatically disconnect from the dial line and return to the leased line after a specified period.

Option Setting	AT Command Setting	Description
Manual (1, 2, 3)	0	Pressing the Talk/Data key (at the Home position) returns the modem to the leased line.
15 min	1	The modem returns to the leased line after 15 minutes.
30 min	2	The modem returns to the leased line after 30 minutes.
1 hour (4)	3	The modem returns to the leased line after 1 hour.
2 hours	4	The modem returns to the leased line after 2 hours.
4 hours	5	The modem returns to the leased line after 4 hours.

If you set this option to Manual, an alternate method of disconnection must be used. For all other settings, the modem automatically disconnects and returns to the leased line after the selected time expires. Set both modems to the same setting for the D to L option. **NOTE:** If Hold Dialine is set to anything but Off, the modem holds the dial line for the specified time period.

✳LL, ✳LN

AT✳LL (Local Analog Loopback Test Busy Out)

TEST OPT'S ▶ . . .
LAL Busy Out
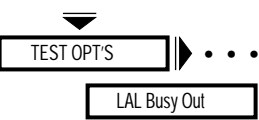
The AT✳LL (LAL Busy Out) command determines whether the modem appears busy to incoming calls during a local analog loopback test. **NOTE:** Set the AT&J (TELCO OPT'S Telco option) to RJ4MB before enabling this option.

Option Setting	AT Command Setting	Description
Off (all)	0	The modem does not busy out the line during a local analog loopback test, allowing incoming calls to ring.
On	1	The modem connects to the line during a local analog loopback test, making the line appear busy to incoming calls.

NOTE: These settings are country-specific. Consult Appendix C, Country-Specific Information, in the *326X Series Modem User's Guide* for the settings that are valid in your country.

AT✳LN (Link Telephone Numbers)

Data 9600 T/D? ▶ . . .
Link Phone #
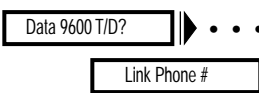
The AT✳LN (Link Phone #) command allows you to link telephone numbers that are stored in the modem's telephone book. Some remote applications provide more than one telephone number to call; if one is busy, you can call another. If a call attempt to a specified number fails and that number has been linked to another, the modem momentarily displays:

Link Wait

and then calls the second (linked) number. **NOTE:** If you enable the AT✳LN (Link Phone #), the modem dials linked numbers before redialing (see the AT✳DR section in this chapter).

The AT✳LNn,m Command

You can also line telephone numbers using the AT✳LN command. Enter the AT✳LN command, followed by the memory location of the number you want to link from (n), a comma, and the number which you want to link (m). A typical AT✳LN command entry would look like the following:

AT✳LN2,4

In this example, memory location 2 is linked to memory location 4. To clear the link between memory locations 2 and 4, enter AT✳LN2. Effectively, memory location 2 is now linked to no memory location.

The Front Panel

See the "Performing Numeric Entry" section in Chapter 2 of this guide for details on how to use numeric entry.

1) Step across the Status/Option Sets/Dialing menu by pressing ▶ until you see:

   Link Phone#=1

2) Press ▼ until the display shows the address number you want to link.

3) Press ◎. The display shows the address that the selected address is currently linked to. For example:

   Link #1 to None

   In this example, the phone number in address 1 is not linked to another number.

4) Press ▼ until the desired address appears and press ◎. For example, when address 1 is linked to address 2, the display shows:

   Link #1 to #2

   In this example, if you initiated a call for the number stored in address 1 and the call fails, the modem then calls the number stored in address 2.

AT∗LS (Low Speed)

▼

| MODULATIONOPT'S | ▶ • • •
|---|
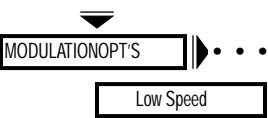
Low Speed

The AT∗LS (Low Speed) command determines which low-speed modulation mode is used in the event that a higher (C.Fast, V.32 bis, V.32, or V.22 bis) modulation mode connection cannot be made when the modem is set to Mod=C.Fast Auto, V32bis Auto or Auto V32.

Option Setting	AT Command Setting	Description
Bell	0	Bell 103 modulation mode is used.
CCITT	1	V.21 modulation mode is used.

∗LT, ∗MD

AT∗LT (DTE Pin 25)

TERMINAL OPT'S ▶ • • •
Dte Pin 25
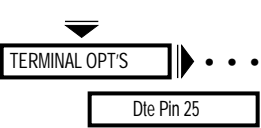
The AT∗LT (DTE Pin 25) command controls whether the modem uses EIA/TIA 232-D Pin 25 as an input or an output. Set rear panel Switch 2 to match the setting of this option (see Table 2-2 in Chapter 2 of the *326X Series Modem User's Guide* for more information on rear panel switches).

Option Setting	AT Command Setting	Description
Busy	0	The DTE signals the modem on Pin 25 to make the modem appear busy to incoming calls. Set rear panel DIP switch 2 to the off (up) position. Also, for this feature to work, the AT&J (Telco option) command must be set to RJ4MB.
Test (all)	1	The modem signals the DTE on V.24 Circuit 142 (Pin 25) when a test is in progress.

NOTE: These settings are country-specific. Consult Appendix C, Country-Specific Information, in the *326X Series Modem User's Guide* for the settings that are valid in your country.

AT∗MD (PSTN Signaling)

MODULATIONOPT'S ▶ • • •
PSTN
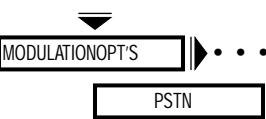
The AT∗MD (public switched telephone network [PSTN]) command determines how your modem handles disconnect signaling when operating in the C.Fast, V.32 bis or V.32 modulation mode.

Option Setting	AT Command Setting	Description
Off	0	Your modem disconnects without signaling the remote modem.
On (all)	1	Your modem signals the remote modem to disconnect by sending PSTN cleardown.

The following two matrixes summarize how the settings for the AT✷MD (PSTN) and the ATY (Longspace) commands interact to affect the behavior of your modem.

- *For C.Fast, V.32, and V.32 and V.32 Uncoded Modulation Modes*

	————————AT✷MD (PSTN) ————————	
	On	**Off**
ATY (Longspace)		
On	The modem signals the remote modem to disconnect (PSTN), and disconnects when it receives space that exceeds 1.6 seconds in durations modem responds to the AT✷MD (PSTN) signal from the remote modem.	The modem disconnects when it receives space that exceeds 1.6 seconds in duration. When terminating a call, the modem sends continuous space for 4 seconds. The modem does respond to the AT✷MD (PSTN) signal from the remote modem.
Off	The modem signals the remote modem to disconnect (PSTN). The modem does not disconnect when it receives space that exceeds 1.6 seconds in duration. The modem does respond to the AT✷MD (PSTN) signal from the remote modem.	The modem disconnects without signaling the remote modem, and without sending continuous space for 4 seconds. The modem does not disconnect when it receives space that exceeds 1.6 seconds in duration. The modem does respond to the AT✷MD (PSTN) signal from the remote modem.

- *For V.22 bis, V.21, Bell 212 and Bell 103 Modulation Modes*

	————————AT✷MD (PSTN) ————————	
	On	**Off**
ATY (Longspace)		
On	The modem disconnects when it receives space that exceeds 1.6 seconds in duration. When terminating a call, the modem sends continuous space for 4 seconds.	The modem disconnects when it receives space that exceeds 1.6 seconds in duration. When terminating a call, the modem sends continuous space for 4 seconds.
Off	The modem disconnects without signaling the remote modem, and without sending continuous space for 4 seconds. The modem does not disconnect when it receives space that exceeds 1.6 seconds in duration.	The modem disconnects without signaling the remote modem, and without sending continuous space for 4 seconds. The modem does not disconnect when it receives space that exceeds 1.6 seconds in duration.

✳MF, ✳MM

AT✳MF (Modem Flow Control)

EC/DC OPT'S ▶ • • •
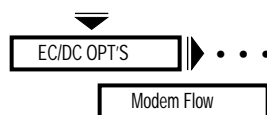
Modem Flow

The AT✳MF (Modem Flow) command allows the modem to generate and respond to XON/XOFF flow control signals received at the DIAL LINE or LEASED LINE port. **NOTE:** This option only applies to the Normal data transfer mode.

Option Setting	AT Command Setting	Description
Off	0	The modem flow control is not used.
On (all)	1	The modem periodically sends XON signals to the remote modem when it is able to receive data. When the modem becomes unable to receive data, it sends an XOFF signal to the remote modem. Likewise, the modem acts according to XON/XOFF signals received from the remote modem by starting or stopping the transmission of data.

AT✳MM (Modulation Mode)

MODULATIONOPT'S ▶ • • •

Mod
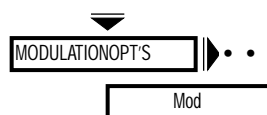
The AT✳MM (Mod) command determines the modulation mode used by the modem in data transmission. Changing modulation mode resets the AT✳MX (Max Rate) and AT✳MN (Min Rate) commands to their defaults for the modulation mode selected.

Option Setting	AT Command Setting	Description
C.Fast Auto (all)[1]	10	The modem negotiates the highest common connection in one of the following modulation modes: C.Fast V.32 bis V.32 V.22 bis Bell 212 V.21 or Bell 103 (depending on the setting of the Low Speed option). **NOTE:** This selection does not appear if you have the 326X V.32 bis Series Modem.
C.Fast Only	11	The modem negotiates the highest common connection in the Motorola proprietary modulation mode C.Fast. **NOTE:** This selection does not appear if you have the 326X V.32 bis Series Modem.

Option Setting	AT Command Setting	Description
V32bis Auto (all)[2]	0	The modem negotiates the highest common connection in one of the following modulation modes: V.32 bis V.32 V.22 bis Bell 212 V.21 or Bell 103 (depending on the setting of the Low Speed option).
Auto V32	1	The modem negotiates the highest common connection in one of the following modulation modes: V.32 V.22 bis Bell 212 V.21 or Bell 103 (depending on the setting of the Low Speed option)
V32bis only	2	V.32 bis or V.32 modulation mode is used.
V32 only	3	V.32 modulation mode is used.
V32 Uncoded	12	The V.32 modulation scheme is used without the Trellis-coded Modulation (TCM) scheme. This selection reduces end-to-end data delay. With this selection you do not have an embedded secondary channel (i.e. network management and remote configuration are not available).
V22bis only	4	V.22 bis modulation mode is used.
212 only	5	Bell 212 modulation mode is used.
103 only	6	Bell 103 modulation mode is used.
V21 only	7	V.21 modulation mode is used.

[1] Default in 326X*FAST*/326X*FAST*-SDC Product

[2] Default in V.32 bis Product

✶MN, ✶MR, &S, ✶MS

AT✶MN (Minimum Rate)

MODULATIONOPT'S ▶ • • •
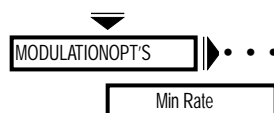
Min Rate

The AT✶MN (Min Rate) command sets the minimum rate at which the modems communicate. Settings vary depending on the modulation mode you choose, but some of the following speeds are available.

Option Setting

326X V.32 bis Modem	*326XFAST Modem*	*326XFAST-SDC Modem*	*AT Command Setting*	*Minimum Modem Modulation Rate (bps)*
300	300	300	0	300
(all)	(all)	(1)		
1200	1200	1200	1	1200
2400	2400	2400	2	2400
4800	4800	4800	3	4800
7200	7200	7200	4	7200
9600	9600	9600 (2, 3, 4L)	5	9600
12.0	12.0	12.0	6	12,000
14.4	14.4	14.4	7	14,400
	16.8	16.8	8	16,800
	19.2	19.2	9	19,200
	21.6	21.6	10	21,600
	24.0	24.0	11	24,000

NOTE: When the C.Fast Auto modulation mode is selected, the 326X Series Modem negotiates data rates from 300 to 24,000 bps. When the C.Fast Only modulation mode is selected, the modem negotiates data rates from 9600 to 24,000 bps.

AT✶MR, AT&S (DSR Control)

See the AT&S command description.

AT✶MS (AT Messages)

ACU OPT'S ▶ • • •
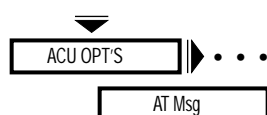
AT Msg

The AT✶MS (AT Msg) command determines when the AT connect message is sent to the DTE.

Option Setting	*AT Command Setting*	*Description*
Before CD (all)	1	The AT connect message is sent to the DTE before DCD is raised.
After CD	0	The AT connect message is sent to the DTE after DCD is raised.

AT✶MX (Maximum Rate)

MODULATION OPT'S ▶ • • •
Max Rate
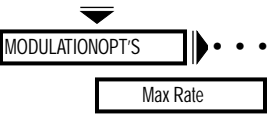
The AT✶MX (Max Rate) command sets the maximum rate at which the modems communicate over the analog network. Settings will vary depending on the modulation mode you choose, but some of the following speeds will be available.

———— **Option Setting** ————

326X V.32 bis Modem	326XFAST Modem	326XFAST-SDC Modem	AT Command Setting	Maximum Modem Modulation Rates (bps)
	24.0	24.0	11	24,000
	(all)	(all)		
	21.6	21.6[3]	10	21,600
	19.2	19.2[3]	9	19,200
	16.8	16.8[3]	8	16,800
14.4	14.4	14.4	7	14,400
(all)				
12.0	12.0	12.0	6	12,000
9600	9600	9600	5	9600
7200	7200	7200	4	7200
4800	4800	4800	3	4800
2400	2400	2400	2	2400
1200	1200	1200	1	1200
300	300	300	0	300

NOTE: When the C.Fast Auto modulation mode is selected, the 326X Series Modem negotiates data rates from 300 to 24,000 bps. When the C.Fast Only modulation mode is selected, the modem negotiates data rates from 9600 to 24,000 bps.

AT✶NB (Buffer Option)

EC/DC OPT'S ▶ • • •
Buffers
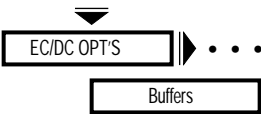
The AT✶NB (Buffer Option) allows you to specify whether normal or reduced sized buffers are used to store data received from a local DTE. Use this option if you have DTE-to-DTE flow control enabled to reduce the amount of data sent to the remote DTE when a flow-off condition is received at the local DTE.

NOTE: This option is available only when Mode= Normal (AT✶SM).

Option Setting	AT Command Setting	Description
Regular	0	Normal capacity buffers are used.
(all)		
Reduced	1	Reduced sized buffers are used allowing less data to be accumulated in the modem.

✳NC, ✳ND

AT✳NC (Network Compensation)

TELCO OPT'S ▸ • • •
Network Comp
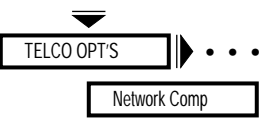
The Network Compensation option allows you to enhance the performance reliability of the 326X*FAST*/326X*FAST*-SDC Modem when operating with certain types of network equipment.

NOTES:

1) This option is available only when the C.Fast Auto or C.Fast Only modulation modes are selected.

2) This option applies to Releases 5.2 and greater of the 326X*FAST*/326X*FAST*-SDC Modems only.

Option Setting	AT Command Setting	Description
Off (default)	0	Off should be selected when making most normal connections within a continent.
Lvl1	1	Select Lvl1 if the modem is experiencing performance problems when connected to a line terminating equipment via a short loop, having low loop loss with below normal receive signal levels (for example, when operating behind a low grade PBX). **NOTE:** This selection limits the maximum possible DCE data rate to 21,600 bps.
Lvl2	2	Lvl2 is recommended when performance problems are encountered making intercontinental calls. **NOTE:** This selection limits the maximum possible DCE data rate to 19,200 bps.
		When operating in an environment where the conditions described for Lvl1 and Lvl2 exist, Lvl2 is recommended to enhance performance.

AT✳ND (View Stored Telephone Numbers)

DATA 9600 T/D? ▸ • • •
View Phone #

The AT✳ND (View Phone #) command displays the telephone numbers stored in the modem's nine telephone book addresses.

The AT✳ND Command
To view the telephone numbers stored in your modem's memory, enter:

   AT✳ND<CR>

The Front Panel
Select the address you want displayed at View Phone #. See the "Performing Numeric Entry" section in Chapter 2 for details on how to use numeric entry.

AT∗OC (External Control)

TERMINAL OPT'S ▶ • • •
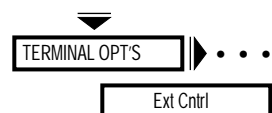
Ext Cntrl

The AT∗OC (Ext Cntrl) command chooses which pin the AT∗OP (Ext Select) command responds to. **NOTE:** If the AT∗OP is set to 0, this command has no effect.

Option Setting	AT Command Setting	Description
Pin 14 (all)	0	The Ext Select option loads an option set based upon the transition of Pin 14. This setting overrides the AT∗RE (Restore) command setting FP/116 or FP/116.ACU.
Pin 20	1	The Ext Select option loads an option set based upon the transition of Pin 20. When using this setting, set the AT&D (DTR) command to High. This setting overrides the AT∗RE (Restore) command settings FP/108.1 and FP/108.ACU and all AT&D (DTR) command settings except High.

AT∗OP (External Option Set Select)

TERMINAL OPT'S ▶ • • •
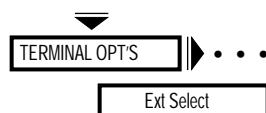
Ext Select

The AT∗OP (Ext Select, also known as 116 Select) command controls how the modem uses an external pin to select option sets. The pin used is defined by the AT∗OC (Ext Cntrl) command. **NOTE:** Upon power up, if the modem is configured for Power Up In=Old, it reads the AT∗OC (Ext Control) option and sets the option set accordingly.

Option Setting	AT Command Setting	Description
Off (all)	0	The AT∗OP (Ext Select) command is disabled.
nH-mL	1-12, where: 1 = 1H/2L 2 = 1H/3L 3 = 1H/4L 4 = 2H/1L 5 = 2H/3L 6 = 2H/4L 7 = 3H/1L 8 = 3H/2L 9 = 3H/4L 10 = 4H/1L 11 = 4H/2L 12 = 4H/3L	There are 12 settings with the format nH-mL, where n = 1, 2, 3, or 4, and m = 1, 2, 3, or 4. When the pin specified by the Ext Cntrl option (Pin 14 or Pin 20) transitions from low to high, the modem loads the "H" option set. When the pin specified by the Ext Cntrl option (Pin 14 or Pin 20) transitions from high to low, the modem loads the "L" option set. For example, if you set Ext Select=1H/2L and the pin specified by the Ext Cntrl option (Pin 14 or Pin 20) transitions from low to high, the modem loads Option Set 1. If the pin specified by the Ext Cntrl option (Pin 14 or Pin 20) transitions from high to low, the modem loads Option Set 2. When an option set is loaded due to the pin specified by the Ext Cntrl option (Pin 14 or Pin 20) transition, the modem disconnects from the line.

✳OS, ✳PE, ✳PF

AT✳OS (Overspeed)

TERMINAL OPT'S ▶ • • •
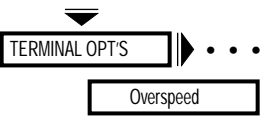
Overspeed

The AT✳OS (Overspeed) command allows the modem to compensate for DTE overspeed. Some asynchronous DTEs send data to the modem faster than specified, a condition known as overspeed.

Option Setting	AT Command Setting	Description
1.0% (all)	0	The modem compensates for DTE overspeed up to 1.0%.
2.5%	1	The modem compensates for DTE overspeed up to 2.5%.

AT✳PE (Enable/Disable Password Protection)

FP SECURITY ▶ • • •
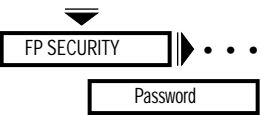
Password

The AT✳PE (Password) command enables and disables the Password function. Once you have enabled the Password function, set protection in order to lock the modem (see AT✳PF).

Option Setting	AT Command Setting	Description
Enable	1	AT✳PE1 enables password.
Disable	0	AT✳PE0 disables password.

When you set protection, you must use a password before you can access the protected functions. Otherwise, you do not need to enter a password to access any modem function. Refer to the AT✳PW command for details on creating and changing a password.

AT✳PF (Set Protection)

FP SECURITY ▶ • • •

Password ▶
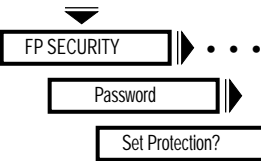
Set Protection?

The AT✳PF (Set Protection) command allows you to set protection in order to lock the modem. Refer to the AT✳PN command for details on entering a password.

Option Setting	AT Command Setting	Description
Set Protection?	AT✳PF	Use the AT✳PF command to lock your modem.

The Front Panel

After you have enabled the password function explained in the AT✳PE command description, you must set protection.

To set protection:

1) Display:

   Set Protection?

2) Press ◎. The modem responds with: Password Protected

   The modem is now locked and it is necessary to enter your password to access locked functions. If you try to access locked functions, the modem responds with:

   Password Locked

AT∗PN (Unlock Password Protection)

FP SECURITY ▶ • • •
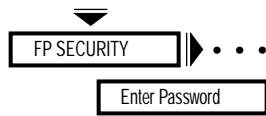
Enter Password

To unlock a password protected modem and gain access to all modem functions, use the AT∗PNxxxx command. xxxx represents the password, which must be entered with the command.

You can also use the front panel option to gain access to all modem functions. Do the following:

1) Display:

Enter Password?

2) Press ◎. The modem displays:

Enter PW:0000

3) The cursor on the leftmost zero is flashing, indicating it is selected. Using ▼ to select digits 0 – 9, and ▶ to move the cursor to the right, enter your new password. If you should incorrectly enter the password, press ▨ and the modem displays:

Entry Cancelled!

4) Once you have entered the password correctly, press ◎. The modem displays:

Passwd Unlocked

5) If you should enter an incorrect password, the modem responds with:

Invalid Password

Your modem relocks the password protected features after five minutes of no activity. To lock the modem before the default time expires, see the AT∗PF command.

AT∗PT (Dial Type)

See the ATP command description described earlier.

✳PW, ✳RA

AT✳PW (Change Password)

FP SECURITY ▶ • • •
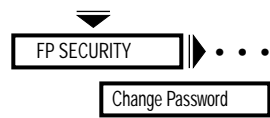
Change Password

The AT✳PW (Change Password) command is used as follows:

AT✳PWold password/new password<CR>

If the change is successful, the modem responds with:

OK

The Front Panel

1) Display:

   Change Password

2) Press ◎. The modem responds with:

   Old PW:0000

3) The cursor on the leftmost zero is flashing, indicating it is selected. Using ▼ to select digits 0 – 9, and ▶ to move the cursor to the right, enter your old password. If you are entering a password for the first time, enter the factory default password of four zeros (0000). Press ◎ again. The modem responds with:

   New PW:0000

4) The cursor on the leftmost zero is flashing, indicating it is selected. Using ▼ to select digits 0 – 9, and ▶ to move the cursor to the right, enter your new password. Your password must contain four characters; the characters are limited to 0 – 9. Press ◎. The modem responds with:

   Verify PW:xxxx

   where "xxxx" is the password you have just entered.

5) If the password displayed is correct, press ◎ again. The modem responds with:

   Password Saved!

6) If the password is incorrect, press any front panel key other than ◎ to abort the Change Password function.

AT✳RA (Remote Access)

RMT CONFIG OPT'S ▶ • • •
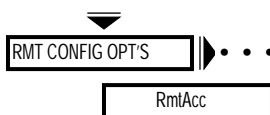
RmtAcc

The AT✳RA (RmtAcc) command determines whether your modem allows itself to be configured by the remote modem.

Option Setting	AT Command Setting	Description
Enable (all)	1	The local modem can be configured by the remote modem.
Disable	0	The local modem cannot be configured by the remote modem.

AT∗RC (Initiate, Terminate, or Abort Remote Configuration Session)

RMT CONFIG OPT'S ▶ • • •

Init Rmt Cnfg?

The AT∗RC command allows you to initiate, terminate, or abort a remote configuration session with the connected modem.

Option Setting	AT Command Setting	Description
Initiate Rmt Cnfg?	2	The modem attempts to initiate a remote configuration session with the connected modem.
Terminate	0	The modem terminates a remote configuration session with the connected modem. Changes to the remote modem's configuration are saved. This setting is not displayed unless you are already in a remote configuration session.
Abort	1	The modem aborts a remote configuration session with the connected modem. Changes made to the remote modem's configuration are not saved. This setting is not displayed unless you are already in a remote configuration session.

Initiating a Remote Configuration Session with a Dial Modem

The AT∗RC Command

To use the AT∗RC command to initiate a remote configuration session with a dial modem:

1) Establish a dial-line connection with the remote modem at 7200 bps or greater.

2) Enter:

   AT∗RC2<CR>

3) Your terminal displays:

   INITIATING RC

   When the remote configuration session has been established, your terminal displays:

   RC ESTABLISHED

   If unsuccessful, the terminal displays:

   RC FAILED!

   or

   RC DENIED!

*RC

The Front Panel

To initiate a remote configuration session with a dial modem, use your front panel to:

1) Establish a dial-line connection with the remote modem at 7200 bps or greater.

2) Press ▨ to move to the "home" position on the front panel menu tree.

3) Press ▼ until the RMT CONFIG OPT'S menu appears.

4) Press ▶ to display:

   Init Rmt Cnfg?

5) Press ◎. The modem displays:

   Initiating RC…

   If successful, the modem displays:

   RC Established!

   If unsuccessful, the modem displays:

   RC Failed!

   or

   RC Denied!

Failure to establish a remote configuration session can be caused by the following:

• The remote modem's AT*RA (Rmt Acc) command is set to Disabled.

• The remote modem is running a test.

• You have already established a remote configuration session with the remote modem, but via a different means. (For example, you have already established a remote configuration session using your AT ACU, and you are now trying to use your front panel to do the same thing).

Initiating a Remote Configuration Session with a Leased Line Modem

The leased line remote configuration function makes use of the SET RMT LL ADDR and SRCH RMT LL ADDR menus. Before beginning a remote configuration session with a leased line modem, you must know the remote modem's address. If you have not yet assigned the remote modem an address, or cannot find its address, see the "SET RMT LL ADDR" menu and "SRCH RMT LL ADDR" menu sections in Chapter 2 of this guide first.

To initiate a remote configuration session with a leased-line modem:

1) Establish a leased-line connection with the remote modem at 7200 bps or greater.

2) Press ▨ to move to the "Home" position on the front panel menu tree.

3) Press ▼ until the RMT CONFIG OPT'S menu appears.

4) Press ▶ to display:

    Init Rmt Cnfg?

5) Press ◎. The modem displays:

    Rmt Address=000

The leftmost 0 is blinking. Enter the remote modem's address. Using ▼, select the first digit of the leased line modem's address. Press ▶ to move the cursor to the next digit. Use ▼ again to select the second digit. Once you have finished entering all three digits of the remote modem's address, press ◎. The modem displays:

    Initiating RC…

If successful, the modem displays:

    RC Established

If unsuccessful, the modem displays:

    RC Failed!

or

    RC Denied!

Failure to establish a remote configuration session can be caused by the following:

- The remote modem's Rmt Acc option is set to Disabled (AT✳RA0).

- The remote modem is running a test.

✳RC

Terminating a Remote Configuration Session

When you terminate a remote configuration session, changes made to the remote modem's configuration are automatically saved.

The AT✳RC Command
To use the AT✳RC command to terminate a session:

1) Enter:

   AT✳RC0<CR>

2) Your terminal displays:

   RC COMPLETE
   OK

3) You are now in escape mode. To return online, enter:

   ATO<CR>

The remote configuration session is terminated, and the remote modem saves changes made to it during the session.

The Front Panel
To use your front panel to terminate a session:

1) Display:

   Rmt Cnfg=Established

2) Press ▼ until the modem displays:

   Rmt Cnfg:Terminate

3) Press ◎. The modem displays:

   RC Complete!

Aborting a Remote Configuration Session

When you abort a remote configuration session, changes made to the remote modem's configuration are not saved.

The AT✳RC Command
To use the AT✳RC command to abort a session:

1) Enter:

   AT✳RC1<CR>

2) Your terminal displays:

   RC ABORTED
   OK

The Front Panel
To use your front panel to abort a session:

1) Display:

   Rmt Cnfg=Established

2) Press ▼ until the modem displays:

   Rmt Cnfg:Abort

3) Press ◎. The modem displays:

   RC Aborted!

AT✻RE (Initiate/Terminate Restoral)

RESTORAL OPT'S ▶ • • •
Restore
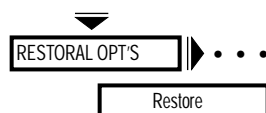
The AT✻RE (Restoral) command determines how modems operating on a leased line handle initiation of dial restoral. The 326X Series provides four different methods of initiating restoral:

- Automatic
- Manual
- DTE signal
- DTE ACU

Option Set 4 configures the modem for automatic restoral initiation (Restore=FP/Auto). **NOTE:** The Restoral option and its option settings appear on your modem's front panel only if you have the Restoral option installed. The 326X Series Modem models that include the Restoral option are the 3261, 3263, 3266, and 3268.

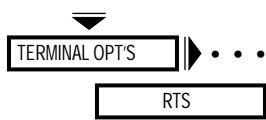| Option Setting	AT Command Setting	Description
Off (1, 2, 3, 4D)	0	This option disables the initiation of restoral.
FP Only	1	Manual initiation allows you to initiate and terminate restoral by pressing the Talk/Data key (◎ key in the Home position) on the modem's front panel.
FP/108.1	2	The 326X Series Modem allows the DTE to initiate restoral using its DTR signal. In DTR restoral, an off-to-on DTR transition from the DTE interface initiates restoral. This option is provided for DTEs that cannot manipulate Circuit 116 for restoral purposes. In DTR restoral, either the answering or originating modem can initiate restoral when the connected DTE turns DTR from off to on by dialing the number stored in its telephone directory, based on the setting of the Default Dial option.
		Once a call is successful, an on-to-off transition of DTR from the DTE disconnects the modem from the dial line and returns it to the leased line.
		Once restoral is terminated by any means other than the DTR signal, the DTR signal from the attached DTE must be turned off before an off-to-on DTR transition can initiate another restoral attempt.
		NOTE: The Ext Select option overrides DTR restoral if Ext Cntrl option is configured for Pin 20 and the Ext Select option is configured for a setting other than Off.

*RE

Option Setting	AT Command Setting	Description
FP/116	3	The 326X Series allows the DTE to initiate restoral with Circuit 116. Circuit 116 allows you to use off-to-on transitions of this signal from the DTE to initiate restoral, according to CCITT V.24 specifications. In Circuit 116 restoral, the answer or originating modem can initiate restoral (when the connected DTE turns Circuit 116 from off to on) by dialing the number stored in its telephone directory, based on the setting of the Default Dial option. You can initiate restoral manually by pressing the Talk/Data key (◎ at the Home position) on the front panel.
		Once a call is successful, an on-to-off transition of Circuit 116 disconnects the affected modem from the dial line and returns it to the leased line. You can manually disconnect either modem from the dial line by pressing the Talk/Data key (◎ at the Home position) on the front panel.
FP/Auto (4L)	4	In automatic restoral, the originating modem on the leased line determines when restoral takes place. The answer modem cannot automatically initiate restoral; it can only answer an inbound call, thus ensuring that both modems do not try to call each other at the same time. Such an occurrence would result in a failed restoral attempt.
		During data transmission, the originating modem monitors leased line signal quality by counting the number of retrains, both inbound and outbound, that occur over a specified time period. **NOTE:** Retrains that cause a change (through the Adaptive Rate feature) are not counted.
		If the number of retrains over a period of time exceeds the threshold set by the L to D (Leased to Dial) option, or if the modem does not receive answers to its training sequences, the originating modem initiates restoral by dialing the number stored in its telephone directory, based on the setting of the Default Dial option.
		Once the modems are using the dial line, the originating modem continues to count retrains on the dial line. If the number of retrains over a period of time exceeds the threshold set by the L to D (Leased to Dial) option, the originating modem disconnects from the dial line and returns to the leased line.

Option Setting	AT Command Setting	Description
FP/108.ACU	5	The 108.ACU restoral setting allows you to use off-to-on transitions of this signal from the DTE to activate the ACU. This allows the modem to accept dial commands. In the FP/108.ACU restoral setting, the answer or originating modem can enable the ACU when the connected DTE turns Circuit 116 from off to on.
		Once a call is successful, an on-to-off transition of DTR disconnects the affected modem from the dial line and returns it to the leased line.
		If a call is terminated by any means other than DTR, the modem remains in a disconnected state waiting for ACU commands. An on-to-off transition is required to return to the leased line.
		NOTE: The Ext Select option overrides FP/108.ACU restoral if Ext Cntrl option is configured for Pin 20 and the Ext Select option is configured for a setting other than Off.
FP/116.ACU	6	The 116.ACU restoral setting allows you to use off-to-on transitions of this signal from the DTE to activate the ACU. This allows the modem to accept dial commands to initiate restoral. In the 116.ACU restoral setting, the answer or originating modem can enable the ACU when the connected DTE turns Circuit 116 from off to on.
		Once a call is successful, an on-to-off transition of Circuit 116 disconnects the affected modem from the dial line and returns it to the leased line.
		If a call is terminated by any means other than Circuit 116, the modem remains in a disconnected state waiting for ACU commands. An on-to-off transition is required to return to the leased line.
		NOTE: The Ext Select option overrides FP/116.ACU restoral if Ext Cntrl option is configured for Pin 14 and the Ext Select option is configured for a setting other than Off.

∗RP

AT∗RP (Parity)

ACU OPT'S ▸ • • •
Parity
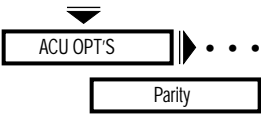
When using the ASCII character set, you must select the parity used by the modem and DTE. The Parity option applies to only asynchronous and character-synchronous data formats. The modem ignores parity bits if you are using a bit-synchronous protocol, but adds parity bits to all data units in the message field in its responses to the DTE.

NOTE: This command is allowed only when remotely configuring another modem via the AT Remote Config command. If this command is issued at any other time, an ERROR response is returned to the DTE and the setting of the parity strap remains unchanged.

Option Setting	AT Command Setting	Description
V.25 (all)	0	Sets parity according to V.25 bis specifications. The following parity applies:
		Parity is a Space for bit-synchronous protocol. A zero is added to each 7-bit character in the message field. Parity is odd for character-synchronous protocol. A one or zero is added to each 7-bit character making the total number of one bits equal to an odd number. Parity is even for asynchronous data format. A one or zero is added to each 7-bit character making the total number of one bits equal an even number.
Even	1	Parity is even. A one or zero is added to each 7-bit character making the total number of one bits equal an even number.
Odd	2	Parity is odd. A one or zero is added to each 7-bit character making the total number of one bits equal an odd number.
Mark	3	Parity is a Mark. A one is added to each 7-bit character.
Space	4	Parity is a Space. A zero is added to each 7-bit character (no parity).

AT✳RS (RTS Control)

TERMINAL OPT'S ▶ • • •

RTS

The AT✳RS (RTS) command determines how the modem interprets the RTS signal. The DTE signals the modem with the RTS on EIA/TIA 232-D Pin 4 (V.24 Circuit 105).

Option Setting	AT Command Setting	Description
Normal (2, 3, 4)	0	The DTE controls data transmission with RTS.
High (1)	1	The modem sets RTS high. Use this setting if the DTE does not provide RTS. If you are using Normal or Reliable data transfer mode and you are using RTS/CTS flow control, this setting is overridden and RTS behaves as if RTS=Normal
Remote	2	This setting applies to simulated half-duplex applications and works only if the remote modem also supports RTS/DCD signaling. For this application to work properly, the DCD option at the remote site must be set to Remote. Coordinate your setting with the remote site.
		When the local DTE turns RTS on, it forces DCD on at the remote modem. The remote modem can only receive data during this period. Once the local DTE drops RTS, DCD at the remote modem follows. The RemRST/DCD option allows you to choose the type of RTS/DCD signaling.
		NOTE: This setting functions as described only when the modem is in the Direct data transfer modem, and *not* using the V.21 or Bell 103 modulation mode. If the modem is using the V.21 or Bell 103 modulation mode, or *not* using the Direct data transfer mode, RTS behaves as if RTS=Normal

✻RT

AT✻RT (Auto Retrain)

MODULATIONOPT'S ▶ • • •
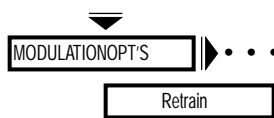
Retrain

The AT✻RT (Retrain) command enables the auto-retrain feature. When enabled, the modem retrains if the specified bit error rate is exceeded. Enable Retrain for most applications because retrains allow the modem to compensate for changing line conditions. **NOTE:** When you set this feature to Off, the modem is unable to detect when the central office has initiated a loopback test on the data communications line.

Option Setting	AT Command Setting	Description
Off	0	The modem does not automatically initiate retrains, but will respond to retrains from the remote modem.
Low BER	1	Using C.Fast, V.32 bis, V.32, or V.32 Uncoded the modem retrains when the bit error rate (BER) exceeds approximately 10^{-4} for eight seconds.
		Using V.22 bis, the modem retrains when the bit error rate (BER) exceeds approximately 10^{-4} for one second.
		The Low BER setting is more sensitive than the High BER setting. When ARS is enabled, this setting has no meaning.
High BER (all)	2	Using C.Fast, V.32 bis, or V.32, the modem retrains when the bit error rate (BER) exceeds approximately 10^{-3} for eight seconds.
		Using V.22 bis, the modem retrains when the bit-error rate (BER) exceeds approximately 10^{-3} for one second. When ARS is enabled, bit error rate is always used.
		The High BER setting is less sensitive than the Low BER setting. **NOTE:** Motorola recommends this setting for most applications.

AT∗SC (Speed Conversion)

TERMINAL OPT'S ▶ • • •
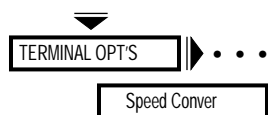
Speed Conver

The AT∗SC (Speed Conver) command determines whether the modem uses the speed conversion feature. **NOTE:** This option does not apply when the modem is in the Direct or synchronous data transfer mode.

Option Setting	AT Command Setting	Description
Off	0	The modem adjusts its DTE port speed to match the speed of the negotiated data link.
On (all)	1	DTE-to-modem speed remains constant, regardless of the negotiated data link speed. (The exception is Direct data mode. In this case, DTE-to-modem speed must always match the modem-to-modem speed.)

AT∗SI (DTE Inactivity)

TERMINAL OPT'S ▶ • • •
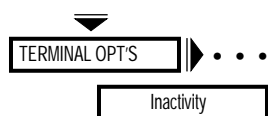
Inactivity

The AT∗SI (Inactivity) command allows you to select the length of the time the modem waits before disconnecting when no data is being transferred. **NOTE:** This option does not apply when the modem is set for the synchronous data transfer mode.

Option Setting	AT Command Setting	Description
Off (all)	AT∗SI	The Off option disables the inactivity timer.
3min	AT∗SI1	The modem will disconnect if 3 minutes elapses without data transfer to or from the DTE.
10min	AT∗SI2	The modem will disconnect if 10 minutes elapses without data transfer to or from the DTE.
20min	AT∗SI3	The modem will disconnect if 20 minutes elapses without data transfer to or from the DTE.
30min	AT∗SI4	The modem will disconnect if 30 minutes elapses without data transfer to or from the DTE.
S30	AT∗SI5	The inactivity timeout is controlled by the value set in S-Register 30.

∗SL, ∗SM

AT∗SL (Error Correction ID)

EC/DC OPT'S ▶ • • •
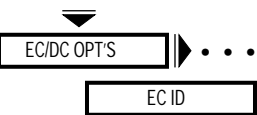
EC ID

The AT∗SL (EC ID) command allows you to set the identification number that modems exchange when they attempt to establish an MNP link.

Option Setting	AT Command Setting	Description
Default (all)	0	The modem identifies itself with a generic MNP identification number. Use this setting unless you are certain that the remote modem(s) is a Motorola modem.
Codex	1	The modem identifies itself with a special MNP identification number assigned to modems only. This allows one modem to recognize another modem during an MNP link negotiation.

AT∗SM (Data Transfer Mode)

EC/DC OPT'S ▶ • • •
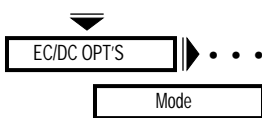
Mode

The AT∗SM (Mode) command sets the data transfer mode for asynchronous applications, or for synchronous applications with the 326X*FAST* Synchronous Data Compression (SDC) product. The setting you choose governs the modem's use of error correction. **NOTE:** To enable 326X*FAST*-SDC, one of the reliable data transfer modes (Mode=Reliable, Auto Reliable, or Speed Dependent Auto Reliable) must be selected. These modes are described in this section.

⚠ **Caution**

A characteristic of error-correcting modems is that they negotiate error-correction type and level after the physical connection with a remote modem has been established. Upon initial connection to a non error-correcting modem, the originating error-correcting modem attempts to negotiate an error-corrected link by sending a link request. This request is seen by the non error-correcting answer modem and treated as user data. The link request characters may appear as a short burst of jumbled data at the answer site. Also, any data sent by a non error-correcting modem during link negotiation will be rejected (lost) by the error-correcting modem (in either answer or originate mode).

| ─── *Option Setting* ─── | | | | |
326X V.32 bis Modem	*326XFAST Modem*	*326XFAST-SDC Modem*	*AT Command Setting*	*Description*
Direct (2, 3, 4L)	Direct (2, 3, 4L)	Direct	0	Direct. In Direct mode (asynchronous or synchronous), the modem does not use error correction. When the modem operates in Direct mode, all of the options in the EC/DC OPT's menu are disabled. During data mode, the DTE speed must match the modem's speed.
Normal	Normal	Normal	1	Normal. In normal mode (asynchronous), the modem does not use error correction or data compression. The break type is assumed to be standard. During data mode, the modem uses speed conversion (if enabled). This allows the modem to automatically accommodate DTEs of different speeds. Enable terminal flow control when operating in Normal mode. The modem flow control should also be enabled using the Modem Flow option. **NOTE:** Selecting Mode=Normal results in a Direct synchronous connection in the 326X*FAST* Synchronous Data Compression mode.
Reliable	Reliable	Reliable	2	Reliable. In an asynchronous application, with this selection, once the local modem connects with the remote modem, it attempts to establish an error-corrected link. During Reliable data mode, the modem uses speed conversion (if enabled). The local modem disconnects if it cannot establish an error-corrected link. Enable the terminal flow control when operating in reliable mode. If the modem negotiates a connection in the V.21 or Bell 103 modulation mode, it terminates the call.
				If operating with 326X*FAST* Synchronous Data Compression enabled in both the local and remote modems, once the local modem connects with the remote modem, it attempts to establish an error-corrected link. In SDC mode, the setting of Data Compression (AT✳DC) and Error Correction (AT✳EC) options are ignored; a connection is attempted using V.42 bis data compression and LAPM error correction. The local modem establishes a synchronous Reliable connection or disconnects if it cannot establish an error-corrected link. During Reliable data mode, the modem uses speed conversion (if enabled). Enable the terminal flow control when operating in reliable mode. If the modem negotiates a connection in the V.21 or Bell 103 modulation mode, it terminates the call.

✳SM, ✳SR

Auto Rel (1, 4D)	Auto Rel (1, 4D)	Auto Rel (1, 2, 3, 4L)	3	Auto-Reliable. Once the local modem connects with the remote modem, it attempts to establish an error-corrected link. During Auto-Reliable data mode, the modem uses speed conversion (if enabled). This allows the modem to automatically accommodate DTEs of different speeds. The modem reverts to Normal mode if it cannot establish an error-corrected link. In 326X*FAST*-SDC mode, with the Auto Rel selection, the modem reverts to Direct mode if it cannot establish an error-corrected link.
				Enable terminal flow control when operating in the Auto-Reliable mode. If the local modem negotiates a connection in the V.21 or Bell 103 modulation mode, Normal mode is used in asynchronous applications; Direct mode is used in synchronous applications.
Spd AutoRel	Spd AutoRel	Spd AutoRel	4	Speed-Dependent Auto-Reliable. Once the local modem connects with the remote modem, it attempts to establish an error-corrected link. If a connection is established at 1200 bps or less, Normal mode is used in asynchronous applications; Direct mode is used in synchronous applications.
				During data mode, the Speed-Dependent Auto-Reliable mode uses speed conversion (if enabled). This allows the modem to automatically accommodate DTEs of different speeds. Enable terminal flow control when operating in the Auto-Reliable mode.

[1] Default with the 326X*FAST*-SDC Modem

AT✳SR (RTS/DCD Remote Signaling)
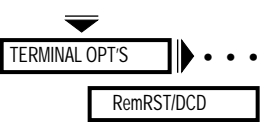
The AT✳SR (RemRTS/DCD) command allows for two types of PN signaling. It is valid only when the RTS or DCD option is set to Remote.

TERMINAL OPT'S ▶ • • •

RemRST/DCD

Option Setting	AT Command Setting	Description
Codex (all)	AT✳SR0	The Codex option setting allows you to configure the modem for proprietary signaling.
V.13	AT✳SR1	This setting allows signaling that is compliant with CCITT V.13 for synchronous applications only.

AT✳ST, AT&V (Modem Status Display)

See the AT&V command description.

AT✳TD (Throughput Delay Minimization)

TERMINAL OPT'S ▶ • • •

TpDlyMin
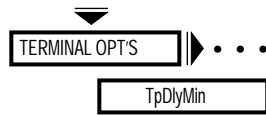
The AT✳TD (Throughput Delay Minimization) command allows you to improve the modem's performance while operating in 326X*FAST* Synchronous Data Compression mode by minimizing delays during data transmission. This feature, when enabled, allows the remote modem to begin transmitting synchronous data to its DTE, before an entire frame of data has been received from the local modem. This option applies only when the modem is operating in 326X*FAST*-SDC mode.

Option Setting	AT Command Setting	Description
Rx Clock (2, 3, 4L)	1	With this setting the remote modem uses its internal Rx Clock to control the flow of data from the modem to the DTE, preventing a loss of synchronization during data transmission. This setting allows the remote modem to begin transmitting data before an end-of-frame has been received from the local modem. If the rate of data transmission slows, the clock stops, temporarily ceasing the flow of data. Motorola recommends that the Rx Clock setting be used in most applications. **NOTE:** This setting is operational only when Clock=Internal (AT&X).
RxD Dly	2	With this setting, the remote modem continuously monitors and adjusts line traffic to estimate (based on time) when to transmit data to the DTE. The modem calculates a delay time based on variables such as frame size, DTE rate, DCE rate, and data compression ratio. The remote modem waits this time before transmitting data to its DTE. **NOTE:** Due to variable line conditions or varying types of data, frame losses could result with this selection.
Off	0	The Throughput Delay Minimization feature is disabled. With this setting, the remote modem waits until it has received an entire frame of data before beginning to transmit this data to its DTE.

✳TL, ✳TT

AT✳TL (Tone Length)

DIALING OPT'S ▶ • • •
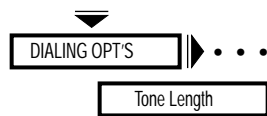
Tone Length

The AT✳TL (Tone Length) command determines the time duration of the DTMF (Dual Tone Multifrequency) tone. This command is operational only when tone dialing is selected using dial modifiers or the ATT command.

Option Setting	AT Command Setting	Description
72	0	Tone length is 72 ms.
S11	1	Tone length is determined by S-Register 11.

NOTE: These settings are country-specific. Consult Appendix C, Country-Specific Information, in the *326X Series Modem User's Guide* for the settings that are valid in your country.

AT✳TT (Call Timeout)

DIALING OPT'S ▶ • • •

Call Timeout

The AT✳TT (Call Timeout) command determines how long the modem waits from the time it completes dialing to the time it detects answer back tone from the remote modem. If the modem does not receive answer-back tone from the remote modem within the specified time, the modem disconnects. The setting of this option also affects the "R" dial modifier. See "Dial Modifiers for Special Dialing Requirements" in Appendix A of the *326X Series Modem User's Guide*.

Option Setting	AT Command Setting	Description
30	0	The modem waits 30 seconds for a call to succeed.
45	1	The modem waits 45 seconds for a call to succeed.
60	2	The modem waits 60 seconds for a call to succeed.
90	3	The modem waits 90 seconds for a call to succeed.
180	4	The modem waits 180 seconds for a call to succeed.
S7	5	The modem waits the amount of time specified by S-Register 7 for a call to succeed.

NOTE: These settings are country-specific. Consult Appendix C, Country-Specific Information, in the *326X Series Modem User's Guide* for the settings that are valid in your country.

AT✳XC (Error Correction Reliable Messages)

ACU OPT'S ▶ • • •
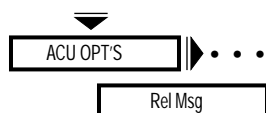
Rel Msg

The AT✳XC (Rel Msg) command applies to the Reliable and Auto-Reliable data transfer modes only. The local modem can send a reliable message to the DTE along with the normal connect message if both modems negotiated a reliable (error-corrected) connection.

Option Setting	AT Command Setting	Description
Off (all)	0	If enabled, the modem sends a connect message to the DTE, but it does not send the reliable portion of the connect message. A typical connect message appears as follows: CONNECT 9600
Short	1	The modem sends a reliable connect message to the DTE when a reliable connection is successful. The message indicates the local DTE-to-modem data rate, but no error correction or data compression is included. A typical short reliable connect message appears as follows: CONNECT 9600 RELIABLE
Long	2	The modem sends a reliable connect message to the DTE when a connection is successful. The message indicates that the local DTE-to-modem data rate, as well as the error-correction and data-compression schemes, are being used. A typical long reliable connect message appears as follows: CONNECT 9600 RELIABLE EC=(LAPM) DC=(V42bis)

AT∗ZC (Callback Feature)

ACCESSSECURITY ▶ • • •
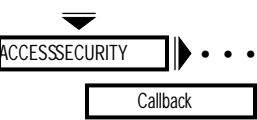
Callback

The AT∗ZC (Callback) command determines the source of the telephone number that your modem calls when it receives a valid access security password from the remote modem.

Option Setting	AT Command Setting	Description
Off (all)	0	Callback is disabled.
Intern 1 – 9	1 – 9	The answer modem performs the callback using the phone number stored in the specified location. Even if the calling modem provides a callback number, the local modem uses the internally stored number.
Remote	10	The answer modem performs the callback using a number *provided by the remote user*. If the calling modem does not provide a callback number and the password is valid, the modem attempts a connection, without hanging up or calling back.
Manager	Only accessible using a network management system	The network management system performs the callback by using a phone number stored in its database that is associated with the received identification code. This selection is not accessible from the front panel or AT ACU and is displayed only when selected by the network management system.
Rmt Ind	12	The answer modem performs the callback using the phone number stored at the specified phone number index *provided by the remote user* (1 – 9). If the remote device does not provide a callback index, the modem attempts to establish a connection without hanging up or calling back if AT∗ZR0 (Rmt Num Rqrd=Off) is set.

AT∗ZD (Dial Restricted)

```
     ▼
ACCESSSECURITY   ▶ • • •
        ┌─────────────┐
        │  DialRstrct │
        └─────────────┘
```

The AT∗ZD (DialRstrct) command defines dial command limitations.

Option Setting	AT Command Setting	Description
Off (all)	0	No dial restrictions exist.
Lvl1	1	The auto redial command is not allowed. The A/ command is not allowed if the previous command was a dial command. In both cases, the modem reports an ERROR message to the DTE.
Lvl2	2	Lvl2 has the same functionality as Lvl1. In addition, only stored phone numbers may be dialed. The ATD, V.25bis CRN, LPDA2 Hex 21, and the front panel Enter Then Dial options are not allowed.

AT∗ZI (Enter Access Security Group Password)

```
     ▼
ACCESSSECURITY   ▶ • • •
        ┌─────────────────┐
        │  Enter GroupPW? │
        └─────────────────┘
```
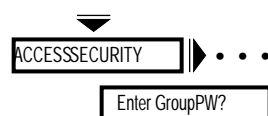
The AT∗ZI (Enter Group PW?) option allows you to enter the password that your modem uses for access security. The maximum length of a password is 10 characters, but you can use as few as one character.

AT∗ZI

You can enter:

> **AT∗ZIx<CR>**

The Front Panel

You can enter the following alphanumeric characters:

> 0123456789ABCD

∗ZP, ∗ZR

AT∗ZP (Select Tones with Access Security)

ACCESSSECURITY ▶ • • •
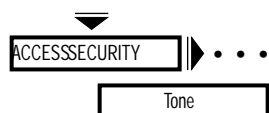
Tone

The AT∗ZP (Tone) command controls the type of tones used by your modem to alert the caller to expect a callback and to enter the access security password.

Option Setting	AT Command Setting	Description
None (all)	0	No tones are generated by the answer modem.
Prompt Only	1	Upon answering a call, the local modem sends the caller a dial tone. This is a prompt for the caller to enter the access security password. The dial tone lasts for the amount of time specified by S-Register 45. The caller must enter the access security password in the amount of time specified by S-Register 46. This setting is intended for manual dialing only.
Ack Only	2	After validating the password, the modem generates an acknowledgment tone before hanging up. This indicates to the caller that the access security password is valid and that the modem should expect to receive a callback. Upon hearing the tone, the caller should hang up immediately. This setting is intended for callback only.
Prompt/Ack	3	Upon answering a call, the local modem generates both the prompt and acknowledgment tone at the appropriate times. This setting is intended for manual dialing only.

AT∗ZR (Remote Number Required)

ACCESSSECURITY ▶ • • •
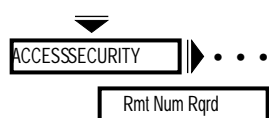
Rmt Num Rqrd

The AT∗ZR (Rmt Num Rqrd) command specifies whether a remote callback number is required when using the AT∗ZC (Callback option). This option is applicable if the Callback option is set to Remote or Rmt Ind only.

Option Setting	AT Command Setting	Description
Off (all)	0	A remote callback number is not required. If the calling modem does not provide a callback number, the modem attempts to establish a connection without hanging up or calling back.
On	1	A remote callback number is required. The modem does not attempt to make a connection or callback if no callback number is provided.

AT∗ZS (Simulated Ringback)

ACCESS SECURITY ▶ • • •
Sim Ring
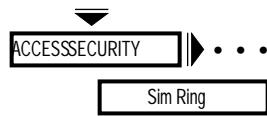
The AT∗ZS (Sim Ring) command determines if the answer modem sends a ring-back tone to the calling modem prior to sending an answer-back tone. Immediately after entering the access security password, some modems (for example, the 2234 Modem) expect to receive a ringback tone from the answering modem.

Option Setting	AT Command Setting	Description
Disable (all)	0	No ringback tone is sent to the remote modem prior to sending an answer-back tone.
Enable	1	After receiving the access security password, the answer modem sends a ringback tone to the remote modem (prior to sending an answer-back tone). The answer modem does not send a ringback tone to the remote modem when the answer modem hangs up prior to a callback.

AT∗ZV (Password Verification)

ACCESS SECURITY ▶ • • •
PW Verify

The AT∗ZV (PW Verify) command determines whether the access security feature is enabled. If access security is enabled, this option selects the method used to verify a password.

Option Setting	AT Command Setting	Description
Dis (all)	0	Password and callback features are disabled.
Intern	1	A single password, stored in modem memory, is checked against the received password. This password is stored in modem memory using the AT∗ZI (Enter Group PW?) command.
Mngr	Only accessible using a network management system.	The network management system verifies the received password. Although displayed at the modem, this selection is not accessible by the front panel or AT ACU.

Chapter 2
Front Panel Operation

Contents

Introduction

This chapter describes the 326X Series Modem front panel options that do not have an associated AT command. It is organized to follow the structure of the front panel menu tree (see your *326X Series Modem Reference Card* for a schematic description of the front panel menu tree). Each main menu is designed to address a specific modem function. For example, all options involved with error correction and data compression are found in the EC/DC OPT'S (Error Correction/Data Compression) menu. **NOTE:** For an in-depth discussion of how to use the front panel keys and how to navigate the front panel menu tree, see Chapter 3, Getting Started, in the *326X Series Modem User's Guid*e.

This chapter includes descriptions that consist of:

- A submenu of the front panel menu structure illustrating the location of the options in the front panel menu tree. This submenu appears whenever a new branch of the main menu is described.

- A list of the menu's front panel options, if any, that have AT-equivalent control terminal commands

- Descriptions of the menu's front panel options that do not have AT-equivalent commands

For an explanation of how to enter and use AT commands, see Chapter 5, Using the AT ACU, in the *326X Series Modem User's Guide*. Appendix A of the user's guide contains a cross-referenced list of AT commands with front panel options.

Status/Option Sets/Dialing Menu

The top menu shown in Figure 2-1 is used for displaying modem status information, using option sets, and dialing.
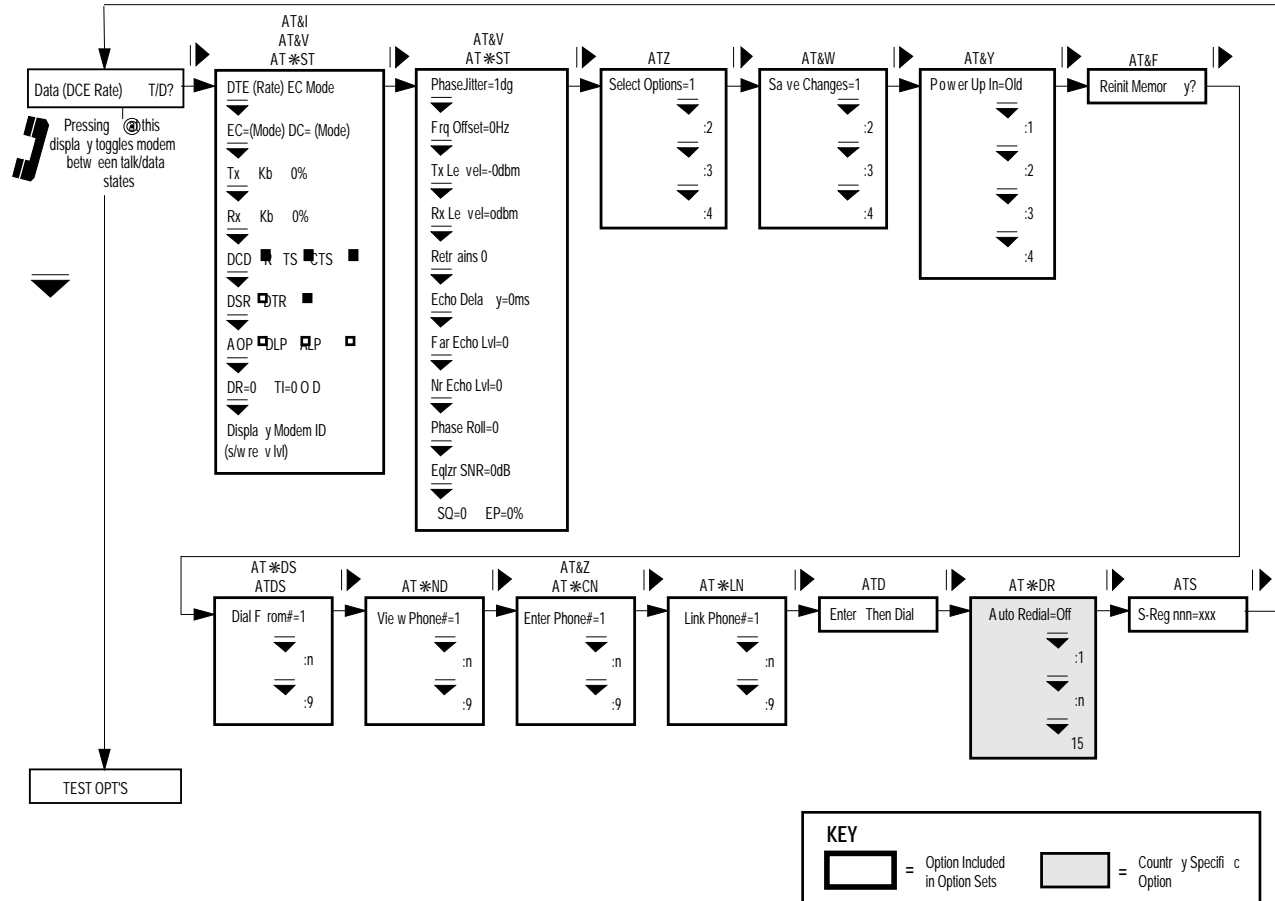
Figure 2-1. Status/Option Sets/Dialing Menu

Status/Option Sets/Dialing Menu

All Status/Option Sets/Dialing options, listed below, have AT command equivalents, which are described in Chapter 1, AT Commands, of this guide.

Options with AT-Command Equivalents
ATD (Dialing an Unstored Telephone Number)
ATDS (Dialing a Stored Telephone Number)
ATS (Assigning an S-Register)
ATZ (Selecting an Option Set)
AT&F (Reinitiate Memory)
AT&I (Viewing Modem Identification)
AT&V, AT✳ST (Viewing Modem Status)
AT&W (Save Changes)
AT&Y (Power Up in Option Set)
AT&Z, AT✳CN (Entering Phone Numbers)
AT✳DR (Auto Redial)
AT✳DS (Dialing a Stored Phone Number)
AT✳LN (Linking Phone Number)
AT✳ND (Viewing Stored Phone Numbers)

Test Options

Figure 2-2 illustrates the TEST OPT'S menu. TEST OPT'S menu options control how the modem and DTE execute certain modem and line tests.
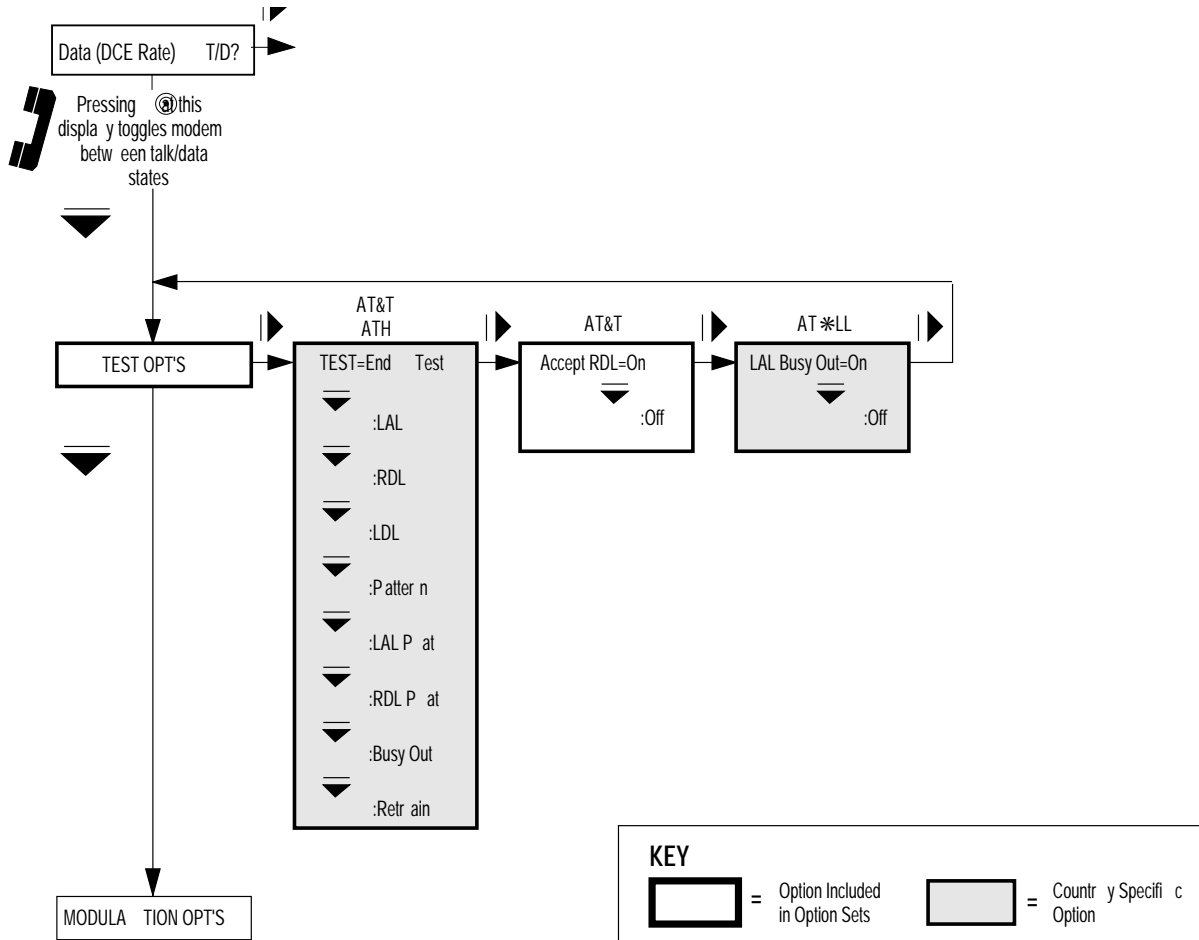
Figure 2-2. TEST OPT'S Menu

All TEST OPT'S menu options, listed below, have AT-command equivalents, which are described in Chapter 1, AT Commands, of this guide. For specific information on how to use the various tests, see Chapter 4, Testing Your Modem, for details.

Options with AT-Command Equivalents
AT&T, ATH (Test)
AT&T4, AT&T5 (Accept RDL)
AT✳LL (Local Analog Loopback Test Busy Out)

Modulation Options

Modulation Options

Figure 2-3 illustrates the MODULATION OPT'S menu. MODULATION OPT'S menu options control variations of the signals between the local and remote modems over the PSTN or private lines.
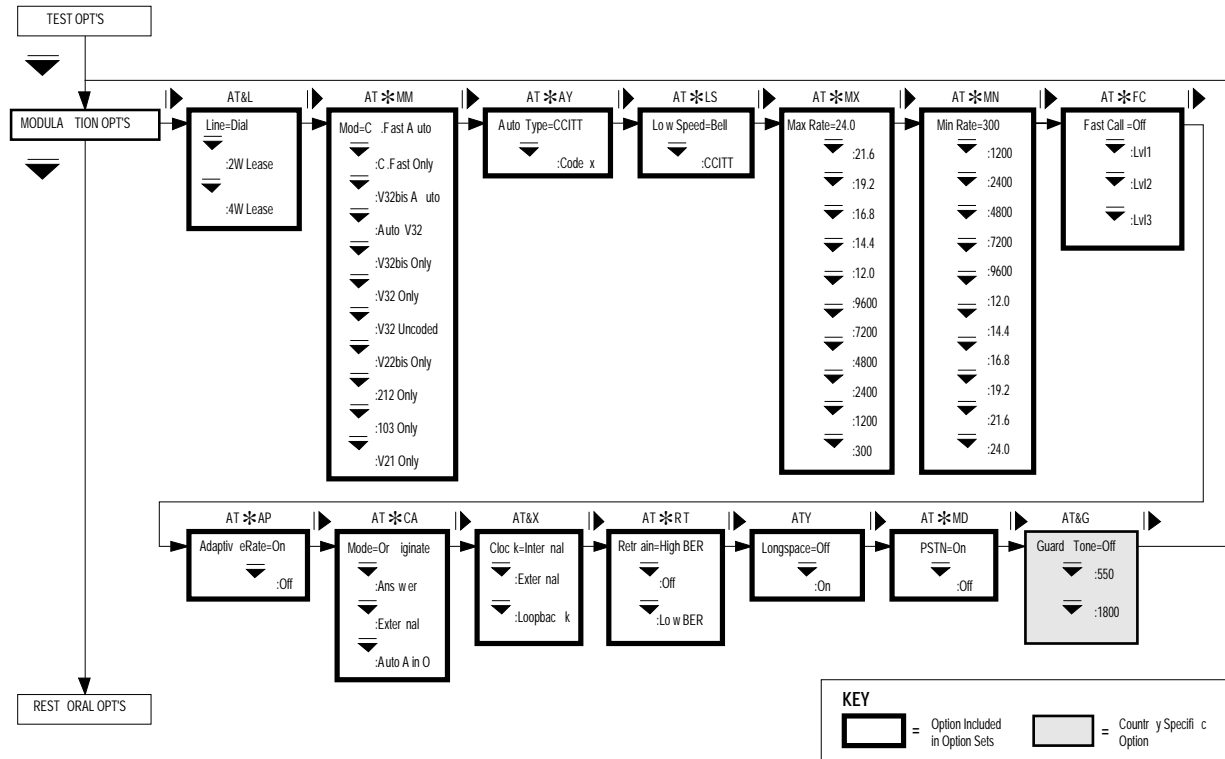
Figure 2-3. MODULATION OPT'S Menu

Modulation Options

All MODULATION OPT'S menu options, listed below, have AT-command equivalents, which are described in Chapter 1, AT Commands, of this guide.

Options with AT-Command Equivalents
ATY (Longspace)
AT&G (Guard Tone)
AT&L (Line Type)
AT&X (Clock)
AT✴AP (Adaptive Rate)
AT✴AY (Auto Type)
AT✴CA (Answer/Originate Mode)
AT✴FC (Fast Call)
AT✴LS (Low Speed)
AT✴MD (PSTN Signaling)
AT✴MM (Modulation Mode)
AT✴MN (Minimum Rate)
AT✴MX (Maximum Rate)
AT✴RT (Retrain)

Restoral Options

Restoral Options

Figure 2-4 illustrates the RESTORAL OPT'S menu. RESTORAL OPT'S menu options control initiation, timing, and connection parameters that your modem uses to communicate over a dial line when leased line problems occur. The 326X Series Modem can be used in V.22 bis (at 2400 or 1200 bps), V.32/.32 Uncoded (at 9600, or 4800 bps), V.32 bis (at 14,000, 12,000, 9600, 7200 bps) or C.Fast (at 24,000, 21,600, 19,200, 16,800, 14,400, 12,000, or 9600 bps) modulation modes as both a leased line modem with dial restoral capability, or a dial modem configured for restoral.

All RESTORAL OPT'S menu options, listed below, have AT-command equivalents, which are described in Chapter 1, AT Commands, of this guide. For proper modem operation, read the following sections explaining how the restoral options operate in conjunction with each other.

Options with AT-Command Equivalents
AT✶AS (Answer in Restoral)
AT✶DI (Leased to Dial)
AT✶HD (Hold Dial Line)
AT✶LE (Dial to Leased, Automatic Disconnect)
AT✶RE (Restoral)
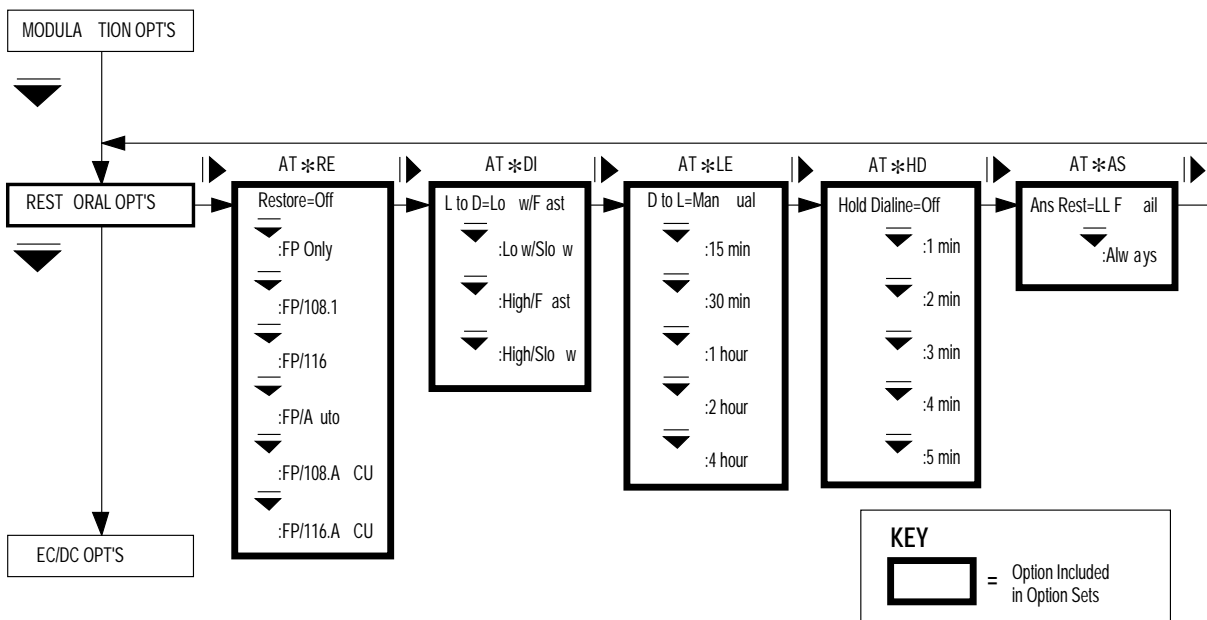
Figure 2-4. RESTORAL OPT'S Menu

A leased line failure is one of the most disruptive occurrences in any data communications network. When installed as a leased line modem, the 326X Series Modem (Models 3261, 3263, 3266 and 3268), can use its dial line capability to restore service when leased line problems occur. If the leased line fails, or if signal quality deteriorates, the 326X Series can redirect data traffic through the Public Switched Telephone Network (PSTN) over a single dial line.

Restoral Indications

When a 326X Series Modem is installed for restoral operation, the following indications are used to determine whether it is operating over the dial or leased line:

- RI/OH LED. If the modem is connected to the dial line (off-hook), the RI/OH LED on the modem front panel is on.

- Status Message. If the modem is passing data on the dial line, the data rate on the status message line of the Status Menu in the front panel display is followed by R. For example, if the modem is operating on the dial line at 9600 bps, the status message line reads:

  Data 9600 R T/D?

- Circuit 117 (Pin 16). During restoral, the modem turns Circuit 117 (Pin 16) on the DTE interface from off to on when it connects to the dial line to initiate a call. When the modem disconnects from the leased line to answer an incoming restoral, it turns Circuit 117 (Pin 16) from off to on.

Restoral Options

Configuring for Dial Restoral

Option Set 4, the default option set for restoral operation, configures the modem as an answer modem in an automatic restoral application for synchronous DTEs. If this configuration suits your application, use Option Set 4 as a starting point when configuring the 326X Series Modem. See Chapter 4, Configuring Your Modem, of the *326X Series Modem User's Guide* for details on option sets.

All option settings that apply to normal operation also apply to restoral. The procedure outlined in the following sections highlights the options critical to dial line restoral operation. Be sure you coordinate local installation with the person who is installing the remote 326X Series Modem. **NOTE:** The Restoral Option and its option settings appear on your modem's front panel only if you have the Restoral option installed. (Models 3261, 3263, 3266, and 3268 include the Restoral option.)

1) Set the Restore option (AT✳RE), under the RESTORAL OPT'S menu, to select the restoral initiation method. For automatic restoral, be sure to set this option the same in both the local and remote modems. Although one modem in the link originates a call and the other answers, both modems can initiate or answer a restoral call.

2) Configure one modem as the answer modem and one as the originating modem through the Mode option (AT✳CA), under the MODULATION OPT'S menu. Confirm this setting with the person at the remote site.

   If you plan to use restoral, make sure that the answer modem is set for auto-answering.

   NOTE: Unless Ans Rest=Always (AT✳AS) under the RESTORAL OPT'S menu, the modem does not answer an incoming call if it is in data mode; this prevents the modem from answering a wrong number.

3) To use automatic restoral, set the L to D option (AT✳DI), under the RESTORAL OPT'S menu, of the originating modem.

4) Set the DTR option (AT&D), under the TERMINAL OPT'S menu, to satisfy your application. The DTR signal controls the connection to the dial line in restoral operation. The DTR signal from the DTE must be on or set properly in the modem for dialing and answering to take place.

   The various settings for the DTR option in the modem are described in Chapter 1, AT Commands, in the AT&D section. Also, see the "Interpreting the DTR Option Setting" section following these procedures. It summarizes the relationship of DTR signal behavior to Restore and DTR option settings.

5) Make sure that the Line option (AT&L), under the MODULATION OPT'S menu, is set in both the local and remote modems for connection to either a two- or four-wire leased line.

6) To dial during restoral, set the Default Dial option (AT✳DA), under the ACU OPT'S menu, to dial from the address in which you plan to store the remote modem's telephone number.

7) Enter a phone number in the address selected by the Default Dial option (AT✳DA), under the ACU OPT'S menu. To use the Link Phone # option (AT✳LN), enter a phone number in each address to be used.

8) During a dial restoral, if you want the modem to disconnect from the dial line automatically after a specified interval, set the D to L (Dial to Leased) option under the RESTORAL OPT'S menu (in the originate modem only). If you want to hold the dial line and test the leased line after this interval, set the Hold Dialine option under the RESTORAL OPT'S menu the same in both modems.

   While operating in dial restoral, the modem periodically returns to the leased line (according to the time interval specified in the Dial to Leased option), to test the line in an attempt to reestablish the leased line connection. If, during 21 seconds, the modem fails to qualify the leased line, data transmission resumes on the held dial line. If the modem successfully establishes a valid connection on the leased line (within 21 seconds), it holds the dial restoral connection for the period of time set in the Hold Dialine option. The modem passes data on the leased line while holding the dial line.

   If a retrain occurs while the modem is testing the leased line, the test is terminated and the modem returns to the dial line.

   After the timer expires, if the leased line is qualified, the dial line is dropped and data transmission resumes on the leased line.

   If the leased line qualification fails (the leased line cannot be qualified after 21 seconds, or if a retrain is initiated), another attempt to qualify the leased line is made according to the time specified in the Dial to Leased option.

   NOTE: When operating with peer-to-peer, or alternate destination restoral, the Hold Dialine option should be set the same in both modems involved with restoral. In peer-to-peer restoral, two leased line modems are involved in restoral. In alternate destination restoral, the remote leased line modem and a local dial modem are involved in restoral. Refer to Figures 1-2(A) and 1-2(B) in the "AT✳HD (Hold Dial Line)" section of Chapter 1, AT Commands, for examples of peer-to-peer and alternate destination restoral.

9) Make sure that the PSTN option (AT✳MD), under the MODULATION OPT'S menu, is set to On.

10) To use error correction, set the Mode option (AT✳CA), under the MODULATION OPT'S menu, to Reliable, Auto Rel, or Spd AutoRel.

   While operating on the leased line, if the Mode option is set to any of the Reliable settings (Reliable, Auto Reliable, or Speed-Dependent Auto Reliable), it is treated as if Mode=Reliable. If the Mode option is set to a Reliable setting, while restoral is operating, that setting is treated normally.

Restoral Options

11) To redial failed call attempts, enable the Auto Redial option (AT✳DR) in the Data 9600 T/D? menu. When restoral is initiated and redialing is enabled, and a call attempt fails, the modem does not return to the leased line until the specified number of redials occurs or the call succeeds. When the modem is configured for any one of the AT✳RE option settings, if the remote modem is a 326X Series Modem and is not in data mode, it answers the call. Otherwise, it answers the call based upon the setting of the Ans Rest option under the RESTORAL OPT'S menu.

When the modem is configured for any one of the AT✳RE option settings except 108.ACU or 116.ACU, if a call fails, the originating modem disconnects from the dial line and returns to the leased line unless the Auto Redial or Link Phone # options are enabled. If the Link Phone # option is enabled, the modem calls the number specified; if the Auto Redial option is enabled, the modem redials until the call is successful or the redials are exhausted. If both the Link Phone # and Auto Redial options are enabled, the modem links first and then redials.

If the modem is configured for 108.ACU or 116.ACU, it disconnects from the dial line and remains in the disconnected state until another ACU command is received.

12) The Retrain option (AT✳RT), under the MODULATION OPT'S menu), which controls the modem's auto-retrain function, is set to High BER in Option Set 4. You must enable the Retrain option in the local and remote modems to implement automatic restoral (Restore=FP/Auto).

   NOTE: Motorola recommends that you enable the Retrain option in most applications.

   Setting the Retrain option in both modems to Low BER instructs the modem to retrain when it detects a low bit error rate (approximately 1 in 10,000). When Retrain=Low BER, the originating modem initiates restoral more quickly because the criteria for retraining is more sensitive.

13) For restoral applications, set the Longspace option (ATY), under the MODULATION OPT'S menu, to Off.

14) When changing any of the default settings, save the changes in nonvolatile memory. Refer to "AT&W (Save Changes: Creating New Option Sets)" in Chapter 1, AT Commands, for information on storing customized options in nonvolatile memory.

Interpreting the DTR Option Setting

The following section describes how the DTR signal behaves when the Restore option is set to FP/Only, FP/116, or FP/Auto.

When DTR=108.1, 108.2, Tail, Reset, or Discon, the following DTR signal behavior applies.

- On the leased line, on-to-off DTR signal transitions have no effect.

  Off-to-on DTR transitions have no effect on connection or disconnection, but they do control whether the modem answers or initiates a call (see Table 2-1).

- On the dial line (in restoral), on-to-off DTR signal transitions cause the modem to drop the dial line and return to the leased line.

  Off-to-on DTR transitions have no effect on connection or disconnection, but they do control whether the modem answers or initiates a call (see Table 2-1).

When DTR=High or Esc, the DTR signal has no effect on modem behavior, except for answering and initiating calls (see Table 2-1).

When Restore=FP/108.1 or FP/108.ACU, the setting of the DTR option has no effect on modem behavior, except for answering and initiating calls (see Table 2-1).

Table 2-1.
DTR Cross-Reference

DTE Signal	DTR Option Setting	Initiate	Answer
ON	High	Yes	Yes
OFF	High	Yes	Yes
ON	108.1	Yes	Yes
OFF	108.1	No	No
ON	108.2	Yes	Yes
OFF	108.2	No	No
ON	Tail	Yes	Yes
OFF	Tail	No	Yes
ON	Reset	Yes	Yes
OFF	Reset	Yes	Yes
ON	Disc	Yes	Yes
OFF	Disc	Yes	No
ON	Esc	Yes	Yes
OFF	Esc	Yes	Yes

Error Correction and Data Compression Options

Error Correction and Data Compression Options

Figure 2-5 illustrates the EC/DC OPT'S menu. EC/DC OPT'S menu options control the parameters and protocol your modem uses to set the error correction or data compression scheme.

REST ORAL OPT'S

EC/DC OPT'S

ACU OPT'S

AT✳SM — Mode=Direct — :Nor mal — :Reliab le — : Auto Rel — :Spd A utoRel

AT✳NB — Buff ers=Regular — :Reduced

AT✳EC — EC=V .42 — : LAPM — :MNP

AT✳DC — DC= Enab led — :Disab led

AT✳DF — Data F or m=NRZ — :NRZI

AT✳BK — Break=Destr uct — :Expedited — :Standard

AT✳MF — Modem Flo w=On — :Off

AT✳DB — Dela y=Off — :Buf or S38 — :Buf & S38 — :S38

AT✳SL — EC ID=Def ault — :Code x

KEY

▢ = Option Included in Option Sets
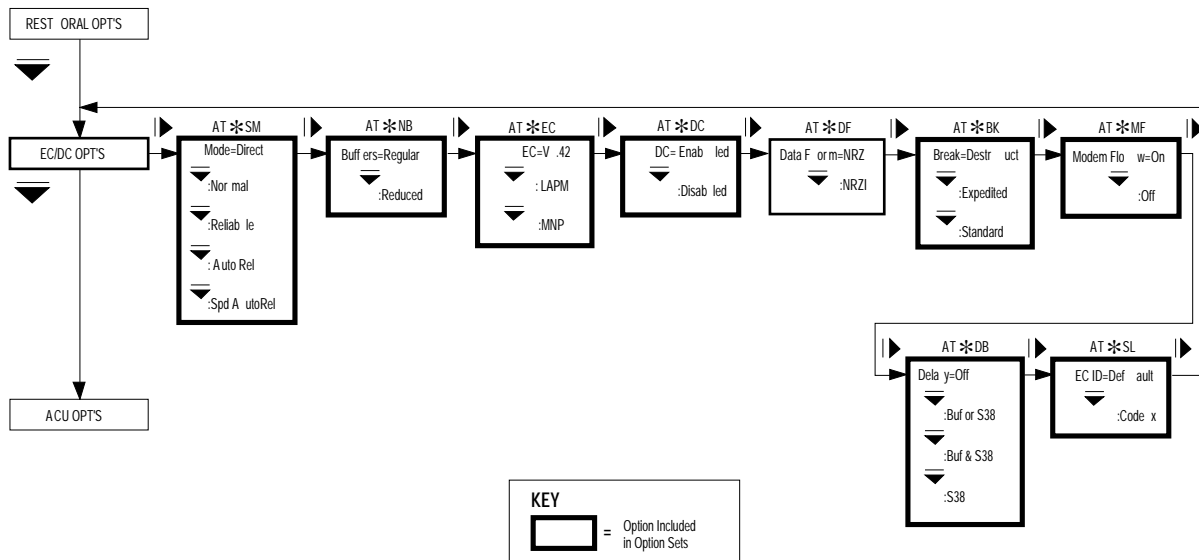
Figure 2-5. EC/DC OPT'S Menu

All EC/DC OPT'S menu options, listed below, have AT-command equivalents, which are described in Chapter 1, AT Commands.

Options with AT-Command Equivalents
AT✳BK (Break Handling)
AT✳DB (Delay Buffer)
AT✳DC (Data Compression)
AT✳DF (Data Format)
AT✳EC (Error Correction)
AT✳MF (Modem Flow Control)
AT✳NB (Buffers)
AT✳SL (Error Correction ID)
AT✳SM (Mode)

ACU Options

Figure 2-6 illustrates the ACU OPT'S menu. ACU OPT'S menu options control how you configure, operate, and test your modem using the AT, LPDA2, or V.25 bis options.
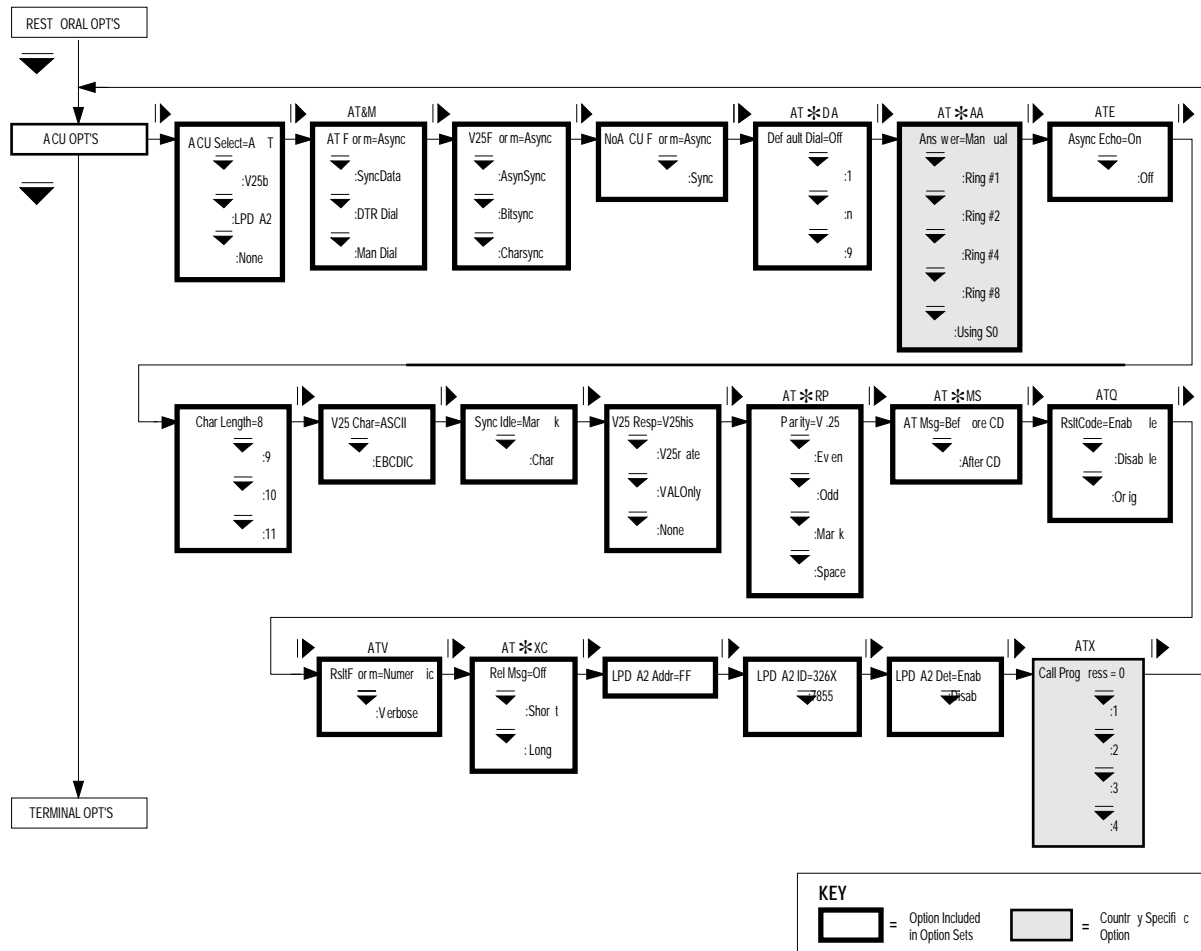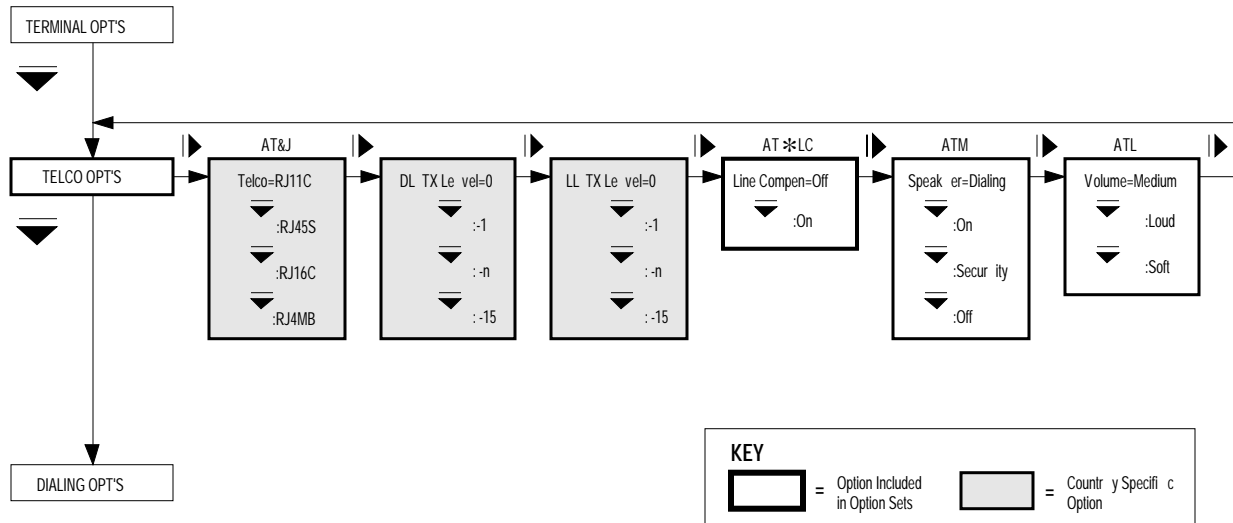

Figure 2-6. ACU OPT'S Menu

ACU Options

Some ACU OPT'S menu options, listed below, have AT-command equivalents, which are described in Chapter 1, AT Commands, of this guide. The remaining ACU OPT'S options, which you can select only from the front panel, are described immediately following this list.

Options with AT-Command Equivalents

ATE (Asynchronous Echo)
ATQ (Result Code Display)
ATV (Result Code Format)
ATX (Call Progress)
AT&M (AT Form)
AT✷AA (Manual Auto-Answering)
AT✷DA (Default Dial Address)
AT✷MS (AT Messages)
AT✷RP (Parity)
AT✷XC (Error Correction Reliable Messages)

ACU Selection

The ACU Select option determines which Auto-Call Unit (ACU) the modem uses.
NOTE: To enable 326X*FAST*-SDC, choose one of the ACU settings described below, select a bit-synchronous data format, and select one of the reliable data transfer modes (Reliable, Auto Reliable, or Speed Auto Reliable) using the Mode (AT✷SM) option.

Option Setting	Description
AT	The AT auto call unit is used.
(1)	To enable 326X*FAST*-SDC, after selecting AT ACU, make sure you select a proper data format using the AT Form (AT&M) command. The valid selections for synchronous data formats are: Sync Data, DTR Dial, or Man Dial. Refer to Chapter 1, AT Commands, of this guide for additional detail on the (AT&M) option.
V25b	The V.25 bis auto call unit is used.
(3)	To enable 326X*FAST*-SDC, after selecting V25b, make sure you select a proper data format using the V.25 Form command (discussed in the next section). The valid selections for V.25 bis data formats are AsynSync or Bitsync.
LPDA	The LPDA-2 auto-call unit is used.
	After selecting LPDA (LPDA transmits data synchronously), to enable 326X*FAST*-SDC, you need only to select one of the reliable data transfer modes (Reliable, Auto Reliable, or Speed Auto Reliable) using the Mode (AT✷SM) option.
None	No auto call unit is used.
(2, 4)	To enable 326X*FAST*-SDC, after selecting None, make sure you choose the synchronous data format using the NoACU Form option (discussed later in this section).

V.25 bis Data Format

The V25 Form option determines the format of data when the ACU Select option is set to V25b.

NOTE: To enable 326X*FAST*-SDC, after selecting V.25bis ACU, make sure you choose one of the synchronous data formats (AsynSync or Bitsync) described below. Also make sure to select one of the reliable data transfer modes (Reliable, Auto Reliable, or Speed Auto Reliable) using the Mode (AT✹SM) option.

Option Setting	Description
Async	Modem is compatible with asynchronous DTEs.
AsynSync	Modem dials calls asynchronously, but data is passed synchronously.
Bitsync (all)	The DTE uses the bit-synchronous, HDLC-like protocol outlined in the CCITT V.25 bis specification.
Charsync	The DTE uses the character-synchronous protocol outlined in the CCITT V.25 bis specification. **NOTE:** Charsync *is not* available for SDC operation. If Charsync is selected, a direct synchronous connection will be made, regardless of the setting of the Mode (AT✹SM) option.

NOTE: For all V25 Form options settings, the modem uses the V.25 bis ACU if you also set the DTR option to 108.2, Discon, Reset, Esc or High.

NoACU Data Format

The NoACU Form option determines the format of data when the ACU Select option is set to Off.

NOTE: To enable 326X*FAST*-SDC, after selecting ACU Select=None, make sure you choose the synchronous data format (Sync) described below. Also make sure to select one of the reliable data transfer modes (Reliable, Auto Reliable, or Speed Auto Reliable) using the Mode (AT✹SM) option.

Option Setting	Description
Async (1, 4D)	Asynchronous data is passed in data mode.
Sync (2, 3, 4L)	Synchronous data is passed in data mode.

ACU Options

Character Length

The Char Length option applies to asynchronous data applications that use the direct data transfer mode (no error correction). The modem ignores this option if you use the normal, reliable, or auto-reliable data transfer modes. The AT and V.25 bis auto-call units (ACUs) use 10-bit characters only. The 10-bit character format does not affect the character length selection. Do not change this option unless your application requires it. If you must change this option, select the setting that corresponds to the number of bits that your DTE uses to code each character (start bit, data bits, parity bit, and stop bit). **NOTE:** The autobauding feature works only with 10-bit characters.

Option Setting	Description
8	Modem is compatible with 8-bit characters.
9	Modem is compatible with 9-bit characters.
10 (all)	Modem is compatible with 10-bit characters.
11	Modem is compatible with 11-bit characters.

V.25 bis Character Selection

The V25 Char option determines the type of character that the V.25 bis ACU uses.

Option Setting	Description
ASCII (all)	The V.25 bis ACU uses ASCII character format.
EBCDIC	The V.25 bis ACU uses EBCDIC character format.

Sync Idle

The Sync Idle option applies to synchronous applications only (direct synchronous or SDC operating modes). Your modem sends Marks or Characters on EIA/TIA 232-D Pin 3 (V.24 Circuit 104) to the DTE when it has no messages to send.

Option Setting	Description
Mark	Modem sends continuous Marks (or one bits) on EIA/TIA 232-D Pin 3 (V.24 Circuit 104) to the DTE when it has no messages to send.
Char (all)	This option setting applies to V.25 bis, LPDA2, and ACUs. If the modem is configured for V.25 bis and the V25Form option is set to Charsync, it sends a continuous stream of SYN (synchronizing) Characters on EIA/TIA 232-D Pin 3 (V.24 Circuit 104) when it has no messages to send. If the V25Form option is set to Bitsync, the modem sends continuous flags (7E hexadecimal) when it has no messages to send.
	If the modem is configured for LPDA2, the modem sends continuous flags (7E hexadecimal) when it does not have a message to send.

V.25 bis Responses

When using the V.25 bis ACU, the modem always indicates a valid connection after the local modem and remote modem switch to data mode. This is accomplished by turning DSR, EIA/TIA 232-D Pin 6 (V.24 Circuit 107), and DCD, EIA/TIA 232-D Pin 8 (V.24 Circuit 109), from off to on. In addition to this hardware response, you can receive an indication of call progress at your DTE. The V25 Resp option chooses the response you receive.

Option Setting	*Description*
V25 bis (all)	Modem sends a VAL message upon receipt of the dial command and a CNX message once an answer-back tone is received from the remote modem.
V25 rate	Modem sends a VAL message upon receipt of the dial command and a CNX message followed by the data rate once the modem switches to data mode. In the direct data transfer mode, the data rate reflects the modem-to-modem data rate. In the normal, reliable, and auto-reliable data transfer modes, the data rate reflects the modem-to-DTE rate. If the Rel Msg option is set to Short or Long, the connect message appears in the following form: CNX rate RELIABLE
VAL Only	Modem sends a VAL message when the modems switch to data mode.
None	Modem does not send a message to the DTE.

LPDA2 Address

This option allows you to select the modem address. The default is 0xFF, allowing the modem to accept as valid any address received in the information field. If the modem LPDA2 address is set to a value other than the default (valid addresses range from 00x01 to 0xFF), the address in the information field must match the configured address. If the address does not match, the command is ignored. If the command address is valid, the address is saved by the modem and used in the command response.

Terminal Options

LPDA2 Identification Number

This option allows the modem type to be returned in the data response field. The modem option settings are as follows:

Option Setting	Description
3260	Sends 3260 in data response.
7855	Sends 7855 in data response.

LPDA2 Determination

This selection allows for the modem to recognize the LPDA2 commands in the data stream.

Option Setting	Description
Disab	LPDA2 command frames are not recognized as commands.
Enab	LPDA2 commands are recognized in the data stream and the commands are processed.

Terminal Options

Figure 2-7 illustrates the TERMINAL OPT'S menu. TERMINAL OPT'S menu options control signals between a co-located modem and DTE.
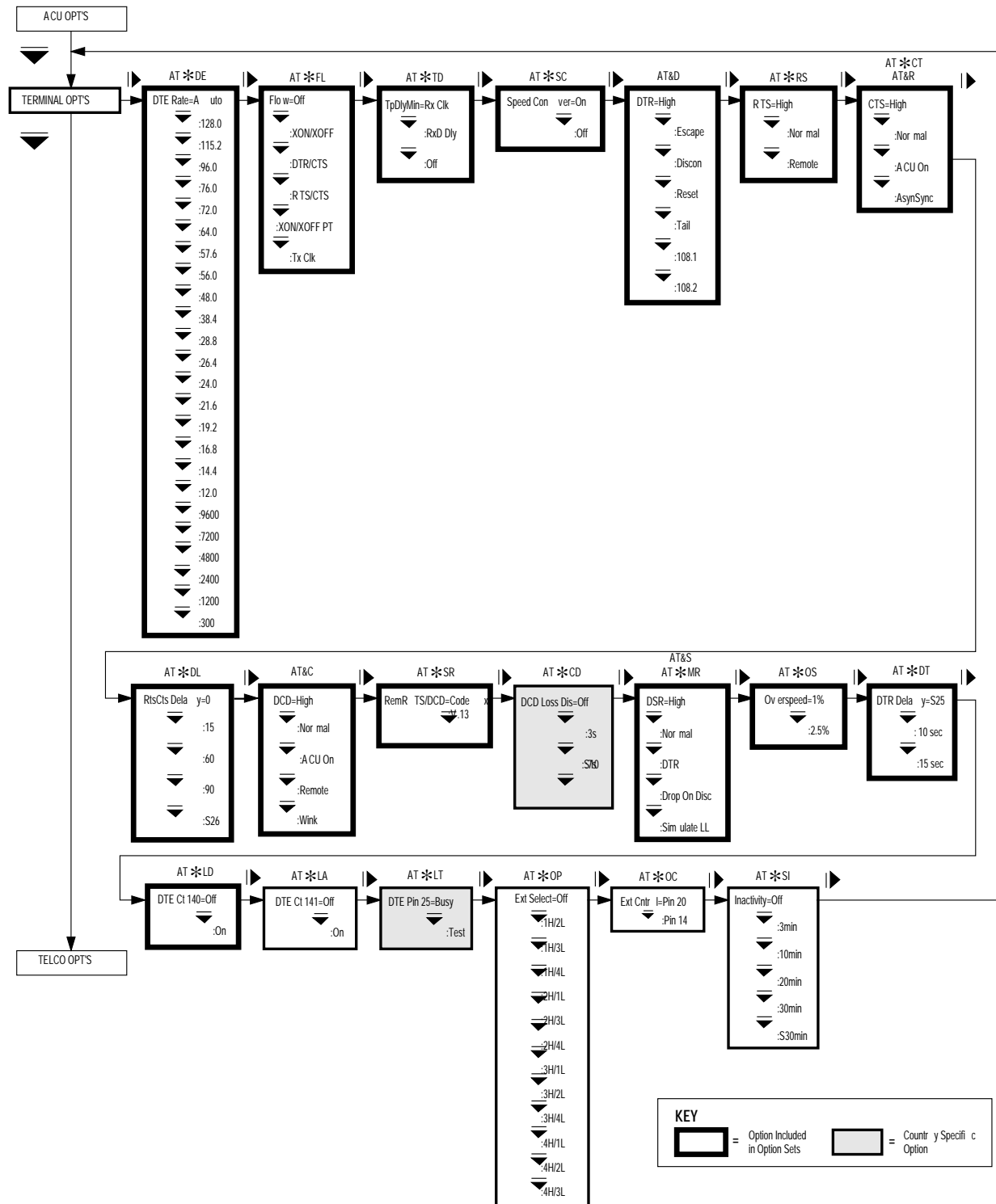
Figure 2-7. TERMINAL OPT'S Menu

Terminal Options

Some TERMINAL OPT'S menu options, listed below, have AT-command equivalents, which are described in Chapter 1, AT Commands. The remaining TERMINAL OPT'S options, which you can select from the front panel, a network management system, or using remote configuration, are described following this list.

Options with AT-Command Equivalents
AT&C (DCD Control)
AT&D (DTR Control)
AT&R, AT✳CT (CTS Control)
AT&S, AT✳MR (DSR Control)
AT✳CD (DCD Loss Disconnect)
AT✳DE (DTE Rate)
AT✳DL (RTS/CTS Delay)
AT✳DT (DTR Delay)
AT✳FL (Flow Control)
AT✳LA (DTE Circuit 141) Circuit 141 Local Analog Loopback
AT✳LD (DTE Circuit 140) Circuit 140 Remote Digital Loopback
AT✳LT (Pin 25 Control)
AT✳OP (Select Option Sets) External Option Set Select
AT✳OC (External Control)
AT✳OS (Overspeed)
AT✳RS (RTS Control)
AT✳SC (Speed Conversion)
AT✳SI (DTE Inactivity)
AT✳SR (Remote RST/DCD)
AT✳TD (Throughput Minimization Delay)

Telco Options

Figure 2-8 illustrates the TELCO OPT'S menu. TELCO OPT'S menu options control the modem's interface transmit level with the PSTN and private lines, the speaker, and telco jack.

Figure 2-8. TELCO OPT'S Menu

Some TELCO OPT'S menu options, listed below, have AT-command equivalents, which are described in Chapter 1, AT Commands. The remaining TELCO OPT'S options, which you can select only from the front panel, are described immediately following this list.

Options with AT-Command Equivalents
ATM (Speaker)
ATL (Volume)
AT&J (Telco)
AT✳LC (Line Compensation)
AT✳NC (Network Compensation)

Telco Options

Dial Line Transmit Level

The DL TX option displays the modem's dial line transmit level, which is set for your country's requirements.

Option Setting	Description
0 to –15	Modem is set to transmit at a level in the 0 to –15 dBm range.

NOTE: This setting is country-specific. In some countries, dial line transmit levels are adjustable. Consult Appendix C, Country-Specific Information, in the *326X Series Modem User's Guide* for the settings that are valid in your country.

Leased Line Transmit Level

The LL TX option displays the modem's leased line transmit level, which is set for your country's requirements.

Option Setting	Description
0 to –15	Modem is set to transmit at a level in the 0 to –15 dBm range.

NOTE: This setting is country-specific. In some countries, leased line transmit levels are adjustable. Consult Appendix C, Country-Specific Information, in the *326X Series Modem User's Guide* for the settings that are valid in your country.

Dialing Options

Figure 2-9 illustrates the DIALING OPT'S menu. DIALING OPT'S menu options control parameters used to dial phone numbers.
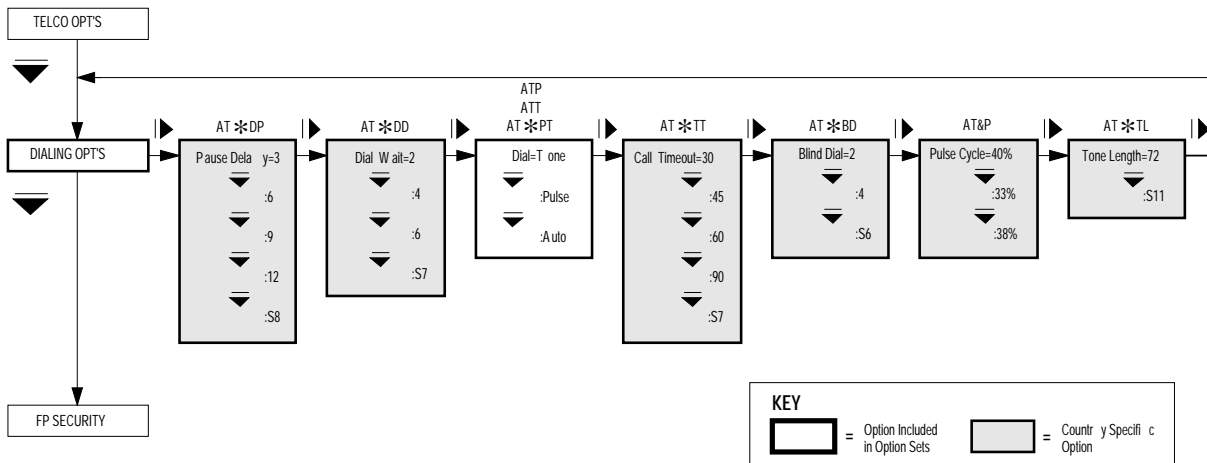
Figure 2-9. DIALING OPT'S Menu

All DIALING OPT'S menu options, listed below, have AT-command equivalents, which are described in Chapter 1, AT Commands.

Options with AT-Command Equivalents
ATP, ATT, AT✳PT (Dial Type)
AT&P (Pulse Cycle)
AT✳BD (Blind Dial)
AT✳DD (Dial Wait Interval)
AT✳DP (Pause Delay)
AT✳TL (Tone Length)
AT✳TT (Call Timeout)

When entering telephone numbers into modem memory or dialing directly from the modem's front panel, you may need to add dial modifiers to your telephone numbers. Some applications, like V.25 bis ACU and LPDA2 applications, require dial modifiers to satisfy special dialing requirements. See Chapter 3, Automatic Calling Interfaces, for details.

Front Panel Security Options

Front Panel Security Options

Figure 2-10 illustrates the FP SECURITY menu. FP SECURITY menu options allow you to protect some aspects of modem operation by using a password. When you enable the front panel password function in the modem, you must enter the password before you can perform the following operations:

- List phone numbers through the front panel, AT commands, or V.25 bis commands.

- Store phone numbers through the front panel, AT commands, or V.25 bis commands.

- Change options through the front panel or AT commands.

- Have phone numbers echoed during redialing.
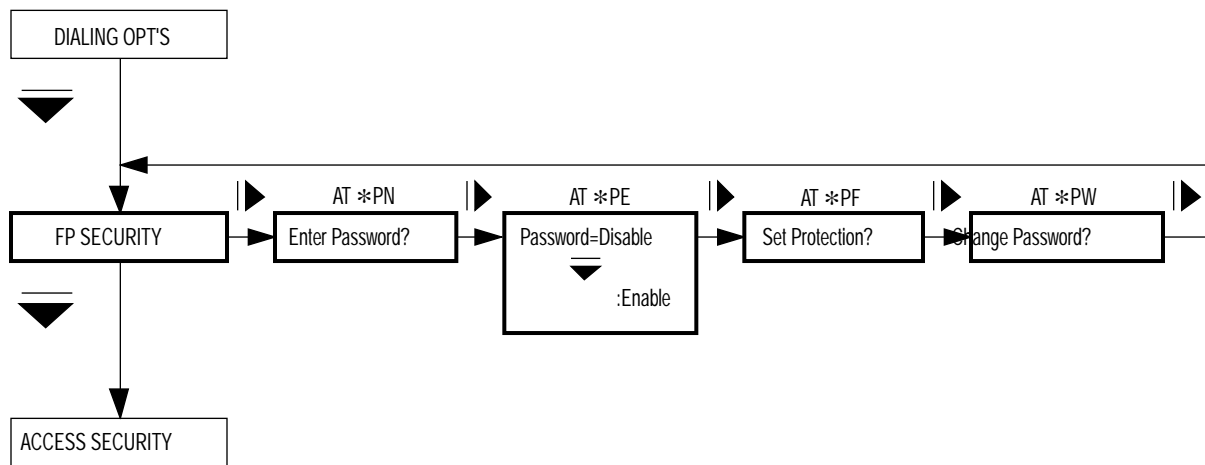
Figure 2-10. FP SECURITY Menu

Some FP Security menu options, listed below, have AT-command equivalents, which are described in Chapter 1, AT Commands. The remaining FP Security options, which you can select only from the front panel, are described immediately following this list.

Options with AT-Command Equivalents
AT✻PE (Enable/Disable Password)
AT✻PF (Setting Protection)
AT✻PN (Unlocking Password Protection)
AT✻PW (Entering and Changing a Password)

If a 326X Series Modem is password-protected, you do not need to enter the password to:

- Dial a stored number
- Answer an incoming call
- View the option settings on the front panel

IMPORTANT: *Know your password before enabling the password function. If you cannot remember your password, the only way to regain access to all modem actions is to clear the modem's memory. This procedure is described in "AT✳PW (Entering and Changing a Password)" in* Chapter 1, AT Commands. *Once you reinitialize modem memory, all settings are lost and you must reconfigure all option settings in the modem and reenter all stored phone numbers.*

When you receive your modem from Motorola, the password is set to four zeros (0000) and the password protection feature is disabled.

Unlocking the Modem

If you know your password, see Chapter 1, AT Commands, for details on the AT✳PN command. If you should forget your password and need to unlock the modem, you can regain access to all modem functions by following the procedure in this section.

⚠ Caution

When you unlock the modem using this procedure, all option settings and stored telephone numbers are deleted from the modem's memory. Before using the modem, you will need to reconfigure all option settings in the modem and reenter all stored phone numbers.

1) Close Switch 4 on the modem's rear panel (set it to the down position). See Table 2-2 in Chapter 2 of the *326X Series Modem User's Guide* for more details.

2) In the Status/Option Sets/Dialing menu, press ▶ until the modem displays:

   Reinit Memory?

   When you press ◎, the modem responds with:

   Reinit All Mem?

3) Press ◎ again. The modem displays:

   326x Initial

4) You have now reset the modem to its factory default option settings and deleted all entries from the electronic telephone book. Password protection is disabled and the password is set to 0000.

5) If you plan to use the password protection feature again, open Switch 4 on the modem's rear panel (set it to the up position).

Access Security Options

Access Security Options

Figure 2-11 illustrates the ACCESS SECURITY menu. Access Security is used with answer 326X Series Modems. Any calling station with DTMF (Dual Tone Multi Frequency) dialing can use the modem's Access Security feature. ACCESS SECURITY menu options allow your modem to screen incoming calls using a password function.
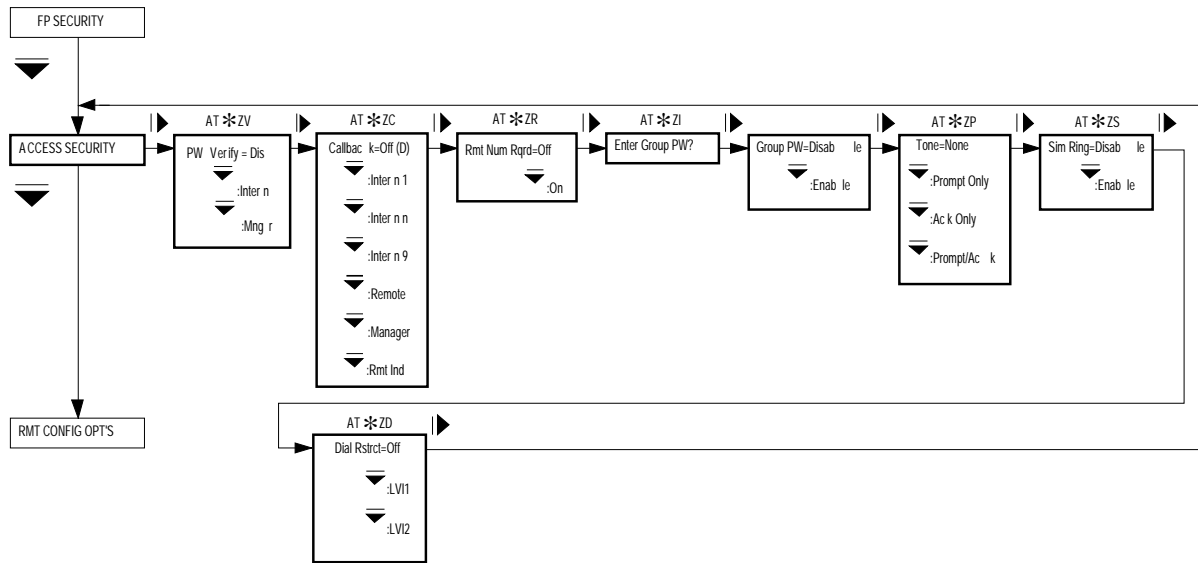
Figure 2-11. ACCESS SECURITY Menu

The ACCESS SECURITY OPT'S menu options, listed below, have AT-command equivalents, which are described in Chapter 1, AT Commands.

Options with AT-Command Equivalents
AT✳ZC (Callback Feature)
AT✳ZD (Dial Restriction)
AT✳ZI (Entering Group Password)
AT✳ZP (Tone)
AT✳ZR (Remote Number Required)
AT✳ZS (Simulated Ringback)
AT✳ZV (Password Verification)

The access security feature works as follows:

1) Your 326X Series Modem receives a call.

2) The calling modem must provide a DTMF password before the modems attempt a connection.

3) The password is validated by the answer modem, or is passed to the network manager for validation. **NOTE**: If the PW Verify command is set to Mngr (AT✳ZV), the network management system verifies the received password. Although displayed at the modem, this selection is not accessible by the front panel or AT ACU.

4) If the password is valid, the modem attempts a connection. If the password is invalid, your modem disconnects immediately.

A callback function is provided to act as a toll-saving feature. Upon verification of the calling modem's access security password, your modem can call a number that is:

• Provided by the calling modem

• Stored in one of nine memory locations in your modem, or

• Provided by the network manager.

If the calling modem's password is valid, your modem disconnects and calls the callback number. By using the answer modem's callback function, you need only stay on a long-distance call long enough for the answer modem to verify your password and read the callback number. The answer modem then disconnects and calls you back.

Group PW Enable/Disable

The Group PW option determines if the modem is able to verify a received password when you have selected the PW Verify=Mngr (AT✳ZV) and the network management system is unable to perform the verification. This option setting is not accessible from the front panel or AT ACU. It is displayed for status purposes only. The network management operator configures the option as needed.

Option Setting	Description
Disable (default)	The modem is not able to verify the password.
Enable	The modem is able to verify the password using its Group PW stored internally.

Access Security Options

If the Answer Modem Is Not Using the Callback Feature

If the answer modem is not using the Callback Feature, it is not necessary to provide the answer modem with a number to call back. You must however, still specify the correct password.

In the answer modem:

1) Set PW Verify=Intern (AT✳ZV1, ACCESS SECURITY category).

2) Enter the access group security password using the Enter Group PW? option (AT✳ZI, ACCESS SECURITY category). Refer to the AT✳ZI description in Chapter 1, AT Commands, of this manual for details on how to enter an access group security password.

3) Set the modem to answer incoming calls. The modem will answer the call based on how the Answer option (AT✳AA) is set (ACU OPT's category).

After setting the answer modem as indicated in steps 1-3 above, next you will dial the answer modem and provide the access security password. When dialing the answer modem, you enter a dial string telling the modem how to complete the call. A typical non-callback dial string appears as follows:

5552345@1111✳0

555-2345 is the answer modem's telephone number. The "@" dial modifier ensures that the answer modem has picked up before the password is transmitted. The password 1111 is transmitted, followed by the ✳0 code, which tells the answer modem that the entry is complete.

To dial the answer modem, proceed as follows:

1) Enter the answer modem's telephone number in the calling modem.

2) Once your modem has dialed the answer modem's number, you must instruct it to wait for the answer modem to answer the call. To do this, use the "@" dial modifier (or, if your modem does not support the "@" dial modifier, use the pause "K" dial modifier).

   The "@" dial modifier instructs your modem to wait for five seconds of silence after hearing the ringback tone. This ensures that the answer modem has picked up the call.

3) Enter the access security password.

4) Include the code (✳0) in the string telling the answer modem that password entry is complete. **NOTE:** The password will not be accepted and the call will be disconnected if the ✳0 code is not at the end of the dial string.

   NOTE: If the answer modem's Callback option (AT✳ZC) is set to Intern n, it will disconnect after validating the access security password, and dial the number stored in memory location "n." Before setting this strap in option in the answer modem, however, the calling modem's dial string must have a semicolon followed immediately by a capital H (;H) at the end of the calling string (for example, 5552345@1111✳0;H).

If the Calling Modem Is Providing the Callback Number

You must specify the callback number along with the password.

In the answer modem:

1) Verify that PW Verify=Intern (AT✳ZV1, ACCESS SECURITY category).

2) Set the Callback option (AT✳ZC, ACCESS SECURITY category) to either Remote (AT✳ZC10) or RMT Ind (AT✳ZC12). (Refer to the AT✳ZC description in Chapter 1, AT Commands.)

3) Enter the access group security password using the Enter Group PW? option (AT✳ZI, ACCESS SECURITY category). Refer to the AT✳ZI description in Chapter 1, AT Commands, of this manual for details on how to enter an access group security password.

4) Set the modem to answer incoming calls. The modem will answer the call based on how the Answer option (AT✳AA) is set (ACU OPT's category).

After setting the answer modem as indicated in steps 1-4 above, next you will dial the answer modem and provide the access security password. When dialing the answer modem, you enter a dial string telling the modem how to complete the call. A typical callback dial string appears as follows:

5552345@1111##5556789✳0;H

555-2345 is the answer modem's telephone number. The "@" dial modifier ensures that the answer modem has picked up before the password is transmitted. The password 1111 is transmitted, followed by the ## code. This alerts the answer modem that the password is complete but the dial string is not yet finished. 555-6789 is the number that the answer modem calls once the password is verified. The ✳0 code tells the answer modem that the entry is complete. The ✳0 followed immediately by a semicolon and a capital H (;H) instructs the originating modem to hang up upon completion of the call. **NOTE:** If the originating modem is not placed on hook, the answer modem will not be able to call back. (Refer to Note 1 below for more information.)

Access Security Options

To dial the answer modem, proceed as follows:

1) Enter the answer modem's telephone number in the calling modem.

2) Once your modem has dialed the answer modem's number, you must instruct it to wait for the answer modem to answer the call. To do this, use the "@" dial modifier (or, if your modem does not support the "@" dial modifier, use the pause "K" dial modifier).

   The "@" dial modifier instructs your modem to wait for five seconds of silence after hearing the ringback tone. This ensures that the answer modem has picked up the call.

3) Enter the access security password.

4) To delineate the password from the callback number, enter the code ##.
   This alerts the answer modem that the password is complete but the dial string is not yet finished.

5) Enter the callback number.

6) Include the code (✳0) in the string telling the answer modem that password entry is complete. **NOTE:** The password will not be accepted and the call will be disconnected if the ✳0 code is not at the end of the dial string.

NOTES:

1) If your modem is using its AT ACU, and you follow the ✳0 with ;H
   (a semicolon followed immediately by a capital H), the semicolon causes the originating modem to enter the command state, and the capital H causes the modem to hang up upon completion of the call.

2) If you are using the V.25 bis ACU, an NMS, or the front panel, you must enter the both the semicolon and capital H together (;H) to disconnect the call.
   In both instances, note that the originating modem *must* be placed on hook in order to be called back.

For any dial modifiers used in the callback number, you must use the DTMF equivalencies provided in Table 2-2.

Using the Callback Feature with an Originate-Only Modem

If your modem can only originate calls and you want to call a 326X Series Modem that is using the callback feature, your callback number must contain the "S5" dial modifier (the DTMF equivalent of the "R" modifier) at the end. When the answer modem dials the callback number, it encounters the "S5" dial modifier. The "S5" dial modifier instructs the answer modem to train as an answer modem when it calls you back, rather than as an originating modem. Therefore, your modem is called back by the answer modem, and can train with it because the callback appears to be coming from an answer modem. A typical callback dial string sent from an originating modem appears as follows:

> 555-2345@1111##555-6789✳5✳0;H

With the exception of the "S5" dial modifier, this string is identical to the one in the previous section.

NOTES:

1) If your modem is using its AT ACU, and you follow the ✳0 with ;H
(a semicolon followed immediately by an H), the originating modem hangs up upon completion of the call, and is ready to be called back.

2) For any dial modifiers used in the callback number, you must use the DTMF equivalencies provided in Table 2-2.

Manual Dialing and Callback DTMF Equivalencies

If you are dialing the answer modem manually via a DTMF (Dual Tone Multi frequency) keypad, or you are providing the callback number in a dial string, you do not have the ability to enter all of the dial characters that are available through the ACU or your modem front panel. In order to accommodate these conditions, the 326X Series Modem recognizes the following DTMF codes as equivalencies (see Table 2-2).

Table 2-2.
DTMF Tone Equivalencies

DTMF Tone	Equivalent AT or Front Panel Dial Character
✳0	✳0 (End)
✳1	W w (Dial Wait)
✳2	K k < , (Pause Delay)
✳3	@ (Wait for five seconds of silence)
✳4	T t (Tone)
✳5	R (Reverse: calling modem trains as an answer modem)
✳6	P p (Pulse)
✳✳	✳ (Provides a ✳ as part of the callback number)
##	Delineates password from callback number.

Network Control Options

Network Control Options

Figure 2-12 illustrates the NETWK CNTL OPT'S menu. NETWK CNTL OPT'S menu options control how your modem interacts with the network manager.
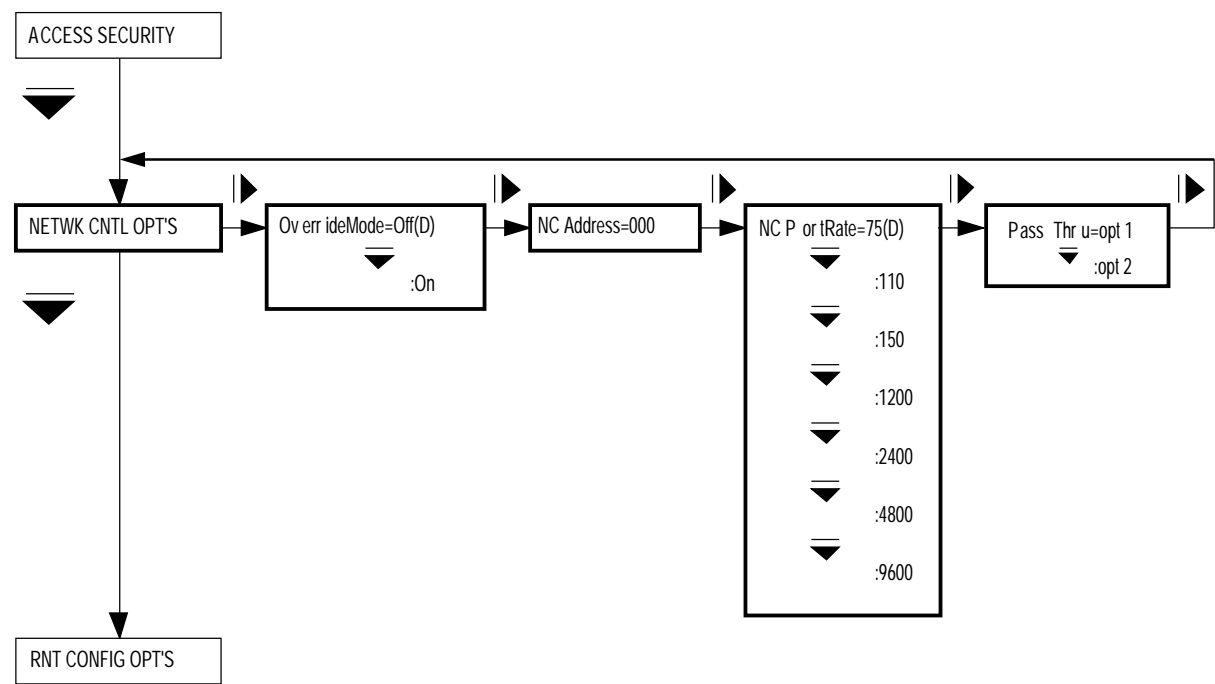
Figure 2-12. NETWK CNTL OPT'S Menu

The options in the NETWK CNTL OPT'S menu, described below, can be selected only from the front panel. The following sections provide a detailed description of the option settings.

Override Mode

The Override Mode option determines whether your modem can be controlled by the network manager.

Option Setting	Description
Off	The network manager can attach your modem. Once the network manager has attached, front panel control is locked out. You can still use front panel keys to read your option settings and status through the front panel menu tree, but you cannot change any option settings. If you attempt to change an option setting, the modem responds with:

Net Man Attached

AT commands can still be issued to the modem from an attached control terminal, but testing and access security AT commands have no effect. If you issue a testing or access security AT command, the modem responds with:

Network Management Inhibited

The only front panel option whose setting can be changed while the network manager is attached is the Override Mode option. If you change the setting from Off to On, you regain control of your modem front panel. **NOTE:** If the network manager has set your modem's front panel password protection, you cannot change the setting of the Override Mode option. You can, however, unlock password protection using the Enter Password? function in the FP SECURITY menu and then override network management control.

Option Setting	Description
On	The network manager cannot attach your modem.

Network Control Address

The NC Address option allows you to set your modem's network control address. This is the same address that 326X Series Modems use with the SET RMT LL ADDR and SRCH RMT LL ADDR functions. The range of valid addresses is 0 to 254.

To set your network control address, see "Performing Numeric Entry" at the end of this chapter for details.

Note that if you enter an invalid address, the modem displays:

    Invalid NC Addr!

Network Control Options

Network Control Port Rate

Set the NC Port Rate option to match the speed of your network manager. This setting controls the speed of the NC ports on your modem's rear panel.

Option Setting	Network Control Port Configured for:
75 (default)	75 bps
110	110 bps
150	150 bps
1200	1200 bps
2400	2400 bps
4800	4800 bps
9600	9600 bps

Pass Thru

The 326X Series Modem uses an in-band secondary channel to pass network management data to the remote modem. This channel is not disruptive to main channel user data. The Pass Thru option controls the manner in which the network control data is passed to the remote modem when the 326X Series Modem is configured as a DIAL modem. It also determines if the DIAL remote modem passes the network management in-band secondary channel data through to its network control (NC) port out jack. The out jack is located on the rear panel of the modem. Use the Pass Thru option when you have configured the modem for network management data to be passed to second tier devices.

Option Setting	Description
opt 1 (default)	The local modem (connected to a network manager through the NC port) will not forward all network management data received from the NC port to the remote modem over the in-band secondary channel. Only commands from the network manager designated for the remote modem are passed through to the in-band secondary channel. Only responses from the remote modem are passed through to the NC port for the network manager. The remote modem does not pass network management data to its NC port out jack.
opt 2	No filtering is performed by the local or remote modems. The modems pass all network management data received from the NC port to the in-band secondary channel and from the in-band secondary channel to the NC port.

Remote Configuration Options

Figure 2-13 illustrates the RMT CONFIG OPT'S menu. The options in the RMT CONFIG OPT'S menu, along with the SET RMT LL ADDR and SRCH RMT LL ADDR menus, provide all the options needed to read status information and configure a connected 326X Series Modem. All guidelines described in this section apply to all three of these menus.
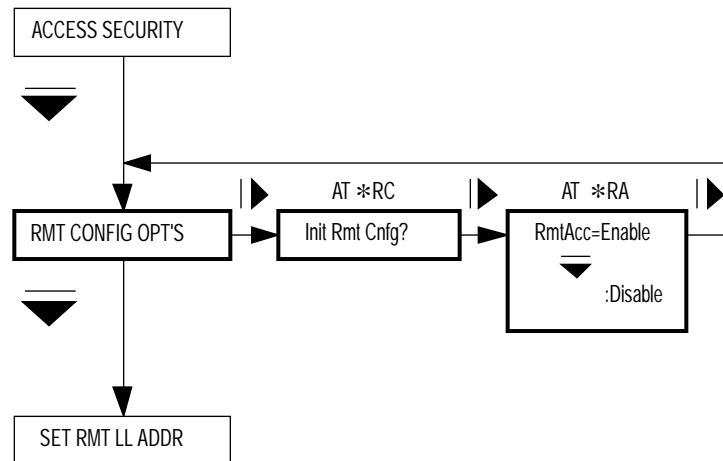
Figure 2-13. RMT CONFIG OPT'S Menu

The RMT CONFIG OPT'S menu options, listed below, have AT-command equivalents, which are described in Chapter 1, AT Commands.

Options with AT-Command Equivalents
AT✳RA (Remote Access)
AT✳RC (Terminate, Initiate, or Abort Remote Configuration Session)

The remote configuration function can be used in two-wire dial or four-wire leased line applications. Since it uses an in-band secondary channel that is not disruptive to user data, a remote configuration session can be established while modems are passing user data.

Two remote configuration methods are available:

- Via your AT ACU
- Via your front panel

Whether you choose to use your front panel or your AT ACU, the remote configuration feature gives you control over both your modem and the connected modem.

Remote Configuration Options

AT ACU: If you use your AT ACU to establish a remote configuration session with the connected modem, any status information you display and any configuration changes you perform via your AT ACU affect the remote modem *only.* Your control terminal displays the AT ACU information of the remote modem, not your own. However, you can still use your front panel to read your status information and configure your modem. Also, your modem can use its AT ACU to establish a remote configuration session even if the remote modem's ACU Select option is set to V25b (V.25 bis ACU), LPDA2, or Off (NoACU).

Front Panel: If you use your front panel to establish a remote configuration session with the connected modem, any status information you display and any configuration changes you perform via your front panel affect the remote modem *only.* Your front panel displays the front panel information of the remote modem, not your own. However, you can still use your AT ACU to read your status information and configure your modem.

When a 326X Series Modem is under remote configuration control by another modem, its front panel RC/NC LED blinks, and its front panel displays:

> UNDER RC--T/D?

NOTE: Each modem's front panel LEDs reflect only its own operational status. In other words, you cannot view the LED status of a remotely connected modem.

The following features and functions are restricted for a 326X Series Modem under remote configuration control:

- Dialing
- Testing
- Initiating a remote configuration session
- Searching for and setting a remote modem's leased line address

Changes made to the remote modem's configuration using the remote configuration function do not take effect until you *terminate* the session. If you *abort* the session, or if the modems disconnect during the session, changes made to the remote modem's configuration are not saved.

If your modem is under remote configuration control by another 326X Series Modem, and you have disabled your *front panel* using Switch 3 on your modem's rear panel, the controlling modem still has full front-panel control of your modem. (See Table 2-2, Rear Panel Switches, in Chapter 2, Installing Your Modem, in the *326X Series Modem User's Guide*.)

If your modem is under remote configuration control by another 326X Series Modem, and you have disabled your modem's *AT auto call unit* using Switch 5 on your modem's rear panel (see Table 2-2, Rear Panel Switches, for more details), the controlling modem will still have full AT ACU control of your modem.

Your modem-to-modem speed must be 7200 bps or greater for a remote configuration session to be possible. Make certain that your MODULATION OPT'S menu Mod, Max Rate, and Min Rate options are set to accommodate at least 7200 bps. For fastest remote configuration channel speed, modem-to-modem speed should be 7200 bps. Higher modem-to-modem speeds do not improve your remote configuration channel speed.

⚠ Caution

When your 326X Series Modem is being controlled by another 326X Series Modem, if you enter the AT escape sequence (+ + +) at your control terminal, your terminal displays:

    UNDER RMT CONFIG

and you enter the AT command node. Once in AT command mode, you will not be able to issue AT commands or return from the AT command mode to other terminal displays until the remote configuration session is over. **NOTE:** It is advised that you not enter the AT escape sequence while your modem is under remote configuration control.

Remote Configuration Options

Setting a Remote Modem's Leased Line Address

The SET RMT LL ADDR menu (Figure 2-14) is intended for use with remote configuration on leased lines. Using the SET RMT LL ADDR option, you can set the remote modem's address.

NOTE: If you attempt to search for and set a remote modem's leased line address, and the remote 326X Series Modem has Release 4.0 (or earlier) software, you cannot set the remote modem's serial number from the local unit. You must know the serial number to configure it from the local unit or have someone at the remote site manually enter the address.
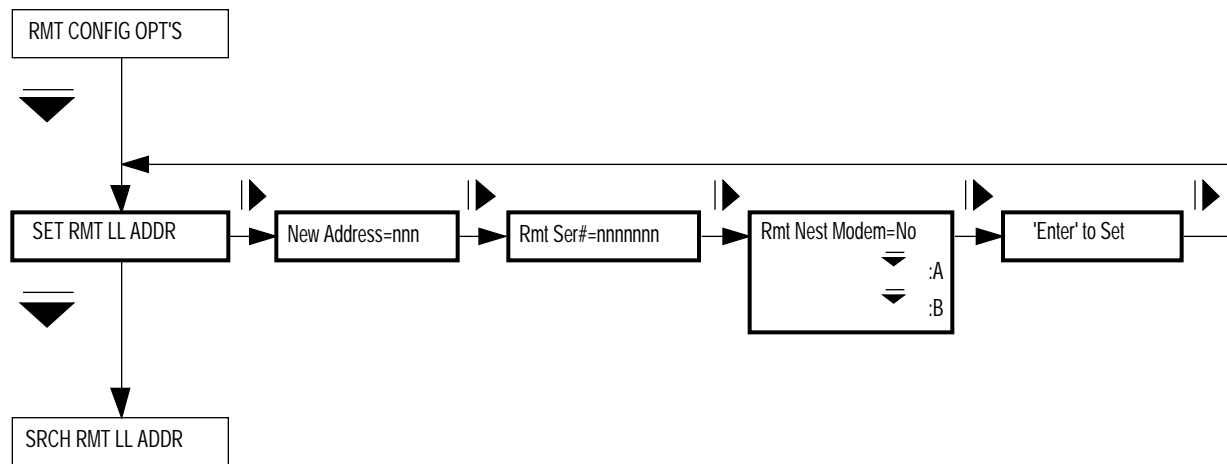
Figure 2-14. SET RMT LL ADDR Menu

Once you have determined the remote modem's serial number (using the procedure described in "Before Setting or Searching for a Remote Modem's Leased Line Address" in Chapter 1, AT Commands), do the following to set its address:

1) Establish a leased-line connection with the remote modem at 7200 bps or greater.

2) Display:

    SET RMT LL ADDR

3) Press ▶ until the modem displays:

    New Address=xxx

4) See "Performing Numeric Entry" at the end of this chapter for details on how to enter the modem's new address.

5) Press ▮▶ until the modem displays:

    Rmt Ser#=xxxxxxx

6) See "Performing Numeric Entry" at the end of this chapter for details on how to enter the modem's remote serial number.

7) Press ▮▶ until the modem displays:

    Rmt Nest Modem=xx

8) If the remote modem is in a nest and it is on a dual modem nest card, select A if it is Modem A on the modem dual nest card or B if it is Modem B on the card. Select No if the remote modem is a standalone modem or a single modem nest card.

9) Press ▮▶ until the modem displays:

    Enter to Set

10) Press ◎. If successful, the modem displays:

    New Address=xxx

where xxx is the address you just set. If unsuccessful, the modem displays:

    Rmt Set Failed!

or

    Rmt Set Denied!

Failure to set a remote modem's address can be caused by the following:

- The remote modem's Rmt Acc option is set to Disabled.
- The remote modem is running a test.

Searching for a Remote Modem's Leased Line Address

The SRCH RMT LL ADDR menu (Figure 2-15) is intended for use with remote configuration on leased lines. Using the SRCH RMT LL ADDR option, you can search for the remote modem's address.
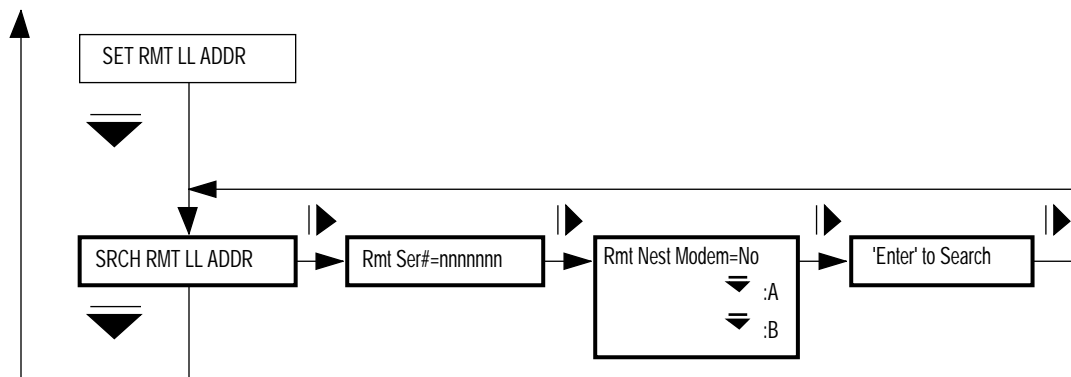
Figure 2-15. SRCH RMT LL ADDR Menu

Remote Configuration Options

Once you have determined the remote modem's serial number, do the following to search for its address:

1) Establish a leased-line connection with the remote modem at 7200 bps or greater.

2) Display:

   SRCH RMT LL ADDR

3) Press ▶ until the modem displays:

   Rmt Ser#=xxxxxxx

4) See "Performing Numeric Entry" at the end of this chapter for details on how to enter the modem's remote serial number.

5) Press ▶ until the modem displays:

   Enter to Set

6) Press ◎. The modem displays:

   ...Wait...

   If successful, the modem displays:

   Address=xxx

   If unsuccessful, the modem displays:

   Rmt Srch Failed!

   or

   Rmt Srch Denied!

7) Press ▶ until the modem displays:

   Rmt Nest Modem=xx

8) If the remote modem is in a nest and it is on a dual modem nest card, select A if it is Modem A on the dual modem nest card or B if it is Modem B on the dual modem nest card. Select No if the remote modem is a standalone modem or a single modem nest card.

A failed search for a remote modem's address can be caused by the following:

- The remote modem's Rmt Acc option is set to Disabled.

- The remote modem is running a test.

Setting or Searching for a Remote Modem's Leased Line Address

Before you can use the SET RMT LL ADDR and SRCH RMT LL ADDR functions, you must know the remote modem's serial number. A 326X Series Modem serial number can be located three ways:

- Use the front panel Status display.

- Read the serial number label on the underside of the modem.

- Use the AT✳ST0 command.

AT✳ST0 Command
At the remote modem, enter:

AT✳ST0<CR>

The Front Panel
At the remote modem, display the Status/Option Sets/Dialing menu. Scroll through the status information until you see.

Display Modem ID

Press ◎. Use ▼ to scroll through the ID numbers until you see:

Serial #=xxxxxxx

On dual modem nest cards, the serial number will have an A or B. For example, the modem will display:

Serial #=xxxxxxxA

or

Serial #=xxxxxxxB

Remote Configuration Options

Modem's Serial Number

As Figure 2-16 illustrates, the 326X Series Modem serial number is located on the label attached to the modem's underside. Locate this label on the remote modem and record the number.
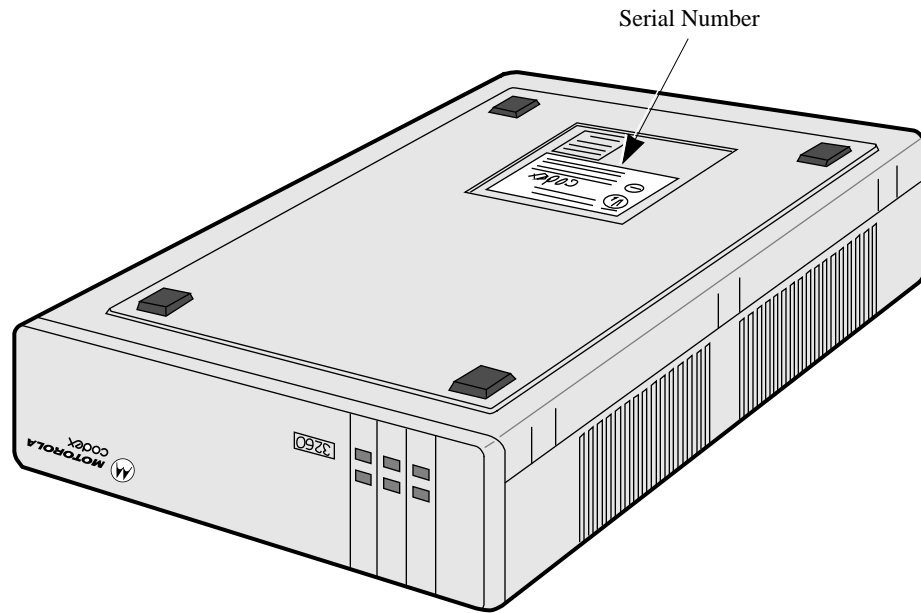
Figure 2-16. Locating Modem Serial Number

Performing Numeric Entry

Listed below are front panel option settings that require you to enter information using the front panel or ACUs. The following procedure describes how to use the front panel keys to make a numeric entry.

Front Panel Option	*Description*
Enter Phone #=n	Stores phone number to phone book memory in location n.
Enter Then Dial	Allows you to dial from the front panel.
S-Reg xxx=nnn	Allows you to set S-Register xxx to nnn.
LPDA-2 Addr=nnn	Allows you to set the LPDA2 address.
Enter PW:nnnn	Allows you to unlock a modem's password protection.
Old PW:nnnn	Allows you to enter old password.
New PW:nnnn	Allows you to configure new password.
Verify PW:nnnn	Allows you to verify new password.
Enter Group PW:	Allows you to verify group password.
NC Address:nnn	Allows you to set network control address.
New Address:nnn	Allows you to set remote modem's leased line address.
Rmt Ser:nnnnnnn	Allows you to enter remote modem's serial number.

The key strokes required to set the numeric entry for the options listed above are as follows:

1) Step across the desired front panel menu by pressing ▸ until the option you want to change is displayed.

2) Press ◎. You are now ready to key in the numeric entry.

3) Press ▾ until the desired digit or character appears in the leftmost position of the display.

   Example: 1xxxxx

4) Press ▸. The display shifts one position to the left, and the second character position is displayed.

5) Repeat Steps 3 and 4 until you have completed keying in the numeric entry. If you make a mistake and you wish to reenter a number or character, press ▨. This will place the cursor at the beginning of the line. You may now re-enter the number or character.

6) After you have input the correct numbers or characters, press ◎ to save your selection.

Chapter 3
Automatic Calling Interfaces

Contents

Contents (continued)

Introduction

Your 326X Series Modem supports three Automatic-Calling Interfaces, (also commonly known as Automatic Calling Unit's [ACU's]):

- AT ACU for asynchronous applications
- V.25 bis ACU for synchronous applications
- LPDA2 ACU for synchronous applications

This chapter discusses operation of the V.25 bis and LPDA2 ACU's. The AT ACU is discussed in detail in Chapter 5, Using the AT Automatic Calling Interface, in the *326X Series Modem User's Guide*.

This chapter also discusses using an External Auto-Call Unit (Bell 801C or Codex 2207) with the 326X Series Modem.

V.25 bis ACU

The 326X Series Modem supports a CCITT V.25 bis Auto-Call Unit (ACU) for initiating calls from a DTE. The V.25 bis ACU can be used with intelligent DTEs that communicate in either synchronous or asynchronous data formats.

When entering telephone numbers into modem memory or dialing directly from the modem's front panel, you may need to add dial modifiers to your telephone numbers. Some applications require dial modifiers to satisfy special dialing requirements.

Table 3-3 lists the dial modifiers used by the 326X Series Modem when operating in V.25 bis ACU applications.

Table 3-3.
Dial Modifiers

Modifier	Function	Description
W w :	Dial Wait	Instructs the modem to stop and wait for a dial tone. If the modem does not detect a dial tone after a specified period, it aborts the call. The factory default for dial wait is country-specific (consult Appendix C of the *326X Series Modem User's Guide* for additional information). In the United States, the default is two seconds. You can change this interval using the Dial Wait option.
K k < ,	Pause Delay	When any of these modifiers are encountered in a dial string or on the command line, the modem pauses. The factory default for the pause delay modifier is three seconds. This default can be extended with the Pause Delay command. The comma modifier can be used as a command outside of the dial string.

Table 3-3.
Dial Modifiers (Continued)

Modifier	Function	Description
P p	Pulse	When either of these modifiers (P, p) are encountered in a dial string, if Dial=Auto (AT✻P2—DIALING OPTS menu), the Dial option setting is not changed from Auto. If set to other than Auto, the pulse/tone setting is modified to force pulse dialing. If no pulse dial modifier is inserted in the number stream, the modem dials according to the pulse/tone setting of the Dial option in the front panel DIALING OPT'S menu. These modifiers can also be used as a command outside of the dial string.
T t	Tone	When either of these modifiers (T, t) are encountered in a dial string, if Dial=Auto (AT✻P2—DIALING OPTS menu), the Dial option setting is not changed from Auto. If set to other than Auto, the pulse/tone setting is modified to force tone dialing. If no tone dial modifier is inserted in the number stream, the modem dials according to the pulse/tone setting or the Dial option in the front panel DIALING OPT'S menu. These modifiers can also be used as a command outside of the dial string.
& !	Flash	Instructs the modem to flash hook (a control signal used by many PBXs to enable special dialing features, such as transferring a call, call forwarding, etc.).
;	Return to command state after dialing	Instructs the modem to return to the command state after dialing, without breaking the connection. The modem can dial but cannot train, and no call progress messages are received. This modifier is used when calling an electronic service that permits the user to transmit numbers using tones once a connection has been established.

Table 3-3.
Dial Modifiers (Continued)

Modifier	Function	Description
@	Quiet Answer	Causes the modem to look for one or more ringbacks (followed by five seconds of silence) within the delay time specified by the front panel Call Timeout option. If five seconds of delay silence is detected, the modem continues to dial the remainder of the dial string. If the line is busy, the modem hangs up and sends a BUSY message to the DTE. If the modem does not detect delay silence or a busy signal, the modem hangs up and the screen displays NO ANSWER.
R	Reverse	Must be the last character in the dial string before a carriage return. The R modifier causes your modem to originate the call in answer mode and is used to dial an originate-only modem. Immediately after the dial command is processed, an answer-back tone is generated and the modem attempts to complete the connection for the length of time specified by the Call Timeout option.
H h	Disconnect	Causes the modem to disconnect from the dial line. This must be the last modifier in the dial string, and must also be preceded by a semicolon. If the "H" or "h" modifier is not preceded by a semicolon, it is ignored by the modem. The "H" or "h" modifier can be entered through the front panel, the AT ACU, or network manager.
(space) . (period) - (dash) ( ) parentheses	Presentation characters	These characters do not act as modifiers. Instead, they are presentation characters that are ignored.

Call Establishment Methods

The V.25 bis ACU in your 326X Series Modem supports an addressed mode that uses the commands described in this chapter. You can store phone numbers in memory, dial calls from memory, and perform other ACU functions through the addressed mode.

In addition to addressed mode, the modem supports manual and direct call establishment methods. The direct mode allows you to use DTR transitions from the DTE to establish calls. The manual mode allows you to manually initiate and answer calls with a telephone and then transfer the call to the modem. The direct and manual methods of call establishment are described later in this chapter.

Modem Configuration

Ensure that all option settings under the TERMINAL OPT'S menu are appropriate for your application. See Chapter 2, Front Panel Operation, of this guide for information on the TERMINAL OPT'S menu.

You must set the V25Form option in the ACU OPT'S menu to either Bitsync or Charsync for synchronous DTEs, or Async for asynchronous DTEs. The setting of the DTR option depends on the call establishment method you plan to use. Table 3-4 describes these settings.

Table 3-4.
DTR Option Settings

Call Establishment Method	DTR Option Setting
Addressed	DTR=108.2 or DTR=High
Direct	DTR=108.1, Tail
Manual	DTR=108.2 or DTR=High

If you plan to use the addressed mode, make sure that the options in the ACU OPT'S menu are set appropriately. These options make the V.25 bis ACU in the modem compatible with your DTE.

Addressed Mode

To use the addressed mode, you must set the DTR option of the front panel display to Esc, Disc, High, or 108.2. With the DTR option set to High, the modem is always ready to execute V.25 bis commands. On-to-off DTR transitions from the DTE do not disconnect the modem from the line.

If the DTR option is set to 108.2, the DTE must turn DTR from off to on before the modem can execute V.25 bis commands. On-to-off DTR transitions disconnect the modem from the telephone line.

Throughout the following sections, all sample commands are shown in uppercase letters. However, you may enter commands in either uppercase or lowercase letters.

V.25 bis Commands

The V.25 bis command set allows you to dial calls, answer incoming calls, and perform other important ACU functions from your DTE. Table 3-5 describes each command.

Table 3-5.
V.25 bis Commands

Command	Description
CIC	Connect Incoming Call. This command instructs the modem to connect to an incoming call. When you enter this command, the modem answers an incoming call immediately. If you do not answer an incoming call with this command, the modem acts according to the Answer option in the ACU OPT'S menu of the modem front panel display. If you enter the CIC command and there is no incoming call, the modem responds with the INV (INValid) response.
CRNn	Call Requested Number. This command instructs the modem to dial the number that follows it. Use this command to dial directly from the keyboard of the DTE. A typical CRNn command might look like this:
	CRN1-555-123
	The telephone number can contain hyphens or spaces; the modem ignores them. You may enter the dial modifiers described in the previous section to accommodate special dialing requirements. If the number entered exceeds 50 digits, the modem responds with:
	INV
CRSa	Call Request with Address. This command instructs the modem to dial a number from a specific address in modem memory. To dial the number stored in address 5, enter:
	CRS5
	You can dial a phone number from any of the modem's memory addresses (1-9) with the CRS command.

Table 3-5.
V.25 bis Commands (Continued)

Command	Description
DIC	Disregard Incoming Call. This command instructs the modem to disregard an incoming call. If you have set the modem for auto-answer through the Answer option in the ACU OPT'S menu, the DIC command overrides this setting for one incoming call. If you enter the DIC command and there is no incoming call, the modem responds with the INV (INValid) response.
PRNa;n	PRogram Number. This command instructs the modem to store a phone number in a specific address in the modem's nonvolatile memory. The modem has nine (1-9) phone number addresses in nonvolatile memory. To store a phone number in address 2, issue the following command:

PRN2; 1-555-1234

The telephone number can contain up to 50 characters including hyphens or spaces. Use the dial modifiers described in the previous section to accommodate special dialing requirements. To delete a number from a specific memory address, enter the PRN command followed by the address of the number you want to delete. For example, to delete the number in memory address 1, enter:

PRN1

RLF	Request List of Forbidden numbers. This command instructs the modem to send a list of forbidden numbers to the DTE. The PTT may require the modem to place a number on a forbidden list if a call to that number fails. The modem cannot dial a number that is on the forbidden list until the power to the modem is turned off and then on again. A typical list of forbidden numbers might look like this:

LSF;8005551212

In this case, a call or calls to the number described failed. Consequently, the modem placed the number on the forbidden list. If the modem currently has no numbers on the forbidden list, it responds with:

LSF

If the RLF command is issued when password protection is enabled and the modem is locked, the modem responds with the "invalid" message:

INV

Also, if your PTT does not require forbidden numbers and you issue the RLF command, the modem responds with the "invalid" message:

INV

Table 3-5.
V.25 bis Commands (Continued)

Command	Description
RLD	Request List of Delayed numbers. This command instructs the modem to send a list of delayed numbers to the DTE. The PTT may require the modem to place a number on a delayed call list if a call to that number fails. The modem cannot dial a number that is on the delayed call list until the prescribed time (the xxx designation) expires or until power to the modem is turned off and then on again. A typical list of delayed numbers might look like this:

> **RLD**
>
> **LSD;8005551212;45**

In this case, a call or calls to the number described failed. Consequently, the modem placed the number on the delayed list. The modem cannot call this number for 45 minutes or until the modem power is turned off and then on again. If the modem currently has no numbers on the delayed list, it responds with:

> **RLD**
>
> **LSD**

If the RLD command is issued when password protection is enabled and the modem is locked, the modem responds with the "invalid" message:

> **INV**

Also, if your PTT does not require delayed numbers and you issue the RLD command, the modem responds with the "invalid" message:

> **INV**

Command	Description
RLN	Request Listed Numbers. This command instructs the modem to list the numbers stored in the modem's nonvolatile memory. Motorola recommends that you proofread stored phone numbers after you have entered them into modem memory. The modem lists the addresses along with corresponding phone numbers. If an address is empty, it is not listed. A typical list might look like this. Enter RLN:

> **LSN1; 1-234-555-8910**
>
> **LSN2; 1-222-555-4444**
>
> **LSN3; 1-333-555-5555**
>
> **LSN5; 1-555-555-7777**
>
> **LSN6; 1-666-555-8888**
>
> **LSN7; 1-777-555-9999**

In this example, addresses 1, 2, 3, 5, 6, and 7 have numbers stored in them; address 4 is empty. If all the addresses are empty, the modem responds with the LSN message. If the RLN command is entered, password protection is enabled and the modem is locked; the modem responds with the INV message.

V.25 bis Responses

When using the V.25 bis ACU, the modem responds to the DTE with messages. Table 3-6 describes the responses and conditions under which they appear.

Table 3-6.
V.25 bis Responses

Response	Definition
CNX	Connection. The local modem has negotiated a link with the remote modem.
INC	INcoming Call. The modem sends the INC response to the DTE whenever it detects an incoming call.
INV	INValid. The modem sends the INV response whenever you enter a command incorrectly or a command that the modem cannot execute. For example, if you issue the CIC (Connect Incoming Call) command and the modem does not detect an incoming call, the modem responds with: **INV**
LSF	List of Stored Forbidden numbers. When you issue the RLF command, the modem precedes each forbidden number currently on the forbidden list with LSF. **LSF;8005551212** In this example, the number 8005551212 is on the forbidden call list.
LSD	List of Stored Delayed numbers. When you issue the RLD command, the modem precedes each number currently on the delayed list with LSD and follows each number with the number of minutes that number will remain on the list. **LSD;8005554901;45** In this example, the number 8005554091 is on the delayed call list and cannot be called for 45 minutes.
LSN	List of Stored Numbers. When you issue the RLN command and the modem has numbers stored in memory, the modem precedes each number stored in modem memory with LSN as shown: **LSN1; 1-234-555-8910** **LSN2; 1-222-555-4444** **LSN3; 1-333-555-5555** In the example above, the modem had phone numbers stored in addresses 1 through 3.
VAL	VALid. The modem responds to CIC, DIC, and PRNa;n commands with the VAL response whenever the modem can carry out the command. The modem also uses the VAL response during call progress reporting, which is described in "Call Progress Responses," following the next section.

Call Failure Responses

When you attempt a connection with the CRNn and CRSa commands, the modem sends a call failure response to the DTE if the call is unsuccessful. Table 3-7 describes each response and the conditions under which each appears. The Call Failure response that is displayed depends on which Call Progress option setting you have selected.

Table 3-7.
Call Failure Responses

Response	Description
CFIAB	Call Failure Indication ABort Call. The modem aborted a call attempt for one of the following reasons:
	• ⦿ was pressed during dialing.
	• The modem did not detect a dial tone.
	• A character was received from the DTE during dialing (asynchronous only)
CFICB	Call Failure Indication DCE Busy. The local modem detected an incoming ring after a dialing command was entered, or a command was entered at the DTE during manual answering or dialing.
CFIET	Call Failure Indication Engaged Tone. The local modem detected a busy tone after dialing. If you set the Call Progress option in the ACU OPT'S menu of the front panel display to 0, 1, or 2, the modem does not use the CFIET failure response.
CFIFC	Call Failure Indication Forbidden Call. The number is on the forbidden number list. The modem cannot dial the number as instructed. The PTT may require the modem to place a number on a forbidden call list if a call to that number fails. The modem cannot dial a number that is on the forbidden list until the power to the modem is turned off and then on again.
CFINS	Call Failure Indication Number Not Stored. You used the CRSa command to dial from a modem memory address that did not have a number stored in it.
CFINT	Call Failure Indication, No Tone. No answer-back tone or ring-back tone was detected in the remote modem. When a call was sent to the remote modem, after a pause, the remote modem failed to respond with an answer-back tone. The local modem will wait the amount of time specified by the Call Timeout option and then hang up.
CFIRT	Call Failure Indication, Ring Tone. Ringback is detected, but the call is not completed due to a timeout.
DLCxxx	Delayed Call. The telephone number is on the delayed call list. The modem cannot dial the number as instructed. The PTT may require the modem to place a number on a delayed call list if a call to that number fails. The modem cannot dial a number on the delayed call list until the prescribed time (the xxx designation) expires or until the power to the modem is turned off and then on again.

Call Progress Responses

When using V.25 bis, the 326X indicates a valid connection when it switches to data mode by turning DSR, EIA/TIA 232-D Pin 6 (V.24 Circuit 107) and DCD, EIA/TIA 232-D Pin 8 (V.24 Circuit 109), from off to on. In addition to this hardware response, you may want to receive call progress responses at the DTE.

The modem uses the VAL (valid) and CNX (connect) messages to indicate call progress. You enable the call progress messages through the V25 Resp option in the ACU OPT'S menu in the front panel display. The following settings for the V25 Resp option apply:

None	The modem does not send any CONNECT messages to the DTE.
VAL only	The modem sends a VAL message when the modems switch to data mode.
V.25 bis	The modem sends a VAL message upon receipt of the dial command and a CNX message once an answer-back tone is received from the remote modem.
V.25 rate	The modem sends a VAL message upon receipt of the dial command, and a CNX message followed by the DTE to modem data rate once the modems switch to data mode.

Result Code Responses

When using V.25 bis, the 326X Series indicates a valid connection when it switches to data mode by turning DSR, EIA/TIA 232-D Pin 6 (V.24 Circuit 107) and DCD, EIA/TIA 232-D Pin 8 (V.24 Circuit 109), from off to on. In addition to this hardware response, you may want to receive call progress responses at the DTE.

The modem uses the VAL (valid) and CNX (connect) messages to indicate a successful connection. You enable the result code responses through the V25 Resp option in the ACU OPT'S menu in the front panel display. The following settings for the V25 Resp option apply:

None	The modem does not send any CONNECT messages to the DTE.
VAL only	The modem sends a VAL message when the modems switch to data mode.
V.25 bis	The modem sends a VAL message upon receipt of the dial command and a CNX message once an answer-back tone is received from the remote modem.
V.25 rate	The modem sends a VAL message upon receipt of the dial command, and a CNX message followed by the DTE to modem data rate once the modems switch to data mode.

Reliable Connection Response

If you are using MNP or LAPM, you may want a response sent to your DTE which indicates when a reliable link was negotiated with the remote modem. To receive the reliable message, you have to set the V25 Resp option in the ACU OPT'S menu to V25 rate. In addition, you must set the Reliable Msg option to Long or Short. A reliable CONNECT message would look like this:

CNX 9600 RELIABLE

If you do not want the CONNECT message to display the data rate, set the Call Progress option in the ACU OPT'S menu of the front panel display to 0. In such a case, the CONNECT message looks like this:

CNX RELIABLE

Programming Guide for the V.25 bis Auto-Call Unit (ACU)

This section will help programmers to develop software commands. The V.25 bis command set supports both bit- and character-oriented synchronous protocols, using either ASCII or EBCDIC character sets.

The V.25 bis ACU also supports asynchronous data formats that use the ASCII character set. Appendix A, ASCII/EBCDIC Hexadecimal Equivalents, provides the hexadecimal equivalents for both ASCII and EBCDIC of the characters and symbols defined by the V.25 bis specification.

Frame formats for both bit- and character-oriented synchronous and asynchronous transmission are defined in the following sections. The 326X Series Modem supports most individual protocol elements necessary for the modem and terminal to communicate accurately. In all cases, if the modem receives a frame with a link-level error (framing error, bad parity, corrupted frame check sequence), the frame is ignored.

Asynchronous Frame Format

You can use the V.25 bis commands described in the previous sections from an asynchronous DTE. When using an asynchronous DTE, you must set the Parity option in the ACU OPT'S menu to the appropriate setting. Framing characters and data are all assigned parity bits. The modem uses a start bit and at least one stop bit for each character. Figure 3-1 illustrates a typical asynchronous exchange between the modem and DTE.

Terminal

CRN 555-4231	CR	LF*

Modem

VAL	CR	LF*

Legend:
CR = Carriage Return
LF = Line Feed*

*LF is optional from DTE and may precede CR.

Figure 3-1. Asynchronous Exchange

The V.25 bis ACU allows you to perform line editing if you make a mistake when entering commands. Backspace and delete characters can be used to change commands. The modem does not execute a command until it receives the carriage return (CR).

If the modem receives a framing error, such as a missing stop bit, or a parity error, it ignores the command and sends no indication to the DTE. If a command is entered incorrectly, or the modem cannot execute the command entered, the modem responds with the Invalid response described in "V.25 bis Responses" under "Addressed Mode" in this chapter.

Synchronous Bit-Oriented Frame Format

The bit-oriented frame is compatible with HDLC and SDLC synchronous protocol frame formats (see Figure 3-2). All commands and indications are preceded with at least one flag (F) in an HDLC unnumbered information frame with the address (A) set to global. The modem uses the control field poll/final (C) bit to signal the final response to a given command. The frame check sequence (FCS) indicates if there are errors in the frame.

F	A	C	Command/Indication	FCS	F

Legend:
F = Flag = 7E
A = Address = FF
C = Control = 03 or 13
FCS = Frame Check Sequence

Figure 3-2. Synchronous Bit-Oriented Frame Format

The RLN (Request Listed Numbers) command is used in Figure 3-3 to illustrate a typical exchange between the modem and DTE. The 326X Series Modem uses the poll/final bit in the control field to indicate multiple responses, which it transmits. The modem ignores the poll/final bit in commands it receives. The control field in intermediate responses contains a hexadecimal 03; the control field in the final response of a multiple response indication contains a hexadecimal 13.

Terminal

7E	FF	13	RLN	FCS	7E

Modem

7E	FF	03	LSN1;555-4231	FCS	7E

7E	FF	03	LSN2;555-3030	FCS	7E

7E	FF	03	LSN3;555-3131	FCS	7E

7E	FF	13	LSN4;555-7066	FCS	7E

Legend:
7E = Flag
FF = Address
03 = Control for Intermediate Response
13 = Control for Final Response
FCS = Frame Check Sequence

Figure 3-3. Using the RLN Command in a Bit-Oriented Frame Format

If the modem receives either a framing or FCS error, it ignores the command and sends no indication to the DTE. If a command is entered incorrectly, or the modem cannot execute the command entered, the modem responds with the Invalid response described in "V.25 bis Responses" under "Addressed Mode" in this chapter.

The data characters may be either 8-bit EBCDIC or 7-bit ASCII with a parity bit. The character set used is selected through the V25 Char (character set) option. The modem ignores all parity bits it receives; however, all message field characters in modem responses have parity bits. Parity is selected through the Parity option. The Parity and V25 Char options are in the ACU OPT'S menu of the front panel display.

Terminal

SYN	SYN	STX	RLN	ETX

Modem

SYN	SYN	STX	LSN1;555-4231	ETB

SYN	SYN	STX	LSN2;555-3030	ETB

SYN	SYN	STX	LSN3;555-4011	ETX

Legend:
SYN = Synchronization Character
STX = Start of Text
ETB = End of Block, Intermediate Response
ETX = End of Text, Last Response
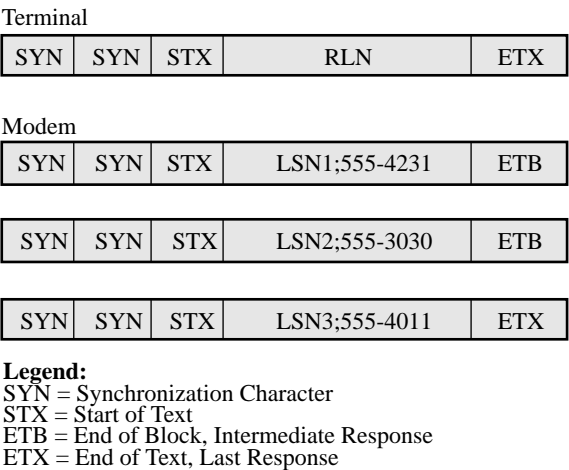
Figure 3-4. Using the RLN Command in a Character-Oriented Frame Format

Synchronous Character-Oriented Frame Format

The synchronous character-oriented frame is illustrated in Figure 3-4. All commands and indications are preceded with at least two synchronizing (SYN) characters, followed by one start of text (STX) character. All commands from the DTE must be followed by an end of text (ETX) character. The modem uses an end of block (ETB) character for intermediate responses to a command and ETX character for the final response to a command. If the modem receives a block check character (BCC), it is ignored. The modem does not use BCC characters in its responses.

If the modem receives either a framing or parity error, it ignores the command and sends no indication to the DTE. If a command is entered incorrectly, or the modem cannot execute the command entered, the modem responds with the Invalid response described in "V.25 bis Responses" under "Addressed Mode" in this chapter.

The data characters may be either 8-bit EBCDIC or 7-bit ASCII with a parity bit. You select the character set used through the V25 Char (character set) option; parity is selected through the Parity option. The Parity and V25 Char options are in the ACU OPT'S menu of the front panel display.

V.25 bis Control Signaling in Addressed Mode

The V.25 bis ACU uses V.24 Circuits 108.2 (DTR, Pin 20), 106 (CTS, Pin 5), 107 (DSR, Pin 6), 109 (DCD, Pin 8), and 125 (RI, Pin 22) to signal the various states of call establishment. The following sections describe this signaling in detail. This description assumes that the RTS, CTS, DSR, and DCD options in the TERMINAL OPT'S menu of the front panel display are set to Normal.

Idle Condition

Idle condition applies only if the DTR option in the modem is set to 108.2. When the modem is disconnected from the telephone line and the DTE has 108.2 (DTR) off, the devices are idle. If the modem detects an incoming call, it signals the DTE on Circuit 125 (RI, Pin 22). To answer an incoming call, the DTE must raise 108.2 (DTR) and enter dialog state. Figure 3-5 illustrates the status of the pertinent signals for the idle state when no incoming calls are detected.
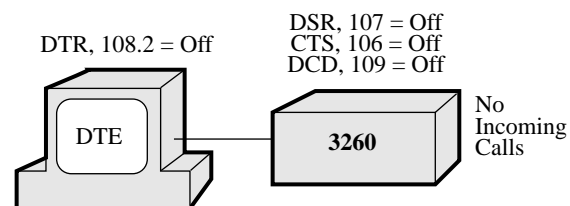
Figure 3-5. Idle State

Dialog State

If the DTR option in the modem is set to High and the phone line is disconnected, the modem is in dialog state. If the DTR option in the modem is set to 108.2, the DTR signal from the DTE must be turned on to enter dialog state. The modem responds by turning Circuit 106 (CTS) on and entering dialog state. Once in dialog state, the modem accepts V.25 bis commands from the DTE. Figure 3-6 illustrates this signaling.
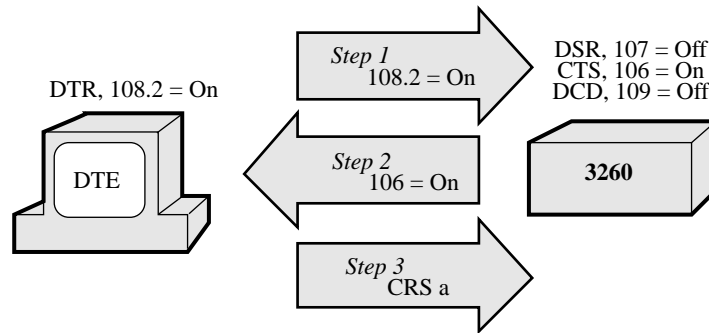
Figure 3-6. Dialog State

When the modem receives the CIC, CRSa, or CRNn commands, the modem enters connecting state and performs as instructed. If you enter the DIC command, the modem disregards an incoming call and stays in dialog state.

When the modem is in dialog state and the Answer option in the ACU OPT'S menu is set to answer automatically, the modem answers incoming calls after the number of rings specified. Once the modem answers a call, it enters connecting state.

Connecting State

Once the modem enters connecting state, it turns 106 (CTS) off and does not accept any commands unless the call fails or you disconnect the call. If the call fails, the modem raises Circuit 106 (CTS) and enters dialog state. Figure 3-7 illustrates the signaling for the connecting state.
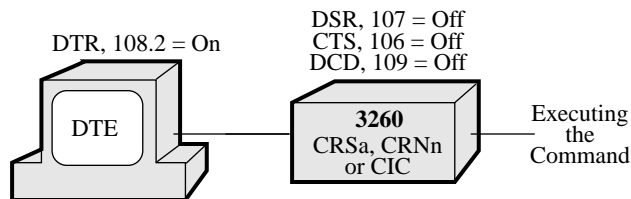
Figure 3-7. Connecting State

Data State

When a connection is successful, the modem enters data state. At this time, the modem turns on Circuits 107 (DSR) and 109 (DCD); inbound data is accepted from the remote site. When the local DTE turns Circuit 105 (RTS) on, the modem turns Circuit 106 (CTS) on, and outbound data transmission takes place as shown in Figure 3-8 below.
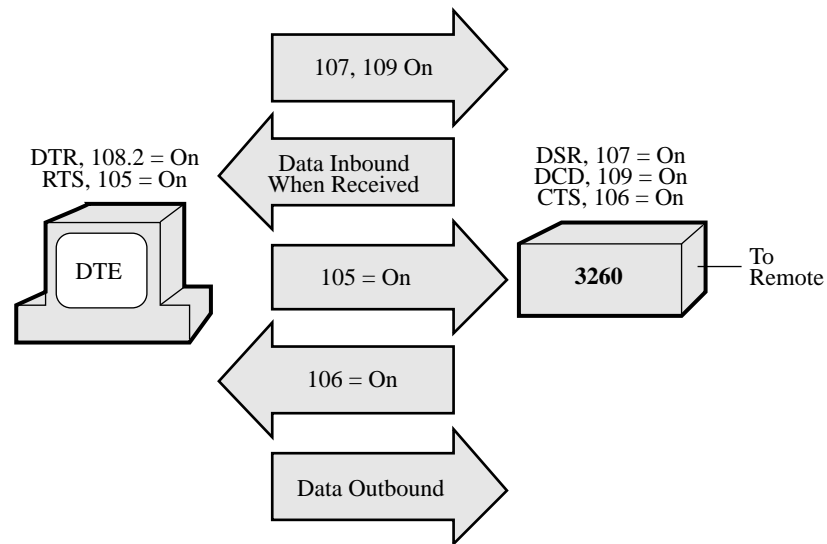
Figure 3-8. Data State

Disconnecting

If the remote modem disconnects, the local modem drops the connection and enters dialog state. If the DTR option in the local modem is set to 108.2, dropping DTR at the local DTE disconnects the call.

Direct Mode

To use the direct mode, set the DTR option of the front panel display to 108.1. Setting the DTR option in the modem to 108.1 allows DTR signal transitions from the DTE to control connection to the dial line. In direct mode, the modem does not accept V.25 bis commands, issue responses, or CONNECT messages.

Direct Answering

The modem signals an incoming call to the DTE on Circuit 125 (Pin 22). When the DTR signal from the DTE is turned from off to on, the modem connects to the line. If there is an incoming call, the modem answers the call. When the DTR signal from the DTE is switched from on to off, the modem disconnects from the line.

Direct Dialing

When the DTE turns its DTR signal from off to on and there is no incoming call, the modem connects to the line. If the Default Dial option is enabled, the modem dials the number that is stored in the selected address. If the Default Dial option is disabled, or there is no phone number stored in the selected address, the modem connects to the line and negotiates a modulation mode based on the setting of the Mod option. If the DTR signal from the DTE is switched from on to off, the modem disconnects from the line. If you set the DTR option to Tail, the modem operates the same as if you have selected 108.1. The only difference is that the modem automatically answers incoming calls, regardless of the DTR signal status.

Manual Answering and Dialing

You may choose to dial and answer calls manually. The procedures for this are described next.

Manual Answering

To configure your modem for manual answering, use the following procedure:

1) In the MODULATION OPT'S menu, set the Mode option to Answer.

2) In the TERMINAL OPT'S menu, set the DTR option to 108.2 or High.

3) In the ACU OPT'S menu, set the Answer option to Manual.

4) In the ACU OPT'S menu, set the Default Dial option to Off.

To answer a call manually, use the following procedure:

1) If the DTR option is set to 108.2, raise the DTR signal at the DTE.

2) Answer the call using the telephone connected to the same dial line as the modem.

3) Press ▨ twice to get to the Home display. Press ◎ to connect the modem to the line.

4) The modem goes off-hook and sends answer-back tone.

5) To disconnect from the line, press ◎. If the DTR option is set to 108.2, you can disconnect by turning the DTR signal from the DTE from on to off.

Manual Dialing

To configure your modem for manual dialing, use the following procedure:

1) In the MODULATION OPT'S menu, set the Mode option to Originate.

2) In the TERMINAL OPT'S menu, set the DTR option to 108.2 or High.

3) In the ACU OPT'S menu, set the Default Dial option to Off.

To dial a call manually, follow this procedure:

1) If the DTR option is set to 108.2, raise the DTR signal at the DTE.

2) Dial the call using the telephone connected to the same dial line as the modem.

3) Press ▨ twice to get to the Home display. Press ◎ to connect the modem to the line.

4) The modem goes off-hook and waits for answer-back tone.

5) To disconnect from the line, press ◎. If the DTR option is set to 108.2, you can also disconnect by turning the DTR signal from the DTE from on to off.

LPDA2 Command Set

LPDA2 (Link Problem Determination Aid) is the communications protocol between IBM host software and transmission devices for exchanging diagnostic and control information. LPDA2 commands provide a means for an attached DTE to command the modem to dial a telephone number and report back if the call is successful or not successful.

The LPDA2 ACU supports dial and leased line operation. In dial applications, the LPDA2 ACU eliminates the need for the additional ports and equipment that were previously required to support external 801 auto-dialing equipment in IBM environments. In leased line operation and while connected on the dial line, the 326X Series (if configured for this operation) monitors for LPDA2 commands in the data stream. If the local modem detects an LPDA2 command, the frame that is being processed is aborted. This prevents the remote modem from processing the command frame as valid data.

How to Configure for LPDA2 ACU

To configure for LPDA2 ACU, do the following:

1) Set the ACU Select option under the ACU OPT'S menu to LPDA2.

2) Set the Sync Idle option to Mark.

3) Set the DSR (AT&S or AT✳MR) option under the TERMINAL OPT'S menu to High.

LPDA2 ACU Control Commands

The LPDA2 ACU operates with the following two control commands:

1) A Dial command allowing an attached DTE to dial a telephone number and report back the status of the call.

2) A Disconnect command instructing the modem to drop the switched network data connection.

LPDA2 Message Format

The commands and responses between the modem and the DTE use synchronous data link control (SDLC) nonsequenced information frames. The format of these frames is as follows:
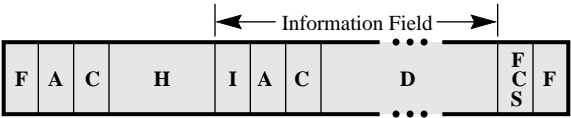
The following explains the LPDA2 responses:

Responses	Definition
Flag	0x7E. Binary number 01111110.
Address and Control	0xFD1B. Binary number 1111110100011011 (neglecting zero bit insertion). These two bytes signify that the command is an LPDA2 command. You should check the message for validity and execute accordingly.
FCS, Frame Check Sequence	16-bit cyclic redundancy check based on the polynomial $X^{16} + X^{12} + X^5 + X^1$.

Information Field Format and Command

The command information field contains the following:

Command	Definition
H	Header (8 bytes)
I	Identifier(2 bytes)
A	Modem Address (2 bytes)
C	Command Code (1 byte)
D	Data Field (Optional. The length of this field is command-dependent.)

NOTE: Fields specified as not used are not checked by the modem and may contain any data pattern.

Header (H)

The following is an example of the byte field.

0x0510420821841042

This byte field is required to identify the SDLC frame as an LPDA2 command.

Identifier (I)

The identifier is two bytes long and structured as follows:

- Byte

    bit 0: Must be coded as 1.

    bit 1: Not used by the modem.

    bit 2: Command flag. Must be coded as 0.

    bits 3-7: Not used by the modem.

- Byte 1: Not Used.

Modem Address (A)

The default for the Modem Address option is 0xFF. This allows the modem to accept as valid any address received in the information field. If the Modem Address option is set to a value other than 0xFF (valid range is 0x01 to 0xFB), the address in the information field must match the configured address. If the address does not match, the command is ignored.

If the address is valid, the modem address is saved by the modem and used in the response.

Command Code (C)

This field is one byte long and contains the command code to be executed by the modem.

Data Field (D)

The length and contents of the data field are command-dependent.

Information Field Format and Response

The information field format differs from a command response as shown below.
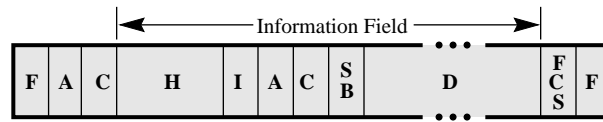
The Response Information field contains the following:

Command	Definition
H	Header (2 bytes)
I	Identifier (2 bytes)
A	Modem address (2 bytes)
C	Command code (1 byte)
SB	Sense Byte (1 byte)
D	Data field (Optional. The length of this field is command-dependent.)

Header (H) Response Field

The header field contains two subfields:

- Length field: This field is 1 byte long (hexadecimal), containing the number of bytes in the response including itself and up to but not including the FCS field.

- Key field: This field is 1 byte long and must contain 0x50.

Identifier Field (I)

The identifier field is two bytes long, with the following format:

- Byte 0:

    bit 0: Always 1

    bit 1: Always 0

    bit 2: Always 1. Shows a response.

    bit 3

        0: The command has been correctly executed.

        1: The command has not been correctly executed.

        The error code is reported in the sense byte.

    bits 4-7: Always 0

- Byte 1: Always 0

Modem Address (A)

This field contains two bytes. The same value received in the command frame is used in the response frame.

Command Code (C)

This field contains one byte. The same value received in the command frame is used in the response frame.

Sense Byte (SB)

The sense byte contains a return code that describes the results of the command operation. The following values are applicable for all commands. Other return codes are specific to individual commands and are defined under the Dial and Disconnect command descriptions in the next sections.

Sense Byte Return Codes	*Definition*
0x00	Command was executed successfully.
0x01 through 0x03	Reserved.
0x04	An unsupported command code was received.
0x05, 0x07	Reserved.
0x08	The contents of the command data field were not valid.
0x09 through 0x0F	Reserved.

Data Field (D)

The length and contents of the data field are command-dependent.

Framing Rules

A frame with a control, or FCS field error, is invalid and is ignored.

Each command and response is conveyed by a single frame. The modem does not accept a new command from the DTE until a response to the previous command has been returned to the DTE.

If a command is valid and the modem executes it, a positive response is returned to the DTE. If the command is invalid or the modem cannot execute it, a negative response containing an error code is returned to the DTE.

LPDA2 Dial Command

The command code format is as follows:

Command Code Format: 0x21

This command causes the modem to go off-hook, the modem to dial the number included in the data field of the command, and all dial modifiers to be implemented. Call progress is then dictated by the option mode selected. The command can contain up to 58 bytes but the modem can only dial 50 characters. Some of the dial modifiers which may be included in the command string would not be counted as part of the 50 dial characters.

LPDA2-specific dial modifiers may be inserted into the number dialed to implement special functions as described in Table 3-8.

In leased line operation, a dial command while on the leased line will cause the modem to initiate restoral. If a dial command is received while the modem is in restoral, an error response is returned to the DTE.

NOTE: Any invalid characters not specified below force the command to be aborted and an error code is returned to the DTE.

Table 3-8.
LPDA2 Dial Modifiers

LPDA2 Dial Modifiers	Hex Value	Definition
0 - 9	0x0 - 0x9	Dial digits packed two per byte.
S	0xE2	This modifier causes a delay of up to the number of seconds specified in S-Register 6. Dialing continues only when dial tone is received by the modem. If dial tone is not detected during the delay time, the modem terminates the command and goes on-hook.
V	0xE5	This parameter causes the modem to go on-hook for.7 seconds and then off-hook again. This is called a flash hook and is usually used to signal the phone system to return a dial tone. When the modem is back off-hook again, it waits for dial tone for up to three seconds before proceeding with the next modifier. If dial tone is detected before the three seconds are up, the modem continues executing the dial command.
W	0xE6	This modifier instructs the modem to pause for the length of time defined in S-Register 8 before continuing to dial.
u	0xA4	The 326X Series Modem attempts to connect at the rate (and associated modulation mode) specified by the Min Rate (AT✳MN) option. It affects the speed of only the call attempt associated with the command that contains the modifier. The modem returns to its original speed setting when the call attempt or the connection ends, whichever occurs last.
/	0xE0	This modifier allows the modem to operate when nonstandard call progress signals or noise signals are found during the connection process. For example, if the modem interprets a ringback tone as a busy signal, the call attempt will terminate incorrectly. This modifier instructs the modem to monitor the telephone line for only the dial tone and the ringback tone during the remainder of the call.
		This modifier overrides the setting of the Call Progress (ATX) option.
X	0xE7	The dial digits following the X up to the next T are to be dialed using pulse dialing.
T	0xE3	The dial digits following the T up to the next X are to be dialed using tone dialing.
Y	0xE8	This represents the dial digit # because this digit cannot be packed into four bits.
Z	0xE9	This represents the dial digit ✳ because this digit cannot be packed into four bits.
U	0xE4	The two bytes immediately following the U contain the call timeout value in seconds. The timeout period is specified by the digits 0 through 9 packed two digits per byte. Only the three rightmost digits of the two bytes contain the timeout value. The first digit of the first byte is ignored. If a call timeout is not specified in the command or if the value specified is 0, the modem uses the default call timeout value. The maximum value of the U modifier is the value configured in the Call Timeout (AT✳TT) option. If the Call Timeout option is set for S-Register 7, the maximum value of the U modifier is 255. For example, the string 0xE40060 sets the call timeout to 60 seconds (each character in the string is a 4-bit value). If a value is not specified or if the value is 0, use the Call Timeout option as described in Chapter 1, AT Commands.
0xC	0xC	This modifier is used to show the end of the dial string and is not required for proper operation. Any data following this modifier is ignored. Use the C at the end of the dial string to place the command message field on a byte boundary as required by the modem.

Table 3-8.
LPDA2 Dial Modifiers (Continued)

LPDA2 Dial Modifiers	Hex Value	Definition
0xD	0xD	This modifier instructs the modem to wait for a dial tone before continuing to dial digits. It is inserted between dial digits when an intermediate dial tone is expected. This modifier performs the same function as the S modifier described previously; however, this modifier may be placed in any position in the dial string while the S must be on a byte boundary.
0xF	0xF	This modifier is an alignment modifier. It may be placed anywhere in the dial string to place the command message field on a byte boundary.
0xB	0xB	This modifier is an alignment modifier. It may be placed anywhere in the dial string to place the command message field on a byte boundary.
@	0xAA	This modifier causes the modem to look for one or more ringbacks (followed by five seconds of silence) within the delay time specified by the front panel Call Timeout option. If five seconds of delay silence is detected, the modem continues to dial the remainder of the dial string. If the line is busy, the modem hangs up and sends a BUSY message to the DTE. If the modem does not detect delay silence or a busy signal, the modem hangs up and the screen displays NO ANSWER.
;	0xAB	This modifier instructs the modem to return to the command state after dialing, without breaking the connection. The modem can dial but cannot train, and no call progress messages are received. This modifier is used when calling an electronic service that permits the user to transmit numbers using tones once a connection has been established. For LPDA2 protocol, the semicolon (;) is applicable only when it is immediately followed by the h modifier.
h	0xAC	This modifier causes the modem to disconnect from the dial line. This must be the last modifier in the dial string, and must also be preceded by a semicolon. If the H or h modifier is not preceded by a semicolon, it is ignored by the modem. The H or h modifier can be entered through the front panel, AT ACU, V.25 bis ACU, LPDA2, or network manager.
A	0xEA	These modifiers are special tones used for some DTMF (Dual Tone Multifrequency) telephone systems.
B	0xEB	
C	0xEC	
D	0xED	
s	0xA2	Reserved.
t	0xA3	Reserved.
v	0xA5	Reserved.
w	0xA6	Reserved.
x	0xA7	Reserved.

Dial Command Sense Bytes

If the dial command is successful and the modems connect, a response with a sense byte of 0x00 (command successful) is displayed to the DTE. The sense byte message is displayed when the modems are ready to pass data. This response follows the DCD (AT&C) option selection which specifies if Connect messages are sent to the DTE before DCD is raised or after DCD is raised.

If the dial command is unsuccessful, a response is sent to the DTE with the sense byte specifying the reason. The sense byte can contain the following error codes in addition to the error codes:

Sense Byte Error Codes	Definition
0x0C	The modem is busy and cannot execute a valid dial command. Usually, use of this response means that something local to the modem is preventing execution of the command. This response indicates that dialing is not allowed due to the DTR conditions.
0x08	This sense byte is normally sent when the modem has received an invalid command.
0x10 - 0x12	Reserved.
0x13	This sense byte is used if the call timeout timer, specified in the Call Timeout (AT✳TT) option, expires.
0x14 - 0x18	Reserved.
0x1A	This sense byte shows a busy signal was detected. When the modem detects a busy signal, it immediately returns this response and hangs up. If the "/" (defeat busy) modifier was included in the dial command string, the modem does not detect a busy signal.
0x1B	Reserved.
0x1C	This sense byte is sent if the modem at the other end of the connection has not answered before the call timeout timer expires. When the call timeout timer expires, the modem continues to detect the ringback signal.
0x1D	This sense byte is sent if the LPDA2 dial attempt is aborted while the modem is dialing. The dial may be aborted in various ways, including pressing the T/D button or dropping the DTR signal.
0x1E	This sense byte is sent only when the dial modifier @ (0xAA) is used in a dial string. If the five seconds of silence is not detected by the modem, this sense byte is returned to the DTE.

Dial Response Data Field

When a sense byte other than 0x00 or 0x04 is sent in the response, there is no response data field. When a call attempt is successful or an invalid command code has been received, the sense byte is sent in the response and a data field is included. The format of this data field is as follows:

Bytes 0-1	Modem type	0xYYYY
Byte 2	Modem model code	0xZZ
Byte 3	Always 0	

The 326X Series Modem allows you to select the modem type to be returned in the data field. You can configure the modem type YYYY for 326x (the default setting) or 7855. The modem model code ZZ reflects the model for the appropriate modem type selected. Use the LPDA2 ID option to make the modem type selection. For modem type 7855, the model code is always 10. For modem type 326x, the model code reflects the number of ports; this is always 01.

LPDA2 Disconnect Command

The command code format is as follows:

Command Code Format: 0x22

The Disconnect command instructs the modem to drop the switched network data connection and go on-hook. There are no modifiers for this command. This command may be issued while the modem is offline or online. In either case, a valid response is returned to the DTE.

In leased line operation, a Disconnect command while in restoral will disconnect the switched network connection and send the modem back to the leased line. If a Disconnect command is received by the modem while on the leased line, the command is ignored.

Disconnect Command Sense Byte

In the response to the Disconnect command, the sense byte can contain only the following error code:

0x08: This sense byte is sent when the modem has received an invalid command.

Disconnect Response Data Field

When a sense byte other than 0x00 is sent in the response, there is no response data field. When the disconnect is successful, a sense byte of 0x00 is sent in the response and a data field is included. The format of this data field is as follows:

- Bytes 0-1

    Modem type: 0xYYYY

- Byte 2

    Modem model code: 0xZZ

- Byte 3

    0x20: Indicates if Disconnect command is received from modem while in a disconnect state.

    0x80: Indicates if Disconnect command is received from modem while not in a disconnect state.

The 326X Series Modem allows you to select the modem type to be returned in the data field. You can configure the modem type YYYY for 326x (the default setting) or 7855. The modem model code ZZ reflects the model for the appropriate modem type selected. Use the LPDA2 ID option to make the modem type selection. For modem type 7855, the model code is always 10. For modem type 326x, the model code reflects the number of ports; this is always 01.

Using an External Auto-Call Unit (Bell 801C or Codex 2207)

Some applications use external dialers, such as the Bell 801C or Codex 2207, to establish calls. Once an external dialer completes a call, it passes control of the dial line to the modem via the MI/MIC control leads on the DIAL LINE connector. This application is supported in Canada and the United States only.

To configure your modem for 801C external dialing using the front panel keys, do the following:

1) Configure the modem for the desired option set, as previously discussed.

2) Set the DTR option in the TERMINAL OPT'S category of the front panel display to 108.2 or High. **NOTE:** If DTR=108.2, the DTR signal from the DTE must be on before the modem can connect to the line. On-to-Off transitions of the DTR signal from the DTE disconnect the modem from the line.

3) Check with your system administrator on the AT Form, Char Length, Parity, DTE Rate, and Mod option settings to make certain they are correct for your application.

4) Set the Default Dial option in the ACU OPT'S category of the front panel display to Off.

5) Modify any other options as required for your application.

6) Display Save Changes=n on the front panel.

7) Press ◎ to enter your changes into nonvolatile memory. You can store your modifications into any of the four option set addresses. Doing so overwrites the settings for the selected option set. Remember to wait for the "Saved Completed" message.

8) Set the Telco option, under the TELCO OPT's category, for the appropriate jack: RJ4MB, RJ45S, or RJ16C.

Your modem is now configured for MI/MIC control by an external dialer. Make sure that the cable between the dialer and the modem DIAL LINE jack supports the MI/MIC leads on Pins 3 and 6.

To Initiate a Call...
Refer to the user's manual supplied with the external dialer.

To Terminate a Call...
A call may be terminated by any of the following conditions:

- If the DTR option is set to 108.2 and the DTE drops the DTR signal.

- If the Talk/Data softkey (◎ at the Home position) is pressed.

- If a disconnect is initiated at the remote modem, and disconnect signaling is sent to your 326X Series Modem.

Chapter 4
Testing Your Modem

Contents

Introduction

This chapter describes tests supported by your 326X Series Modem. These tests include a modem automatic self-test, loopback tests, and pattern tests that help you diagnose problems (faults) in your modem's circuitry and in your data communications system.

Quick Checks

Before starting any of the diagnostic tests described in the following sections, check to ensure that:

- The EIA/TIA 232-D cable is firmly connected to the 326X Series Modem and to your DTE; tighten the retaining screws on the connectors at both ends of the cable.
- All phone line connections at the wall jack and at the modem are secure.
- The AC power outlet for the modem is operating properly.
- The modem is configured properly for your application.

Refer to Chapter 2, Installing Your Modem, in the *326X Series Modem User's Guide* for information about making connections to your modem, DTE, and phone line. Refer also to Chapter 3, Getting Started, and Chapter 4, Configuring Your Modem, in the *326X Series Modem User's Guide*, for information about proper modem configuration.

Automatic Self-Test

Whenever you apply power to the 326X Series Modem, it automatically runs a self-test that checks for and identifies any faults in the modem's circuitry.

Starting the Automatic Self-Test

To start a modem self-test, do the following:

1) At the modem's rear panel, turn on the power switch. If the power switch is already on, turn the power off and then on again.

2) Observe the front panel LCD display to see which of the messages shown in Table 4-1 appears after this message:

> SELF-TEST

Table 4-1.
Self-Test Messages

Self-Test Message	Description
3260/3265 Initial	If this is the first time you are powering up your 326X Series Modem, this message appears in the display immediately after the message: SELF-TEST The "3260/3265 Initial" message indicates that the modem is set to operate using factory default values.
3260/3265 Ready	If this is not the first time you are powering up your 326X Series Modem, this message appears in the display immediately after the message: SELF-TEST The "3260/3265 Ready" message indicates that no faults were encountered during the self-test and that the modem is ready for operation.
Error Message	If a system fault is detected during the modem self-test, an error message appears in the display, immediately after the self-test.

Handling Error Messages

If the modem fails the automatic self-test and displays an error message, do the following:

1) Record any error message displayed to assist in troubleshooting the modem.

2) Power cycle the modem and again observe the front panel display.
   NOTE: If, after power cycling the modem, the modem displays:

> 3260/3265 Ready

it means that the earlier error message was probably caused by a temporary power line problem. Some line problems do not affect modem operation. If the modem continues to display an error message, call the Motorola Customer Support Center, or contact your nearest authorized Motorola distributor for assistance.

When the modem displays either:

> 3260/3265 Initial

or

> 3260/3265 Ready

you can begin system testing. If it becomes necessary to return your 326X Series Modem, include a copy of the recorded error message along with other relevant information before sending the modem back to Motorola.

System Testing

In addition to the automatic self-test capability, the 326X Series Modem features a built-in test generator, error detector, and loopback circuitry to help you isolate problems. System tests can be initiated in the following ways:

- From the modem front panel
- By using AT commands from an attached terminal
- From a DTE, Personal Computer (PC), or from a network management system

The following sections explain how to initiate tests using the modem's front panel and AT Auto Call Unit (ACU).

IMPORTANT: *The tests described in this section cannot be run simultaneously. Because each test interrupts data flow in your network, notify equipment users at both the local and remote sites before starting tests.*

The following types of tests can be run on your 326X Series Modem:

- Loopback
- Busy Out
- Retrain

Loopback tests allow your 326X Series Modem to send data through a part of the communications system and then loop (return) it back to the modem. If there are errors in the returning data, there may be a problem in the part of the system you are testing. You can start a remote digital loopback (RDL) or a local analog loopback (LAL) test from your terminal if it supports Circuits 140 and 141, respectively. For instructions, refer to your terminal's user manual. The procedure for performing each of the following loopback tests is described in this section:

- Local Analog Loopback
- Local Analog Loopback Pattern
- Remote Digital Loopback
- Remote Digital Loopback Pattern
- Data Mode Pattern
- Local Digital Loopback
- Busy Out
- Retrain

326X*FAST* Synchronous Data Compression Testing

When performing diagnostic tests while operating in the 326X*FAST* Synchronous Data Compression (SDC) mode, note the following:

- All tests mentioned in the "System Testing" section above are supported while in the 326X*FAST*-SDC mode.

- When initiating the following "on-line" tests:

  — remote digital loopback
  — remote digital loopback pattern
  — data mode pattern
  — local digital loopback

  during a 326X*FAST*-SDC connection, the modem falls back to Direct mode (Mode= Direct, AT✲SM) in order to run the test. If the modem is set for internal timing (Clock=Internal, AT&X) the DTE clock will be changed to match the DCE rate. If the modem is set for external timing (Clock=External, AT&X) the clock rate provided may not match the DCE rate and the test will not function. (Set Clock=Internal temporarily to complete testing, and then reset to External.)

- To accurately test the integrity of the synchronous data path while running loopback tests, set the modem for one of the asynchronous buffered modes (Mode=Normal, Reliable, Auto Reliable, or Speed Auto Reliable).

Local Analog Loopback Test (AT&T1)

The local analog loopback (LAL) test is an offline test that conforms to the CCITT V.54 specification. The test examines the local modem's transmit and receive circuitry by looping local DTE data from the modem's transmitter to its receiver (see Figure 4-1). If the local modem is connected to a remote modem during an LAL test, initiating the LAL test causes the local modem to disconnect.

During an LAL test, you can make your modem appear busy or not busy to calling modems through the LAL Busy Out option. If LAL Busy Out is set to Off, and you initiate an LAL test, other modems calling your modem receive ringback without an answer. If LAL Busy Out is set to On, and you initiate an LAL test, your modem appears to be busy to other calling modems.

NOTE: The LAL Busy Out option should not be confused with the Busy Out Setting of the TEST option (in the TEST OPT'S menu). The modem does not allow you to first enable the Busy Out option and then perform an LAL test.

Local Modem   Remote Modem
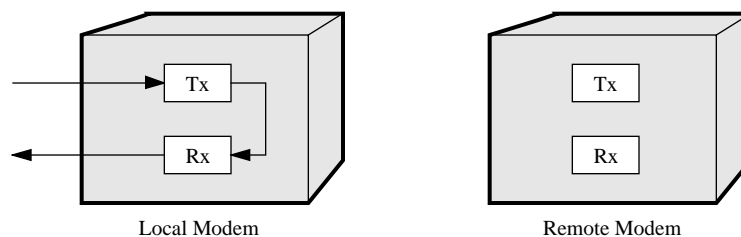
Figure 4-1. Local Analog Loopback Test

If your terminal supports Circuit 141, you can use Circuit 141 signaling to initiate this test. To do this, enable the DTE Ct 141 option (AT✳LA) in your modem's TERMINAL OPT'S menu. The DTE can then initiate an LAL test by turning Circuit 141 from off to on.

From the front panel, to start a local analog loopback test, do the following:

1) Use the front panel key to move through the TEST OPT'S menu until the modem displays:

    TEST=End Test

2) Press ▼ until the modem displays:

    TEST:LAL

3) Press ◎. The modem displays:

    TEST=LAL

   You will hear the modem training if the speaker is enabled.

4) Press ▨ twice to reach the home display. The modem briefly displays:

    LAL Training T/D?

   and then displays:

    LAL (data rate) T/D?

   For example, you may see LAL 9600 T/D?. **NOTE:** If the analog circuitry is faulty, the modem displays:

    Bad LAL T/D?

5) At the local terminal, you are now ready to send data.

   NOTE: If the data loops back to the local terminal without errors, the modem passes the test. If the data does not loop back to the local terminal, run the test again. If it fails again, make sure the DTE and modem speeds match.

6) To end the test, use the front panel keys to move through the TEST OPT'S menu until the modem displays:

    TEST:End Test

   Press ◎. The modem displays:

    Test Completed

To start this test using an AT command, enter the following command at an attached terminal:

AT&T1 <CR>

To stop this test, enter the following command:

+++

When the screen displays:

OK

enter:

AT&T0 <CR>

to end the test. The screen displays the OK message, indicating that the test has been terminated.

NOTE: This test also can be terminated automatically by entering a nonzero value in the Test Timer S-Register 18. The function of S-Register 18 is valid only when loopback tests are issued using the AT&T command. S-Register 18 cannot be used to automatically terminate loopback tests if the test is initiated from the front panel.

When the test terminates, the screen displays:

No Carrier

This test will run indefinitely if not programmed to terminate itself through this S-Register 18.

Local Analog Loopback Pattern Test (AT&T8)

Using an internal pattern generator to provide data, the local analog loopback pattern LAL Pat) test examines the transmit and receive circuitry of the local modem. As shown in Figure 4-2, a pattern is internally generated and looped from the modem's transmitter to its receiver. Data bit and block errors are recorded and displayed on the front panel at the completion of the test. LAL Pat test maybe used with or without a DTE connected to test the modem's internal circuitry. If connected the DTE data that is sent during the test will be ignored. Like the local analog loopback test, the local analog loopback pattern test causes the modem to disconnect.
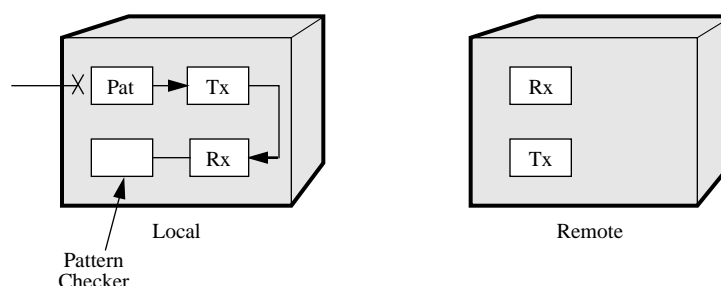
Figure 4-2. Local Analog Loopback Pattern Test

To run an LAL Pat test:

1) Use the front panel keys to move through the TEST OPT'S menu until the modem displays:

    TEST=End Test

2) Press ▼ until the modem displays:

    TEST:LAL Pat

3) Press ◎. The modem displays:

    TEST=LAL Pat

    You will hear the modem training if the speaker is enabled.

4) Press ▨ twice to reach the home display. The modem displays:

    LAL Training T/D?

    briefly, and then displays:

    LAL (data rate) T/D?

    For example, you may see LAL 9600 T/D? in the status display.

5) To end the test, use the front panel keys to move through the TEST OPT'S menu until the modem displays:

TEST:End Test

Press ◎. The modem displays:

Bit=# Blk=#

where the number of bit errors and block errors is displayed.

If the modem's transmitter and receiver were unable to synchronize the pattern, the modem displays:

No Sync Achieved

To start this test using an AT command, enter the following command at an attached terminal:

AT&T8 <CR>

To stop this test, enter the following command:

AT&T0 <CR>

The screen displays the bit errors followed by the OK message, indicating that the test has been terminated.

If the modem's transmitter and receiver were unable to synchronize the pattern, the screen displays:

No Sync Achieved

NOTE: This test also can be terminated automatically by entering a nonzero value in the Test Timer S-Register 18. The function of S-Register 18 is valid only when loopback tests are issued using the AT&T command. S-Register 18 cannot be used to automatically terminate loopback tests if the test is initiated from the front panel.

When the test terminates, the screen displays:

<# of errors>
OK

This test will run indefinitely if not programmed to terminate itself through this S-Register 18.

Remote Digital Loopback Test (AT&T6)

Using local DTE data for testing, the remote digital loopback (RDL) test examines the transmit and receive circuitry of the local and remote modems and the telephone line. Remote DTE data is ignored during the RDL test.

IMPORTANT: *If operating in 326XFAST-SDC mode, refer to the "326XFAST Synchronous Data Compression Testing" section earlier in this chapter for important testing considerations.*

NOTES:

1) For maximum reliability, run the RDL, LDL, and RDL Pat tests at a data rate of 19.2 kbps or lower.

2) This test is not valid in the Bell 103 or V.21 modulation modes. If you attempt to run this test in either of these modulation modes, the modem responds with:

   Test Denied

As shown in Figure 4-3, this test loops data from the local terminal through the system.
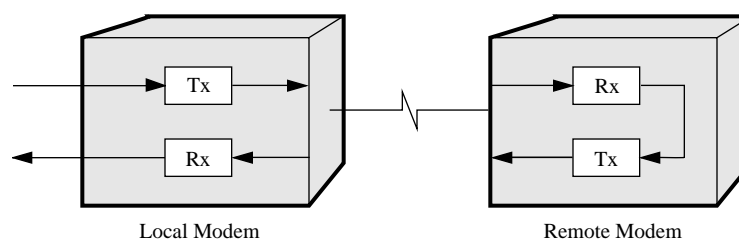
Figure 4-3. Remote Digital Loopback Test

If your terminal supports Circuit 140, you can use Circuit 140 signaling to initiate this test. To use Circuit 140 to initiate an RDL test, enable the DTE Ct 140 option in the TERMINAL OPT'S menu. Once this option is enabled, the DTE can initiate an RDL test by turning Circuit 140 from off to on.

Before starting an RDL test, make sure your modem has established a connection with the remote modem; otherwise, your modem will display:

   Test Denied

when you attempt the test.

To run an RDL test:

1) Establish a connection with the remote modem.

2) Use the front panel keys to move through the TEST OPT'S menu until the modem displays:

   TEST=End Test

3) Press ▼ until the modem displays:

   TEST:RDL

4) Press ◎. The modem displays:

   TEST=RDL

5) Press ▨ twice to reach the home display. The modem displays:

   TEST (data rate) T/D?

   For example, you may see TEST 9600 T/D? in the status display.

   NOTE: If the data loops back to the remote terminal without errors, the modem passes the test. If the data does not loop back to the remote terminal, run the test again. If it fails again, check to make certain that the DTE and modem speeds match.

6) To end the test, use the front panel keys to move through the TEST OPT'S menu until the modem displays:

   TEST:End Test

7) Press ◎. The modem displays:

   Test Completed

NOTE: If the modem begins the test operating in the MNP or LAPM Reliable mode, it attempts to restore the Reliable mode after the test.

To start this test using an AT command, enter the following command from an attached terminal:

   AT&T6 <CR>

To stop this test, enter the following command:

   +++

When the screen displays:

   OK

enter:

   AT&T0 <CR>

to end the test. The screen displays the OK message, indicating that the test has been terminated.

NOTE: This test also can be terminated automatically by entering a nonzero value in the Test Timer S-Register 18. The function of S-Register 18 is valid only when loop-back tests are issued using the AT&T command. S-Register 18 cannot be used to automatically terminate loopback tests if the test is initiated from the front panel.

When the test terminates, the screen displays:

   No Carrier

This test will run indefinitely if not programmed to terminate itself through this S-Register 18.

Remote Digital Loopback Pattern Test (AT&T7)

Using an internally generated test pattern to provide data, the remote digital loopback pattern (RDL Pat) test examines the transmit and receive circuitry of the local and remote modem and the telephone line.

IMPORTANT: *If operating in 326XFAST-SDC mode, refer to the "326XFAST Synchronous Data Compression Testing" section earlier in this chapter for important testing considerations.*

NOTES:

1) For maximum reliability, run the RDL, LDL, and RDL Pat tests at a data rate of 19.2 kbps or lower.

2) This test is not valid in the Bell 103 or V.21 modulation modes. If you attempt to run this test in either of these modulation modes, the modem responds with:

    Test Denied

The pattern is transmitted by the local modem to the remote modem and then looped back to the local modem, as shown in Figure 4-4. Data bit and block errors are recorded during the test and are displayed on the front panel when the test is completed.
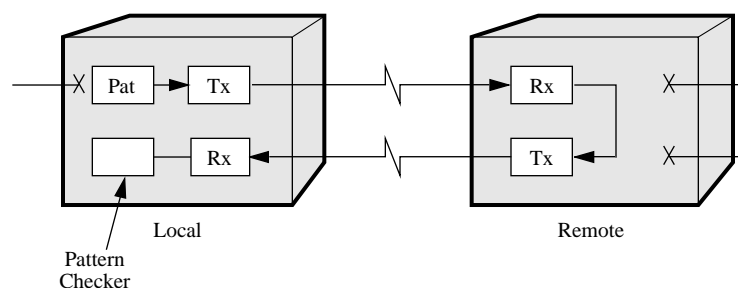
Figure 4-4. Remote Digital Loopback Pattern Test

Before starting an RDL Pattern test, make sure your modem has established a connection with the remote modem; otherwise, your modem will display:

    Test Denied

when you start the test.

To run an RDL Pattern test:

1) Establish a connection with the remote modem.

2) Use the front panel keys to move through the TEST OPT'S menu until the modem displays:

    TEST=End Test

3) Press ▼ until the modem displays:

    TEST:RDL Pat

4) Press ◎. The modem displays:

    TEST=RDL Pat

5) Press ⬛ twice to reach the home display. The modem displays:

    TEST (data rate) T/D?

For example, you may see TEST 9600 T/D? in the status display.

6) To end the test, use the front panel keys to move through the **TEST OPT'S** menu until the modem displays:

    TEST:End Test

7) Press ◎. The modem displays:

    Bit=# Blk=#

where the number of bit errors and block errors is displayed.

If the modem's transmitter and receiver were unable to synchronize the pattern, the modem displays:

    No Sync Achieved

NOTE: If your modem begins the test operating in the MNP or LAPM Reliable mode, it attempts to restore the Reliable mode after the test.

To start this test using an AT command, enter the following command at an attached terminal:

      AT&T7 <CR>

To stop this test, enter the following command:

      AT&T0 <CR>

The screen displays the bit errors followed by the OK message, indicating that the test has been terminated.

If the modem's transmitter and receiver were unable to synchronize the pattern, the screen displays:

    No Sync Achieved

NOTE: This test also can be terminated automatically by entering a nonzero value in the Test Timer S-Register 18. The function of S-Register 18 is valid only when loop-back tests are issued using the AT&T command. S-Register 18 cannot be used to automatically terminate loopback tests if the test is initiated from the front panel.

When the test terminates, the screen displays:

    No Carrier

This test will run indefinitely if not programmed to terminate itself through this S-Register 18.

Data Mode Pattern Test

Using internally generated test patterns to provide data, the Data Mode Pattern test separately examines the inbound and outbound halves of the transmission path. Data bit and block errors are recorded during the test and are displayed on the front panel when the test is completed. Test may begin with or without a DTE. DTE data is ignored during a Data Mode Pattern test.

IMPORTANT: *If operating in 326XFAST-SDC mode, refer to the "326XFAST Synchronous Data Compression Testing" section earlier in this chapter for important testing considerations.*

NOTE: This test is not valid in the Bell 103 or V.21 modulation modes. If you attempt to run this test in either of these modulation modes, the modem responds with:

Test Denied

As shown in Figure 4-5, each modem transmits a pattern to the other modem. The Data Mode Pattern test can be started at the local and remote modems simultaneously.
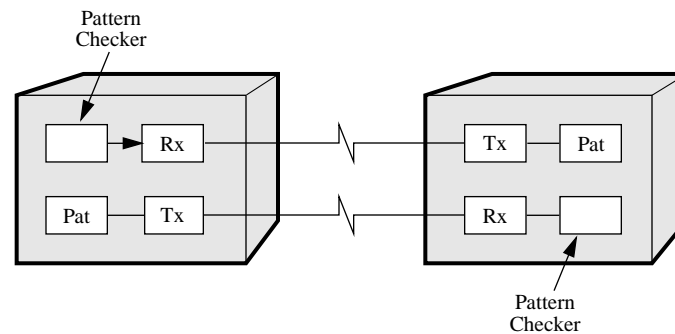
Figure 4-5. Data Mode Pattern Test

Before starting a Data Mode Pattern test, make sure your modem has established a connection with the remote modem; otherwise, your modem will display:

> Test Denied

when you start the test.

To run a Data Mode Pattern test:

1) Use the front panel keys to move through the TEST OPT'S menu until the modem displays:

   > TEST=End Test

2) Press ▼ until the modem displays:

   > TEST:Pattern

3) Press ◎. The modem displays:

   > TEST=Pattern

4) Press ⬗ twice to reach the home display. The modem displays:

   > TEST (data rate) T/D?

   For example, the modem may display TEST 9600 T/D?.

5) To end the test, use the front panel keys to move through the TEST OPT'S menu until the modem displays:

   > TEST:End Test

6) Press ◎. The modem displays:

   > Bit=# Blk=#

   where the number of bit errors and block errors is displayed.

   If the test was initiated on only one of the modems, or the modem's transmitter and receiver were unable to synchronize the pattern, the modem displays:

   > No Sync Achieved

NOTE: If the modem begins the test operating in the MNP or LAPM Reliable mode, the modem attempts to restore the Reliable mode after the test.

Local Digital Loopback (AT&T3)

Using remote DTE data for the test, the local digital loopback test checks the telephone lines and the circuitry of the remote modem. This test loops the data received from the remote modem back to the remote modem. Local DTE data is ignored during the local digital loopback test.

IMPORTANT: *If operating in 326XFAST-SDC mode, refer to the "326XFAST Synchronous Data Compression Testing" section earlier in this chapter for important testing considerations.*

NOTES:

1) For maximum reliability, run the RDL, LDL, and RDL Pat tests at a data rate of 19.2 kbps or lower.

2) This test is not valid in the Bell 103 or V.21 modulation modes. If you attempt to run this test in either of these modulation modes, the modem responds with:

   Test Denied

Occasionally, a 326X Series Modem is used with a remote modem that does not have the digital loopback feature. In this case, to run a local digital loopback test from the remote modem, you must put the local modem into a local digital loopback test (see Figure 4-6). During this test, the local modem loops incoming data back to the remote modem, as if the remote modem had initiated a remote digital loopback test (see Figure 4-3). **NOTE:** This test applies only when the Line option is set to Dial.
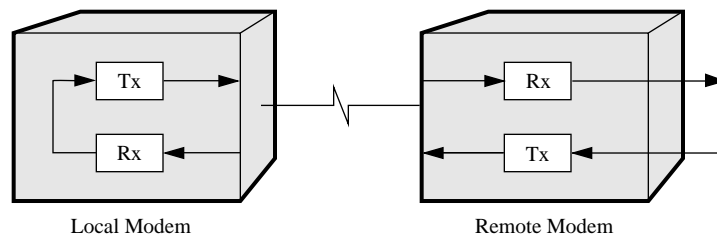
Figure 4-6. Local Digital Loopback Test

Before starting an LDL test, make sure your modem is connected to another modem; otherwise the modem displays:

>   Test Denied

when you start the test.

To run an LDL test:

1) Establish a connection with the remote modem.

2) Use the front panel keys to move through the TEST OPT'S menu until the modem displays:

    >   TEST=End Test

3) Press ▼ until the modem displays:

    >   TEST:LDL

4) Press ◎. The modem displays:

    >   TEST=LDL

5) Press ▨ twice to reach the home display. The modem displays:

    >   TEST (data rate) T/D?

6) To end the test, use the front panel keys to move through the **TEST OPT'S** menu until the modem displays:

    >   TEST:End Test

7) Press ◎. The modem displays:

    >   Test Completed

NOTE: The modem performs this test in the normal mode. If the modem begins the test operating in either the MNP Reliable or LAPM Reliable mode, the modem attempts to restore the Reliable mode after the test.

To start this test using an AT command, enter the following command at an attached terminal:

>   **AT&T3 <CR>**

To stop this test, enter the following command:

>   **AT&T0 <CR>**

The screen displays the OK message, indicating that the test has been terminated.

NOTE: This test also can be terminated automatically by entering a nonzero value in the Test Timer S-Register 18. The function of S-Register 18 is valid only when loopback tests are issued using the AT&T command. S-Register 18 cannot be used to automatically terminate loopback tests if the test is initiated from the front panel.

When the test terminates, the screen displays:

>   OK

This test runs indefinitely if not programmed to terminate itself through this S-Register 18.

Busy Out (ATH1)

The TEST option Busy Out setting allows your modem to appear busy to incoming calls. This option is useful when performing maintenance and repairs on the modem. **NOTE:** This setting should used only for the Telco=RJ4MB setting (under the TELCO OPT'S menu) for use with a make busy data jack. Do not use the Busy Out setting without having the RJ4MB service installed.

IMPORTANT: Before enabling the Busy Out feature set the following:

- AT✳LT (DTE Pin 25) option to Busy (AT✳LT0)
- AT&J (TELCO OPT'S Telco option) command to RJ4MB, *and*
- The 6-position DIP switch 2 on the modem's rear panel to the Off (up) position.

To busy out your modem, do the following:

1) Use the front panel keys to move through the TEST OPT'S menu until the modem displays:

    TEST=End Test

2) Press ▼ until the modem displays:

    TEST:Busy Out

3) Press ◎. The modem displays:

    TEST=Busy Out

4) Press ▨ twice to get to the home display.

    Busyout T/D?

    is shown in the status display. The modem now appears busy to all incoming calls.

5) Terminate the Busy Out condition by using the front panel keys to move through the TEST OPT'S menu until the modem displays:

    TEST:End Test

6) Press ◎. The modem displays:

    Test Completed

To busy out your modem using an AT command, enter the following command from an attached terminal:

ATH1 <CR>

To terminate the Busy Out condition enter:

ATH<CR>

After you end the Busy Out condition, the screen displays:

    OK

Retrain (AT01)

When two modems establish a connection, they train with each other. Training allows the modems at both ends of a connection to adjust their receivers for current telephone line conditions and agree on what data rate to use.

Occasionally, modems need to retrain when signal quality degrades. You may need to manually retrain the modems for the following reasons:

- The automatic retrain function is disabled and you want to improve signal quality by retraining.
- Signal quality is poor, and you do not want to wait for the modem to retrain automatically.

To initiate a retrain, do the following:

1) Use the front panel keys to move through the TEST OPT'S menu until the modem displays:

    TEST=End Test

2) Press ▼ until the modem displays:

    TEST:Retrain

3) Press ◉ to initiate a retrain. The test terminates automatically.

To initiate a retrain using an AT command, enter the following command at an attached terminal:

+++

When the screen displays:

    OK

enter:

AT01<CR>

A connect message appears on the screen. For example, you may see:

    Connect 9600 Reliable

indicating that the two modems have returned online and initiated a return.

326X*FAST* DTE Cable Diagnostics

This section contains a procedure to help you determine if there is a problem with the DTE cables you selected to operate with the 326X*FAST* Modem. Appendix B, Cabling and Interface Pinouts, in the *326X Series Modem User's Guide*, specifies how to select the appropriate cables to use in data rates higher than 38.4 kbps. After selecting and installing the correct cables, perform the following steps *before* proceeding with installation.

If you continue to experience problems with data transmission after choosing a cable and running the diagnostics within this section, the problem may be with your DTE or modem.

NOTE: If your 326X Series Modem is installed at a host site, refer to the second section below for diagnostic information.

1) Either enable the AT ACU (if not already enabled) with async echo set to on (reinitializing the modem will also enable the AT ACU with async echo set to on). Ensure that speed and parity of the modem and the DTE are identical.

2) Send data to the modem from the DTE. **NOTE:** Do not substitute test equipment for the DTE, as the DTE's receivers/drivers are an integral element in this test.

3) If echoed data from the modem, as received by the DTE, matches the transmitted message, send the status screen (AT✳ST<CR>) command.

4) If there are no errors in either of the previous tests, the cable you selected is appropriate for your application.

5) If the transmitted and received messages are different (i.e., character or framing errors), verify the cable length to the limit specified in Appendix B of the *326X Series Modem User's Guide*). Reduce the cable length or capacitance of the cable to the theoretical limit and retry the steps listed in this section. (If the same cable length is required, it is recommended that a low capacitance type cable be used.)

If the 326X Series Modem is installed at a host site, perform the following steps:

1) Set the Mode option AT✳SM (EC/DC OPT'S category) to Reliable. Reliable mode ensures data is transmitted during this test. **NOTE:** Do not initiate loop tests while performing the diagnostic procedures in this section.

2) Follow Steps 1 to 3 in the section above to verify the cable at a remote site.

3) Once the cable at the remote site has been verified, initiate a dial connection with the host site.

4) If there are no errors in data transmission, the cable at the host site is most likely appropriate for the application.

5) If the transmitted and received messages are different, the cable at the host site is most likely incorrect for the application. Verify the cable length to the limit specified in Appendix B of the *326X Series Modem User's Guide*). Reduce the cable length or capacitance of the cable to the theoretical limit and retry Steps 1 to 3. (If the same cable length is required, it is recommended that a low capacitance type cable be used.)

   NOTE: These tests should be done prior to a Local Analog Loopback (LAL) or Remote Digital Loopback (RDL) test when troubleshooting.

Chapter 5
Specifications

Contents

Introduction

This chapter contains the physical and operating specifications for standalone 326X Series Modems (Models 3260, 3261, 3265, and 3266). Specifications for 326X Series Modems Nest Cards (Models 3262, 3263, 3267, and 3268) are provided in Appendix D, 326X Series Modem Cards, in the *326X Series Modem User's Guide*.

NOTE: Throughout this guide, all references to the 326X Series Modem apply to the 326X V.32 bis, 326X*FAST*, and 326XFAST-SDC Modems, unless specifically stated otherwise.

Physical Characteristics

Height: 2.55 in. (6.98 cm)

Width: 6.75 in. (17.14 cm)

Depth: 9.6 in. (24.38 cm)

Weight: 2.75 lb (1.24 kg)

Operating Mode Characteristics

Telephone Line Type

- 2-Wire Dial
- 2-Wire Leased
- 4-Wire Leased (3261/3263/3266/3268 models only)

FAST Modulation Mode

FAST is a Motorola proprietary modulation mode. Modulation mode specifications are not available for publication.

V.32 bis Modulation Mode

Data Rate: 14.4, 12.0, 9.6, 7.2, 4.8 kbps

Baud Rate: 2400 baud

Carrier: 1800 Hz

Modulation: Quadrature Amplitude Modulation with trellis coding at 14.4 kbps, 12.0 kbps, 9600 bps, and 7200 bps; Quadrature Amplitude Modulation without trellis coding at 9600 bps; Phase Shift Key modulation at 4800 bps. CCITT V.32 bis compliant, full-duplex

V.32 Modulation Mode

Data Rate: 9.6, 4.8 kbps

Baud Rate: 2400 baud

Carrier: 1800 Hz

Modulation: Quadrature Amplitude Modulation with trellis coding at 9600 bps; Quadrature Amplitude Modulation without trellis coding at 9600 bps; Phase Shift Key modulation at 4800 bps; CCITT V.32 compliant, full-duplex

NOTE: In V.32 Uncoded Mode, the modem functions as described above for V.32 modulation Mode. The only exception is that the modem does not use trellis coding.

V.22 bis Modulation Mode

Data Rate: 2.4, 1.2 kbps

Baud Rate: 600 baud

Carrier Frequency:
   Answer Modem: 2400 Hz

   Originate Modem: 1200 Hz

Modulation: Quadrature Amplitude Modulation at 2400 bps; Phase Shift Key modulation at 1200 bps; CCITT V.22 bis compatible, full-duplex

V.22 Modulation Mode

Data Rate: 1200 bps

Baud Rate: 600 baud

Carrier Frequency:
   Answer Modem: 2400 Hz

   Originate Modem: 1200 Hz

Modulation: Phase Shift Key modulation at 1200 bps; CCITT V.22 compliant, full-duplex

Bell 212 Modulation Mode

Data Rate: 1200 bps

Baud Rate: 600 baud

Carrier Frequency:
   Answer Modem: 2400 Hz

   Originate Modem: 1200 Hz

Modulation: Phase Shift Key modulation at 1200 bps; Bell 212-compatible, full-duplex

V.21 Modulation Mode

Data Rate: 300 bps

Baud Rate: 300 baud

Carrier Frequency:
    Answer Modem: 1750 Hz

    Originate Modem: 1080 Hz

Modulation: Frequency Shift Keying; CCITT V.21 compliant; full-duplex

Bell 103 Modulation Mode

Data Rate: 300 bps

Baud Rate: 300 baud

Carrier Frequency:
    Answer Modem: 2125 Hz

    Originate Modem: 1170 Hz

Modulation: Frequency Shift Keying; Bell 103 compatible, full-duplex

Environmental Limits

Operating Temperature Range: +32° to +122° F (+0° to +50° C)

Storage Temperature: –40° to +158° F (–40° to +70° C)

Humidity: 5% to 95% (noncondensing)

Radiated/Conducted Emissions: FCC Part 15A compliant, CISPR 22A compliant

Shock and Vibrations: In approved shipping container, conforms to the requirements of the National Safe Transit Association Percipient Test Specification

Primary Power Requirements

- 100 to 240 VAC nominal, (90 to 264 VAC), automatic adapting
- 47 to 63 Hz, automatic adapting
- Single-phase AC, 13.4W input power
- Apparent power 0.014 kvA

Transmitter

Output Level

- FCC Programmable: 0 dBm maximum, –12 dBm minimum (± 1 dB)

- FCC Permissible: –9 dBm maximum (+0, –1 dB)

- 2-Wire Leased Line: 0 dBm maximum, –15 dBm minimum (± 1 dB)

- 4-Wire Leased Line: 0 dBm maximum, –15 dBm minimum (± 1 dB)

Dial mode is country-specific. It is set using the Telco option in the TELCO OPT'S menu. (Values shown above are for the U.S. only. Consult Appendix D, Country-Specific Information, in the *326X Series Modem User's Guide* for the settings that are valid in your country.)

Leased-line mode is country-specific. It is set using the LL TX option in the TELCO OPT'S menu. There is a 0 dBm maximum. (Values shown above are for the U.S. only. Refer to Appendix C, Country-Specific Information, in the *326X Series Modem User's Guide* for the settings that are valid in your country.)

Transmitter Timing

Internal, external, or loopback (326X V.32 bis/326X*FAST*)

Internal or external (326X*FAST*-SDC)

Appendix A
ASCII/EBCDIC Hexadecimal Equivalents

Table A-1 lists the 7-bit ASCII and 8-bit EBCDIC hexadecimal equivalents of the characters and symbols in the V.25 bis specification.

Table A-1.
ASCII to EBCDIC Translation

ASCII Decimal	Symbol	ASCII Hex	EBCDIC Hex
0	NUL	00	00
1	SOH	01	01
2	STX	02	02
3	ETX	03	03
4	EOT	04	37
5	ENQ	05	2D
6	ACK	06	2E
7	BEL	07	2F
8	BS	08	16
9	HT	09	05
10	LF	0A	25
11	VT	0B	0B
12	FF	0C	0C
13	CR	0D	15
14	SO	0E	0E
15	SI	0F	0F
16	DLE	10	10
17	XON	11	
18	DC2	12	12
19	XOFF	13	
20	DC4	14	3C
21	NAK	15	3D
22	SYN	16	32
23	ETB	17	26
24	CAN	18	18
25	EM	19	19
26	SUB	1A	3F
27	ESC	1B	27
28	FS	1C	1C
29	GS	1D	1D
30	RS	1E	1E
31	US	1F	1F

Table A-1.
ASCII to EBCDIC Translation (Continued)

ASCII Decimal	Symbol	ASCII Hex	EBCDIC Hex
32	SP	20	40
33	!	21	5A
34	``	22	7F
35	#	23	7B
36	$	24	5B
37	%	25	6C
38	&	26	50
39	' (apostrophe)	27	7D
40	(	28	4D
41	)	29	5D
42	*	2A	5C
43	+	2B	4E
44	, (comma)	2C	6B
45	- (minus)	2D	60
46	. (period)	2E	4B
47	/	2F	61
48	0	30	F0
49	1	31	F1
50	2	32	F2
51	3	33	F3
52	4	34	F4
53	5	35	F5
54	6	36	F6
55	7	37	F7
56	8	38	F8
57	9	39	F9
58	:	3A	7A
59	;	3B	5E
60	<	3C	4C
61	=	3D	7E
62	>	3E	6E
63	?	3F	6F
64	@	40	7C
65	A	41	C1
66	B	42	C2
67	C	43	C3
68	D	44	C4
69	E	45	C5
70	F	46	C6

Table A-1.
ASCII to EBCDIC Translation (Continued)

ASCII Decimal	Symbol	ASCII Hex	EBCDIC Hex
71	G	47	C7
72	H	48	C8
73	I	49	C9
74	J	4A	D1
75	K	4B	D2
76	L	4C	D3
77	M	4D	D4
78	N	4E	D5
79	O	4F	D6
80	P	50	D7
81	Q	51	D8
82	R	52	D9
83	S	53	E2
84	T	54	E3
85	U	55	E4
86	V	56	E5
87	W	57	E6
88	X	58	E7
89	Y	59	E8
90	Z	5A	E9
91	[	5B	AD
92	\	5C	E0
93	]	5D	
94	¬	5E	5F
95	_ (underscore)	5F	6D
96	` (accent)	60	79
97	a	61	81
98	b	62	82
99	c	63	83
100	d	64	84
101	e	65	85
102	f	66	86
103	g	67	87
104	h	68	88
105	i	69	89
106	j	6A	91
107	k	6B	92
108	l	6C	93
109	m	6D	94

Table A-1.
ASCII to EBCDIC Translation (Continued)

ASCII Decimal	Symbol	ASCII Hex	EBCDIC Hex
110	n	6E	95
111	o	6F	96
112	p	70	97
113	q	71	98
114	r	72	99
115	s	73	A2
116	t	74	A3
117	u	75	A4
118	v	76	A5
119	w	77	A6
120	x	78	A7
121	y	79	A8
122	z	7A	A9
123	{	7B	C0
124			7C	4F
125	}	7D	D0
126	~	7E	A1
127	DEL	7F	FF

Introduction

Use this configuration worksheet to record the front panel option settings and displays of your 326X Series Modem. This worksheet is organized to follow the structure of your modem front panel tree. This worksheet does not list front panel options that do not have configurable settings, such as Reinit Memory? or Enter Then Dial. For defaults, see the *326X Series Modem Reference Card*.

Make copies of this worksheet as necessary to record option settings and displays of other 326X Series Modems in your network.

326X Series Modem Options and Displays Worksheet

Location _____

Date _____

Select Options	=	_____
Save Changes	=	_____
Power Up In	=	_____
Dial From #	=	_____
View Phone #	=	_____
Enter Phone #	1=	_____
	2=	_____
	3=	_____
	4=	_____
	5=	_____
	6=	_____
	7=	_____
	8=	_____
	9=	_____
Link Phone #	1=	_____
	2=	_____
	3=	_____
	4=	_____
	5=	_____
	6=	_____
	7=	_____
	8=	_____
	9=	_____

Auto Redial	=	_____
S-Register 0	=	_____
S-Register 1	=	_____
S-Register 2	=	_____
S-Register 3	=	_____
S-Register 4	=	_____
S-Register 5	=	_____
S-Register 6	=	_____
S-Register 7	=	_____
S-Register 8	=	_____
S-Register 10	=	_____
S-Register 11	=	_____
S-Register 12	=	_____
S-Register 18	=	_____
S-Register 25	=	_____
S-Register 26	=	_____
S-Register 30	=	_____
S-Register 38	=	_____
S-Register 45	=	_____
S-Register 46	=	_____
TEST OPT'S		
Accept RDL	=	_____
LAL Busy Out	=	_____
MODULATION OPT'S		
Line	=	_____
Modulation	=	_____
Auto Type	=	_____
Low Speed	=	_____
Max Rate	=	_____
Min Rate	=	_____
Fast Call	=	_____
Adaptive Rate	=	_____
Mode	=	_____
Clock	=	_____
Retrain	=	_____
Longspace	=	_____
PSTN	=	_____
Guard Tone	=	_____

RESTORAL OPT'S	
Restore	= _____
L to D	= _____
D to L	= _____
Hold Dialine	= _____
Ans Rest	= _____

EC/DC OPT'S	
Mode	= _____
Buffers	= _____
EC	= _____
DC	= _____
Data Form	= _____
Break	= _____
Modem Flow	= _____
Delay	= _____
EC ID	= _____

ACU OPT'S	
ACU Select	= _____
AT Form	= _____
V.25 Form	= _____
NoACU Form	= _____
Default Dial	= _____
Answer	= _____
Async Echo	= _____
Char Length	= _____
V25 Char	= _____
Sync Idle	= _____
V25 Resp	= _____
Parity	= _____
AT Msg	= _____
RsltCode	= _____
RsltForm	= _____
Con Msg	= _____
Rel Msg	= _____
LPDA2 Addr	= _____
LPDA2 ID	= _____
LPDA2 Det	= _____
Call Progress	= _____

TERMINAL OPT'S	
DTE Rate	= _____
Flow	= _____
TpDlyMin	= _____
Speed Conver	= _____
DTR	= _____
RTS	= _____
CTS	= _____
Rts/Cts Delay	= _____
DCD	= _____
RemRTS/DCD	= _____
DCD Loss Dis	= _____
DSR	= _____
Overspeed	= _____
DTR Delay	= _____
DTE Ct 140	= _____
DTE Ct 141	= _____
DTE Pin 25	= _____
Ext Select	= _____
Ext Cntrl	= _____
Inactivity	= _____
TELCO OPT'S	
Telco	= _____
DL TX Level	= _____
LL TX Level	= _____
Line Compen	= _____
Speaker	= _____
Volume	= _____
Netwrk Comp	
DIALING OPT'S	
Pause Delay	= _____
Dial Wait	= _____
Dial Type	= _____
Call Timeout	= _____
Blind Dial	= _____
Pulse Cycle	= _____
Tone Length	= _____
FP SECURITY	
Password Enable/Disable	= _____

ACCESS SECURITY	
PW Verify	= _____
Callback	= _____
Rem Num Rqrd	= _____
Group PW	= _____
Tone	= _____
Sim Ring	= _____
Dial Rstrct	= _____
NETWK CNTL OPT'S	
Override Mode	= _____
NC Address	= _____
NC Port Rate	= _____
Pass Thru	= _____
RMT CONFIG OPT'S	
RmtAcc Enable/Disable	= _____