



**Integrated Services
Digital Network (ISDN)**

**8500 Series Display Terminal
Asynchronous Data Module
User's Manual**

AT&T 555-021-730
COMCODE 107636177
Issue 2

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IMPORTANT SAFETY INSTRUCTIONS

When using your telephone equipment, the following safety precautions should always be followed to reduce the risk of fire, electric shock, and injury to persons.

- Read and understand all instructions.
- Follow all warnings and instructions marked on the telephone.
- This telephone can be hazardous if immersed in water. To avoid the possibility of electrical shock, do not use the telephone while you are in the bathtub or shower, or when you are wet. If you accidentally drop the telephone into water, do not retrieve it until you have first unplugged the line cord from the modular wall jack. Do not reconnect the telephone until it has dried thoroughly.
- Avoid using the telephone during electrical storms in your immediate area. There is a remote risk of electric shock from lightning. Urgent calls should be brief. Even though protective measures may have been installed to limit electrical surges from entering your home or business, absolute protection from lightning is impossible.
- If you suspect a natural gas leak, report it immediately, but use a telephone away from the area in question. The telephone's electrical contacts could generate a tiny spark. While unlikely, it is possible that this spark could ignite heavy concentrations of gas.
- Never push objects of any kind into the telephone through housing slots since they may touch hazardous voltage points or short out parts that could result in a risk of electric shock. Never spill liquid of any kind on the telephone. If liquid is spilled, however, dry immediately, and refer any service problems to service personnel.
- Slots and openings in the housing and the back or bottom of the telephone are provided for ventilation to protect it from overheating; these openings must not be blocked or covered. The openings should never be blocked by placing the telephone on a sofa, rug or other similar surface. This product should not be placed in a built-in installation unless proper ventilation is provided.
- The telephone should be operated only from the type of power source indicated on the marking label. If you are not sure of the type of power supply being used, contact a qualified service person.
- Do not allow anything to rest on the power cord. Do not locate this product where the cord will be abused by persons walking on it.

-
- Do not overload the AC wall outlets and extension cords as this can result in risk of fire or electric shock.
 - Before cleaning, disconnect all cords from the telephone. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.
 - Disconnect the cords on the telephone and refer servicing to qualified service personnel when these conditions exist:
 - when the power supply cord or plug is damaged or frayed.
 - if liquid has been spilled into the telephone.
 - if the telephone has been exposed to rain or water.
 - if the telephone does not operate normally by following the operating instructions. (Do not attempt to adjust any controls other than those described in the User's Manual. Doing so may result in damage and require extensive work to restore the product to normal operation.)
 - if the telephone has been dropped or the housing has been damaged.
 - if the product exhibits a distinct change in the performance.

SAVE THESE INSTRUCTIONS

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Introduction

1

Overview

Congratulations on the addition of an Asynchronous Data Module (ADM) to your AT&T Integrated Services Digital Network (ISDN) 8500 series display terminal. Following our tradition of excellent quality and high reliability, the ADM is designed to provide you with the latest in telecommunications technology.

This manual is intended for use with AT&T's ISDN 8500 series display terminals equipped with an asynchronous EIA-232 (Electronic Industries Association) data interface. Currently, the 8510, 8520, and 8528 terminals are the only members of the ISDN 8500 series display terminals with this feature. Should AT&T introduce other 8500 series display terminals with an asynchronous EIA-232 interface in the future, this document will be updated accordingly. The asynchronous data functionality of the 8500 series display terminals is provided by an Asynchronous Data Module (ADM). The ADM is a printed circuit board within the 8500 series display terminal.

There are two versions of the 8510 and 8528 display terminals with ADM. One version of these two terminals provides the standard 25-pin asynchronous EIA-232 interface. The other version of both of these terminals provides the standard 25-pin asynchronous EIA-232 interface, along with an additional interface called the Telephone Multimedia Interface (TMI). The 8510 and 8528 display terminals currently support TMI; the 8520 display terminal, on the other hand, does NOT support TMI. The TMI is a round 8-pin connector used with special purpose equipment. If present, it is located to the left side of the EIA-232 connector (Figure 1-1).

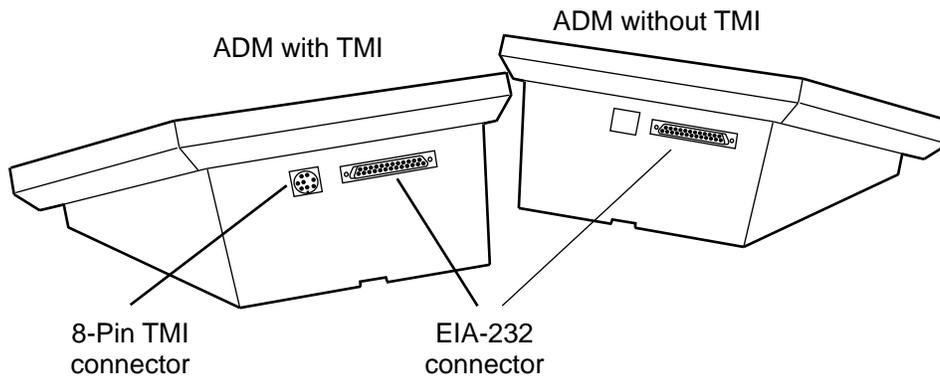


Figure 1-1. Rear Views of an 8510 and 8528 with an ADM/TMI and with an ADM

The TMI is typically used for connecting video equipment for video telephone applications. Although equipment can be connected to both the EIA-232 interface connector and to the TMI connector, simultaneous operation of both interfaces is precluded. Actively operating TMI equipment has priority over EIA-232 equipment. That is, when the TMI equipment is active, none of the data operations described in this manual will work.

AT&T's ISDN 8500 series display terminal, with the ADM, provides you with simultaneous voice and data communications capabilities in one unit.

As a telephone, the 8510 ISDN display terminal offers 10 call appearances, Conference, Drop, Hold, Mute, Redial, and Transfer buttons, a speakerphone, a message indicator, a Volume control button, and an adjunct jack. Four softkeys and four display control buttons located below a 2-line by 24-character liquid crystal display, along with **Exit** located further down on the display terminal, can be used to access features such as Personal Directory, Call Log, Data, and other options. For information on the ISDN 8510 voice terminal features, refer to the *ISDN 8510 Voice Terminal User's Manual*, 555-021-736.

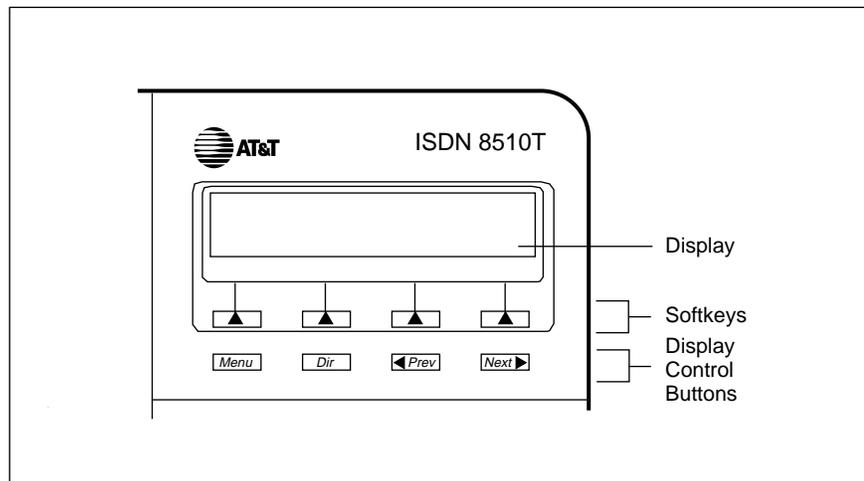


Figure 1-2. 8510 Display Terminal, Softkeys, and Display Control Buttons

The 8520 ISDN display terminal offers 20 call appearances, Conference, Drop, Hold, Mute, Redial, and Transfer buttons, a speakerphone, a message indicator, a Volume control button, and an adjunct jack. Ten softkeys and four display control buttons located to the left and right of a 7-line by 24-character liquid crystal display, along with `Exit` located further down on the display terminal, can be used to access features such as Personal Directory, Call Log, Data, and other options. For information on the ISDN 8520 voice terminal features, refer to the *ISDN 8520 Voice Terminal User's Manual*, 555-021-758.

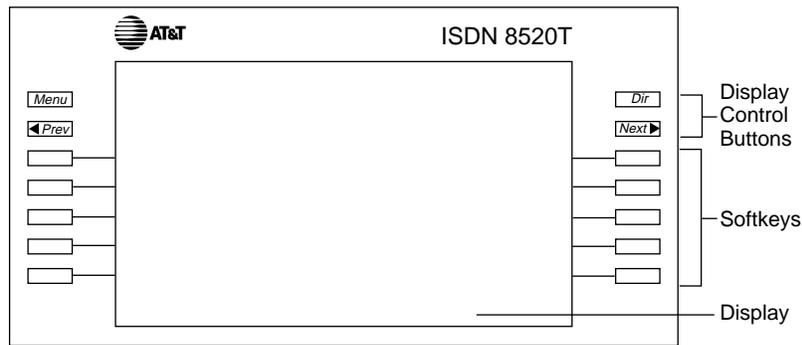


Figure 1-3. 8520 Display Terminal, Softkeys, and Display Control Buttons

The 8528 ISDN display terminal offers 28 call appearances, Conference, Drop, Hold, Mute, Redial, and Transfer buttons, a speakerphone, a message indicator, a Volume control button, and an adjunct jack. Four softkeys and four display control buttons located below a 2-line by 24-character liquid crystal display, along with `Exit` located further down on the display terminal, can be used to access features such as Personal Directory, Call Log, Data, and other options. For information on the ISDN 8528 voice terminal features, refer to the *ISDN 8528 Voice Terminal User's Manual*, 555-021-776.

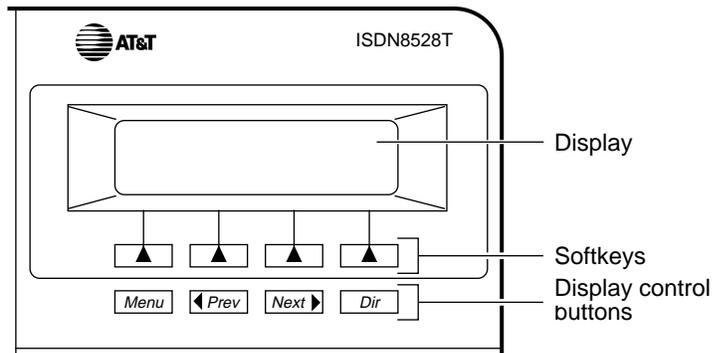


Figure 1-4. 8528 Display Terminal, Softkeys, and Display Control Buttons

The addition of the ADM allows attached data terminals or personal computers to send and receive data through an ISDN network.

Data Features

- Asynchronous full-duplex operation at data rates from 1200 bits per second (bps) to 57.6 kilobits per second (kbps) through an EIA-232 interface.
- X.25 packet switched data communication including receipt of X.29 commands from a remote X.25 host for setting packet switched data parameters.
- Circuit switched data communication over 56 or 64 kbps facilities via industry standard V.120 rate adaption protocol.
- Circuit switched data communication over 64 kbps facilities via AT&T's Digital Multiplexed Interface (DMI) Mode 2 or Mode 3 rate adaption protocols.
- 8510 and 8528 display terminals — Four softkeys and four display control buttons located below a 2-line by 24-character liquid crystal display can be used to access data features such as view current options, change options, answer a data call, place a data call, and reset a locked data set.

8520 display terminal — Ten softkeys and four display control buttons located to the left and right of a 7-line by 24-character liquid crystal display can be used to access data features such as view current options, change options, answer a data call, place a data call, and reset a locked data set. Note, the first two lines of the 7-line display contain switch information; the remaining five lines contain softkey information.

- A user friendly command interface with on-screen help, nine programmable named data memory numbers, and four programmable data option profiles.
- A standard AT command set interface for compatibility with applications which require this command format.
- Remote and local loopback tests.

Voice Terminal Control Features

With the ADM, your 8500 series display terminal also features the Application Programming Interface (API). This interface allows PC communications software to be used to enhance the operability of your ISDN set. For example, the API allows a PC communications package complete control of your ISDN set, from dialing a voice call to answering a voice call.

Some of the many things an application program running in a PC can accomplish through the API include:

- A “call screening” feature that examines the calling party's number and uses a distinctive ring based on who is calling. This allows prioritization of your incoming calls.

- An automated personal phone book that looks up the number and places a call to the specified person. The application also puts any notes about the person being called on the PC screen.
- An automated data lookup that identifies an incoming call and searches for any data available on the caller. The information is available on a timely basis so you are knowledgeable about the incoming call when you answer the telephone.
- An automatic redial feature that will retry a busy telephone number and signal you when the call goes through so you do not have to waste time constantly redialing.
- An automatic conference feature will set up a conference between several parties without the inconvenience of looking up several numbers and placing several calls.
- A variable call forwarding feature prompts the user for a name, retrieves the number from a database, and activates call forwarding to that number.

Any of these things, and more, could be happening simultaneously with a data call. For more information on this interface refer to the *Integrated Services Digital Network (ISDN) Application Programming Interface (API) Programmer's Reference Manual*, 533-705-200. You can order copies of this manual by calling the AT&T GBCS Publications Fulfillment Center at 1 800 457-1235.

System Dependencies

Your 8500 series display terminal with the ADM is intended for use with the AT&T 5ESS® switch, or the AT&T DEFINITY® Generic 2 or Generic 3 Communications Systems. You should be aware of which system your ADM is connected to because some differences exist in the data transport capabilities of each system.

The 5ESS switch supports both X.25 packet switched data communication and circuit switched data communication. For X.25 packet switched data, the system supports either dialed-up data calls (X.25 virtual circuit) or a permanent connection (X.25 permanent virtual circuit). For circuit switched data, the system supports only dialed-up data calls. Your ADM supports only one data call at a time, either circuit or packet switched.

The DEFINITY Generic 2 and Generic 3 switches support circuit switched data communication, but do not support X.25 packet switched data communication. For circuit switched data, the system supports either dialed-up data calls or a permanent switched connection.

Your ADM rate adapts circuit switched data calls onto 56 or 64 kbps channels. This is true regardless of the asynchronous data rate of the EIA-232 interface. Therefore communication circuit switched data directly between two ISDN networks requires digital connectivity between the switching systems.

Hearing and Visually Impaired Users

The following features have been included for the hearing and visually impaired person:



- Two small bars have been placed on the **5** dial pad key.
- The length of time that information messages appear on your display can be set at **Slow**, **Medium**, or **Fast**.
- Confirmation and error tones may be added to display information messages.
- Compatibility with inductively coupled hearing aids.

The System Administrator: An Important Note to All Users

Throughout this manual, we ask you to speak to your system administrator. In your company, it is the person who has been given overall responsibility for the ISDN — including all terminals as well as the system. His or her title may vary from business to business. It may be telecommunications manager, systems manager, data communications manager, or something more unique to your company. We recommend you write down the name and the phone number of your system administrator.

NAME: _____

PHONE: _____

Organization of the User's Manual

This manual is arranged into the following chapters.

- **Chapter 1: Introduction**
- **Chapter 2: Getting Started** — Explains how to set some data options from the softkeys of your 8500 series display terminal and how to make a data call.
- **Chapter 3: Using the CMD and AT Commands** — Explains when to type commands, and how to use CMD and AT Local Mode Commands.
- **Chapter 4: Data Options and Profiles** — Gives definitions of data options used to set up your ADM and explains how to create data profiles.
- **Chapter 5: Testing** — Describes local and remote loopback test procedures.
- **Chapter 6: Troubleshooting** — Provides information on using the Reset (ZAP) Command and Self-test to clear a locked-up ADM.
- **Chapter 7: Technical Information** — Provides reference-type material for technical personnel.
- **Appendix A: Cause Code Tables** — Provides cause messages that may occur during data call set-up.

Conventions Used in This Manual

The following conventions are used in this manual:

- A rectangular box containing a feature name, such as **Menu** , represents any button having a feature assigned to it.
- The 8510 and 8528 display terminal is represented by a 2-line by 24-character screen. The following screen is displayed when you press the **Menu** display control button, followed by the **Next▶** display control button. The second line of the display shows the features you can access by using the four softkeys.

```
<          MENU
Test      Data
```

- The 8520 display terminal is represented by a 7-line by 24-character screen. The following screen is displayed when you press the **Menu** display control button. The first two lines display network related information; the last five lines display the features you can access by using the ten softkeys.

```
July 18, 1993  3:42 PM
----->-
                MENU
Directory          Data
Call Log          Set Spkr
Lock              Set Clock
Options          Home Screen
```

Throughout this document only the five lines of softkey related screen information will be displayed.

- A rounded box, such as **RETURN** , represents a key to be pressed on the data terminal or PC keyboard.

- Information in bold italic characters, such as ***DIAL 3784*** represents commands or command options you can enter on the data terminal or PC keyboard.
- If the manual instructs you to type ***H*** for help, ***dial*** when you are making a data call, and so forth, you can type any and all information in either lowercase or uppercase, whichever you find easier.
- Information in computer type characters, such as `Mar 27, 1992 10:45 AM`, represent messages appearing on the 8500 series display terminal screen.
- Information in bold computer type characters, such as **`CMD:`**, represent messages appearing on the data terminal or PC display.
- Items in italics, such as *nnn*, represent numeric variables.

This chapter explains how to prepare your 8500 series display terminal Asynchronous Data Module (ADM) for data operations and how to make data calls.

Communicating with the 8500 Series Display Terminal ADM

You can “talk” to the 8500 series ADM through an attached data terminal or personal computer by means of commands typed on the keyboard of the data terminal or PC. There are two types of commands that can be used to talk to the ADM: CMD and AT. CMD is the preferred method of talking to the ADM. However, if you have a PC and you are using a communications package, you may need to use AT commands because that may be the only command form the package understands. A more detailed explanation of these commands can be found in Chapter 3, “Using the CMD and AT Commands.”

To use the commands, you must be communicating directly with the ADM in what is called “local mode” (Figure 2-1). In local mode, characters entered at the data terminal or PC keyboard are read, interpreted, and acted on by the ADM. This is in contrast to the “data mode,” in which the ADM passes data from your data terminal or PC to your host computer or other data endpoint.

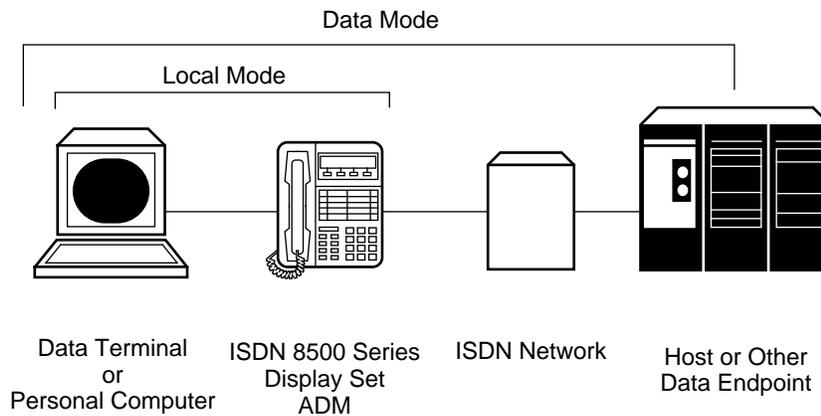


Figure 2-1. Local and Data Mode Operation

Local Mode

In local mode, commands typed at the data terminal or PC keyboard are read, interpreted, and acted upon by the ADM to make and end data calls as well as to modify data option values. There are two varieties of local mode: local-idle and local-data. The ADM is in local-idle mode whenever no data call has been initiated. The ADM goes into local-data mode when an established data call is temporarily suspended by a user who wants to view or modify option values or disconnect a call.

Data Mode

In the data mode, data from your data terminal or PC is exchanged with a host computer or other data endpoint without interpretation by the ADM.

Setting Critical Options to Make a Data Call

The ADM is shipped to you with default data option settings. Depending on your particular needs, you may need to change some of these options. This section briefly describes the four most important data options —local mode, data mode, speed, and parity. It also explains how to set them from the softkeys of your 8500 series display terminal. If you are unable to successfully transmit data after following the procedures in this section, refer to Chapter 4, “Data Options and Profiles” for complete information on each of the options.

You can also set these options and additional data options from an attached data terminal or PC keyboard. These additional options may allow you to specify more precisely the configuration which best suits your needs. For information on setting data options from an attached data terminal or PC, see the **CMD Set and Program** command descriptions in Chapter 3.

Data Mode, Local Mode, Speed, and Parity Options

Data Mode

The data mode option setting determines whether the outgoing calls you make will use X.25 packet switched data on the ISDN D-channel or one of several other data protocols circuit switched on an ISDN B-channel. (For incoming calls, your ADM automatically adapts to the data protocol in use by the compatible calling endpoint.) The D-channel X.25 packet switched option value is DX25. The B-channel circuit switched data mode option values are: B2 (factory setting), BA, BV64U, BV64I, BV56U, and BV56I.

- Select D-channel X.25 packet switched data (DX25) for packet switched data connections.
- Select B-channel AT&T Mode 2 (B2) or B-channel AT&T Mode 3/2 Adaptive (BA) for connectivity over 64 kbps facilities to endpoints supporting only one or both of these protocols.
- Select B-channel V.120 protocol (BV64U, BV64I, BV56U, and BV56I) for connection to equipment supporting this newer industry standard protocol. Select BV64I for error corrected (I-frame) mode or BV64U for uncorrected (UI-frame) mode connections over 64 kbps facilities. Select BV56I for error corrected (I-frame) mode or BV56U for uncorrected (UI-frame) mode connections over 56 kbps facilities.

The data mode option setting must correspond to the capabilities administered on your ISDN telephone line. Contact your System Administrator for information on the proper setting of this option. For more detailed information on data mode, refer to the Mode option in Chapter 4 “Data Option Definitions.”

Local Mode

The local mode option lets you select which form of commands and responses your ADM will use after it is powered up. Local mode option values are CMD, AT, Enhanced AT, and Off.

- Select CMD (factory setting) for the most user friendly interface with on-screen help.
- Select AT if your PC communications package requires the use of an AT command set.
- Select Enhanced AT (EnhAT) **only** if you are using a PC communications package intended for use with the AT&T ISDN Telephone Application Programming Interface. Enhanced AT mode allows your PC to monitor and control all aspects of your ISDN voice and data telephone service. For more information on Enhanced AT, refer to the *Integrated Services Digital Network (ISDN) Application Programming Interface (API) Programmer's Reference Manual*, 533-705-200.
- Select Off to disable the ADM from accepting commands and issuing responses through the Electronic Industries Association (EIA) interface. The Off mode is useful when your ADM is connected to a receive-only device, such as a printer.

Speed

Set the speed option to the highest speed compatible with your data terminal or PC communications package. Speed option values range from 1200 bps to 57.6 kbps. The factory setting is 9.6 kbps.

Parity

Set the parity option to match the requirements of your data terminal or PC communications package. Parity option values are odd, even, mark, or space. If your data terminal or PC communications package does not require a particular parity, set the parity option to *space* (factory setting).

⇒ NOTE:

The factory settings (default settings) may work for you. If these settings are not correct for your particular set-up, follow the steps in the following sections to change them.

Accessing Data Features on Your 8500 Series Display Terminal

You can access several data features on the 8500 series display terminal. The data features that can be accessed are listed below.

- View the data options
- Change the data options

- Place a data call
- Disconnect a data call
- Reset a locked data set
- Set the PC Call Progress Option.

To access these features on the 8510 or 8528, use the four softkeys labeled with arrows () located directly below the display. To access these features on the 8520, use the 10 softkeys located to the left and right of the display. Review the display screen flowcharts in Figures 2-2 and 2-3 before you begin using the softkey features.

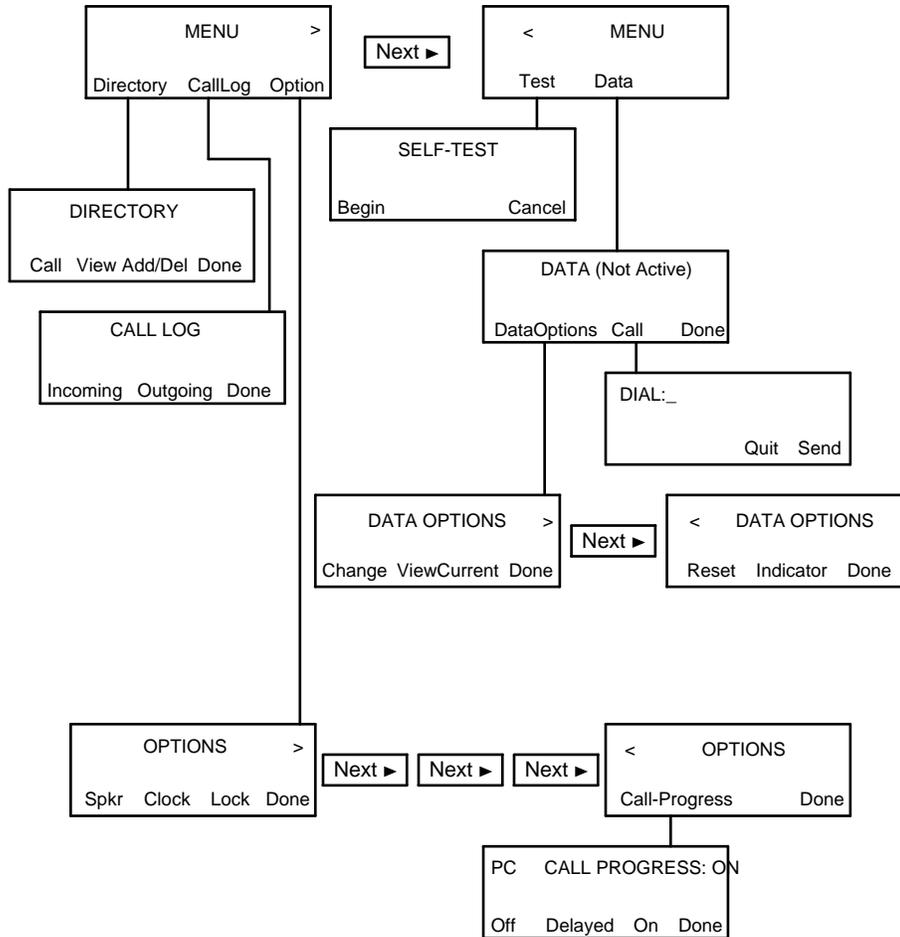


Figure 2-2. Flowchart of Selected 8510 and 8528 Display Terminal Softkey Screens

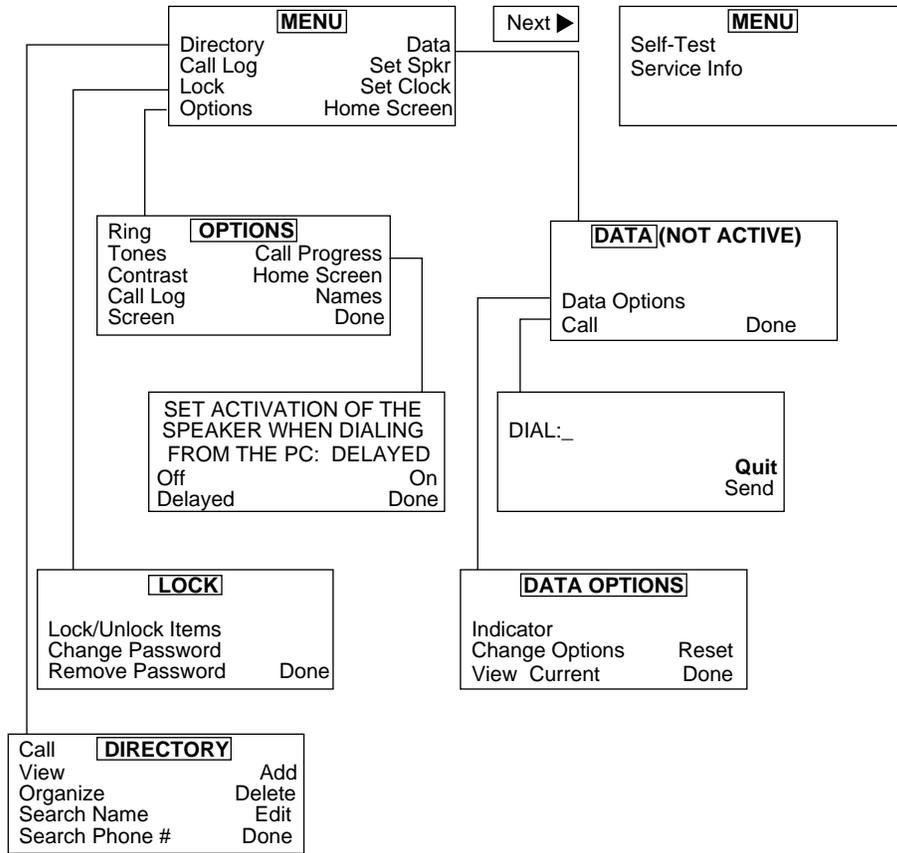


Figure 2-3. Flowchart of Selected 8520 Display Terminal Softkey Screens

Entering and Exiting Softkey Mode

1. Press **Menu** to access the main menu screen.

The following is displayed on the 8510 and 8528 display terminal screen:

```
          MENU          >
Directory CallLog Option
```

The following is displayed on the 8520 display terminal screen:

```
          MENU
Directory          Data
Call Log          Set Spkr
Lock              Set Clock
Options          Home Screen
```

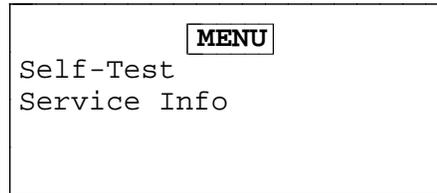
The first line of the 8500 series display is capitalized to show the feature to which you are responding. The line(s) below show the menu choices you may select.

2. Press the softkey associated with the desired menu choice to access the feature.
3. Press **Next ▶** to access the second menu screen.

The following is displayed on the 8510 and 8528 display terminal screen:

```
<          MENU
Test  Data
```

The following is displayed on the 8520 display terminal screen:



⇒ Notes:

- If you press **Menu** on your 8510 or 8528 display terminal while the first page of the main menu is on your screen, you will exit softkey mode.
- If you press **Menu** while you are at any other softkey screen, the action is terminated, and you are returned to the main menu screen.
- There are “timed” informative screens which appear for only a few seconds. You do not need to respond to these screens. If you press any of the softkeys during one of the timed messages, the display advances to the next screen.
- If you press **Exit** on the 8510 or 8528 display terminal at any time, you will exit the softkey mode, abandon the softkey functions in progress, and return to normal call-handling mode.

If you press **Exit** on the 8520 display terminal at any time, you will return to the home screen.

Setting the Options on the 8500 Series Display Terminal

Changing the Data Options

When you change the options through the softkeys, the settings take effect immediately in the currently active profile and are also stored in the power-up profile.



NOTE:

The values initially displayed are the power-up values. These values may not be the same as the currently active values.

To change the options using the softkeys on your 8500 series display terminal, do the following:

1. If you have an 8510 or 8528 display terminal, press **Menu** to access the main softkey menu screen, and then press **Next ▶** to access the second menu screen. The following is displayed on the 8510 and 8528 display terminal screen:

<	MENU
Test	Data

If you have an 8520 display terminal, press **Menu** to access the main softkey menu screen. The following is displayed on the 8520 display terminal screen:

	MENU	
Directory		Data
Call Log		Set Spkr
Lock		Set Clock
Options		Home Screen

2. Press the softkey associated with Data.

The following is displayed on the 8510 and 8528 display terminal screen:

```
DATA      (Not Active)
DataOptions  Call  Done
```

The following is displayed on the 8520 display terminal screen:

```
DATA      (Not Active)

Data Options
Call                               Done
```

3. Press the softkey associated with DataOptions or Data Options.

The following is displayed on the 8510 and 8528 display terminal screen:

```
DATA OPTIONS  >
Change ViewCurrent Done
```

The following is displayed on the 8520 display terminal screen:

```
DATA OPTIONS

Indicator
Change Options      Reset
View Current        Done
```

4. Press the softkey associated with `Change` or `Change Options` to change the data options.

The following is displayed on the 8510 and 8528 display terminal screen:

```
SET DATA MODE: DX25
-      +      Skip  Save
```

The following is displayed on the 8520 display terminal screen:

```
SET DATA MODE: DX25
                                     Quit
Mode(-)                             Skip
Mode(+ )                             Save
```

5. To change the displayed setting, press the softkey associated with `-` or `+` until the desired value is displayed.
6. Do one of the following:
 - Press the softkey associated with `Save` to save the displayed value and set the next data option. A message informing you of the new data mode setting is displayed for a few seconds. The next screen prompts you to change the data rate.
 - Press the softkey associated with `Skip` to set the next data option *without* saving the data mode. The next screen prompts you to change the data rate.
 - If you have an 8520 display terminal, press the softkey associated with `Quit` to return you to the `DATA OPTIONS` menu *without* saving the data mode.

The following is displayed on the 8510 and 8528 display terminal screen:

```
SET DATA RATE: 9600
-      +      Skip  Save
```

The following is displayed on the 8520 display terminal screen:

```
SET DATA RATE: 9600
                                     Quit
Rate(-)                             Skip
Rate(+)                             Save
```

7. Press the softkey associated with - or + to change the currently displayed option value until the desired value is displayed.
8. Do one of the following:
 - Press the softkey associated with *Save* to save the displayed value and set the next data option. A message informing you of the new data rate setting is displayed for a few seconds. The next screen prompts you to change the parity.
 - Press the softkey associated with *Skip* to set the next data option *without* saving the data rate. The next screen prompts you to change the parity.
 - If you have an 8520 display terminal, press the softkey associated with **Quit** to return you to the `DATA OPTIONS` menu *without* saving the data rate.

The following is displayed on the 8510 and 8528 display terminal screen:

SET PARITY: Even
- + Skip Save

The following is displayed on the 8520 display terminal screen:

SET PARITY: EVEN	
	Quit
Parity(-)	Skip
Parity(+)	Save

9. Press the softkey associated with - or + to change the currently displayed option value until the desired value is displayed.
10. Do one of the following:
 - Press the softkey associated with *Save* to save the displayed value and set the next data option. A message informing you of the new parity setting is displayed for a few seconds. The next screen prompts you to change the local mode.
 - Press the softkey associated with *Skip* to set the next data option *without* saving the parity. The next screen prompts you to change the local mode.
 - If you have an 8520 display terminal, press the softkey associated with **Quit** to return you to the DATA OPTIONS menu *without* saving the parity.

The following is displayed on the 8510 and 8528 display terminal screen:

```
SET LOCAL MODE: CMD
-      +      Skip  Save
```

The following is displayed on the 8520 display terminal screen:

```
SET LOCAL MODE: CMD
                                     Quit
Local(-)                             Skip
Local(+)                             Save
```

11. Press the softkey associated with - or + to change the currently displayed option value until the desired value is displayed.
12. Do one of the following:
 - Press the softkey associated with *Save* to save the displayed value and set the next data option. A message informing you of the new local mode setting is displayed for a few seconds.
 - Press the softkey associated with *Skip* to set the next data option *without* saving the local mode. You are returned to the *DATA OPTIONS* menu.
 - If you have an 8520 display terminal, press the softkey associated with **Quit** to return you to the *DATA OPTIONS* menu *without* saving the local mode.

After you have made each selection, the ISDN set stores and activates your selections.

Viewing the Current Data Options

When viewing the options, the currently active values are displayed.



NOTE:

These active values may be different from the values initially displayed on the change options screens. Refer to the section “Changing the Data Options” earlier in this chapter.

To view the currently active settings using the softkeys on your 8500 series display terminal, do the following:

1. If you have an 8510 or 8528 display terminal, press **Menu** to access the main softkey menu screen, and then press **Next ▶** to access the second menu screen.

If you have an 8520 display terminal, press **Menu** to access the main softkey menu screen.

2. Press the softkey associated with **Data**.
3. Press the softkey associated with **DataOptions** or **Data Options**.

The following is displayed on the 8510 and 8528 display terminal screen:

```
DATA OPTIONS >
Change ViewCurrent Done
```

The following is displayed on the 8520 display terminal screen:

```
DATA OPTIONS
Indicator
Change Options      Reset
View Current       Done
```

4. Press the softkey associated with `ViewCurrent` or `View Current` to view the current options.

The current data mode is displayed on the 8510 and 8528 display terminal screen, for example,

```
CURRENT DATA MODE: BV64I
                   Continue Quit
```

All the current data settings are displayed on the 8520 display terminal screen, for example,

```
CURRENT DATA OPTIONS
MODE=DX25      PARITY=EVEN
RATE=9600     LOCAL=CMD
                                     Done
```

⇒ NOTE:

The 8520 display terminal allows you to view all the options on one screen.

The 8510 and 8528 display terminal allows you to view one option per screen.

5. If you have an 8520 display terminal, press the softkey associated with `Done` after you have completed viewing the options. You are returned to the `DATA OPTIONS` menu.

If you have an 8510 or 8528 display terminal, do one of the following:

- Press the softkey associated with `quit` if you have completed viewing the options. You are returned to the `DATA OPTIONS` menu.

- Press the softkey associated with `Continue` to continue stepping through the display of the current options. The current data rate is displayed, for example,

```
CURRENT DATA RATE: 9600
                   Continue Quit
```

6. Do one of the following:

- Press the softkey associated with `Quit` if you have completed viewing the options. You are returned to the `DATA OPTIONS` menu.
- Press the softkey associated with `Continue` to continue stepping through the display of current options. The current parity is displayed, for example,

```
CURRENT PARITY: EVEN
                   Continue Quit
```

7. Do one of the following:

- Press the softkey associated with `Quit` if you have completed viewing the options. You are returned to the `DATA OPTIONS` menu.
- Press the softkey associated with `Continue` to continue stepping through the display of current options. The current local mode is displayed, for example,

```
CURRENT LOCAL MODE: CMD
                   Continue Quit
```

8. Press the softkey associated with `Quit` or the softkey associated with `Continue` when you have completed viewing the data options.

Resetting the Current Data Options

Refer to the section “Using Reset to Clear a Locked-up ADM” in Chapter 6.

Setting the Data Call Indicator

The data call indicator appears on the second line of the 8500 series display terminal screen. If you set the data call indicator to `Yes`, the data call indicator appears when you have established a data call. If you set the data call indicator to `No`, the data call indicator will not be displayed during an active data call. To set the data call indicator using the softkeys on your 8500 series display terminal, do the following:

1. If you have an 8510 or 8528 display terminal, press `Menu` to access the main softkey menu screen and then press `Next ▶` to access the second menu screen.

If you have an 8520 display terminal, press `Menu` to access the main softkey menu screen.

2. Press the softkey associated with `Data`.
3. Press the softkey associated with `DataOptions` or `Data Options`.

The following is displayed on the 8510 and 8528 display terminal screen:

```
DATA OPTIONS >
Change ViewCurrent Done
```

The following is displayed on the 8520 display terminal screen:

```
DATA OPTIONS
Indicator
Change Options      Reset
View Current       Done
```

4. If you have an 8510 or 8528 display terminal, press **Next ▶** to access the second data options screen.

The following is displayed:

```
< DATA OPTIONS
Reset Indicator Done
```

5. Press the softkey associated with `Indicator`.

The following is displayed on the 8510 and 8528 display terminal screen:

```
SHOW DATA INDICATOR?
Yes No Explain
```

The following is displayed on the 8520 display terminal screen:

```
SHOW AN INDICATOR
WHILE A DATA CALL
IS CONNECTED?

Yes No
```

6. Do one of the following:
 - To show an indicator on the screen while a data call is connected, press the softkey associated with `Yes`. A confirmation screen is displayed.
 - If you do not want to show a data call indicator, press the softkey associated with `No`. A confirmation screen is displayed on the 8520 display terminal screen.



NOTE:

If you have the data call indicator set to `Yes`, the main softkey screen on the 8510 and 8528 will show the data indicator. For example,

Aug 13, 1992	11:15AM
	Data

Press the softkey below `Data` (only on the 8510 and 8528 display terminal) to quickly access the data screens.

The `Data` indicator on the 8520 display terminal screen is only an indicator to show that a data call is in progress.

Making a Data Call

You can use the softkeys of your 8500 series display terminal to initiate a data call, or you can initiate it from your data terminal or PC. If you initiate the call from your data terminal or PC, you can use CMD commands or AT commands. Check the documentation from your PC communications package to determine if you need to use AT commands. The procedures for all three methods follow.

Making a Data Call from your 8500 Series Display Terminal

1. Turn on your data terminal or PC. If you are using a PC, make sure your communications software is configured properly at the speed and parity you want to use.
2. If you have an 8510 or 8528 display terminal, press **Menu** to access the main softkey menu screen and then press **Next ▶** to access the second menu screen.

If you have an 8520 display terminal, press **Menu** to access the main softkey menu screen.

3. Press the softkey associated with `Data`.

The following is displayed on the 8510 and 8528 display terminal screen:

```
DATA          (Not Active)
DataOptions   Call   Done
```

The following is displayed on the 8520 display terminal screen:

```
DATA (Not Active)
Data Options
Call Done
```

4. Press the softkey associated with `Call`.

The following is displayed on the 8510 and 8528 display terminal screen:

```
DIAL:_
Quit Send
```

The following is displayed on the 8520 display terminal screen:

```
DIAL:_
Quit
Send
```

To redial the last call, press `Redial` on the 8500 series display terminal, then press the softkey associated with `Send`.

5. Dial the telephone number on your 8500 series display terminal keypad. The blinking cursor indicates that you should enter the telephone number, for example,

```
DIAL:1908555_  
Backspace  Quit  Send
```

- To erase the previous character, press the softkey associated with Backspace.
 - To move the cursor to the left or right, press  Prev or Next  .
 - If you do not want to place the data call, press the softkey associated with Quit.
6. When you have completed entering the telephone number, press the softkey associated with Send. The data call is placed, and the screen returns to normal call handling mode.



NOTE:

Supplementary circuit switched data features may require the entry of additional dialing information prior to completion of the connection. To facilitate the use of these features, the ADM allows you to dial additional digits and send them to the network. Depending upon the network's response to the initial dialed digits, you may or may not receive a CONTINUE input screen.

Ending a Data Call from your 8500 Series Display Terminal

1. If you have an 8510 or 8528 display terminal, press **Menu** to access the main softkey menu screen and then press **Next ▶** to access the second menu screen.

If you have an 8520 display terminal, press **Menu** to access the main softkey menu screen.

2. Press the softkey associated with **Data**.

The following is displayed on the 8510 and 8528 display terminal screen:

```
DATA (Call Connected)
DataOptions EndCall Done
```

The following is displayed on the 8520 display terminal screen:

```
DATA (Call Connected)

Data Options
End Call           Done
```

3. To end a data call, press the softkey associated with **EndCall** or **End Call**.

Checking the Status of a Data Call

1. If you have an 8510 or 8528 display terminal, press **Menu** to access the main softkey menu screen and then press **Next ▶** to access the second menu screen.

If you have an 8520 display terminal, press **Menu** to access the main softkey menu.

2. Press the softkey associated with **Data**.

One of the following is displayed on the 8510 and 8528 display terminal screen:

```
DATA      (Not Active)
DataOptions Call Done
```

```
DATA (Call Connected)
DataOptions EndCall Done
```

One of the following is displayed on the 8520 display terminal screen:

```
DATA      (Not Active)

Data Options
Call                               Done
```

```
DATA (Call Connected)

Data Options
End Call                               Done
```



NOTE:

If the data indicator is displayed during an active data call, you can press the softkey associated with **Data** on the 8510 and 8528 display terminals to access the same screens.

Making a Data Call From a Data Terminal or PC Using CMD Local Mode Commands

The Local Mode option must be set for CMD Local Mode. See the “Setting Critical Options to Make a Data Call” section earlier in this chapter.

1. Turn on your data terminal or PC. If you are using a PC, make sure your communications software is configured properly at the speed and parity you want to use. The **CMD:** prompt should appear on your data terminal or PC screen.

⇒ NOTE:

If the **CMD:** prompt does not appear on your data terminal or PC, the speed and parity options in your ADM may not be matched to your data terminal or PC. Press **(BREAK)** on your data terminal or PC keyboard followed by the letters **AT** and **(RETURN)**. If the **CMD:** prompt still does not appear, the ADMs autoadjust option may not be set to ON. Refer to the definition of Autoadjust in Chapter 4, "Data Options and Profiles" for more information. If the word **OK** appears, you are in one of the AT command modes. To change from AT to CMD mode, refer to Chapter 3, "Using the CMD and AT Commands."

2. At the **CMD:** prompt, type **dial** and the telephone number. For example, type **dial 5552222**.

⇒ NOTE:

When dialing, type: **dial**; then one (and only one) space; then the number. Strict adherence to this format is necessary. For example, typing **dial, two** spaces, and the string results in the second space being transmitted as the first character in the dialed string.

3. To redial the last data call, at the **CMD:** prompt, type **redial** followed by **(RETURN)**.
4. Press **(RETURN)**. The ADMs response will be similar to what is shown below.

```
CALLING 555 2222
Type E to end call:
```

Supplementary circuit switched data features may require the entry of additional dialing information prior to the receipt of the **CONNECT** message. To facilitate the use of these features, the ADM allows you to enter additional **dial** commands before the **CONNECT** message. Depending upon the network's response to the initial dialed digits, you may or may not receive a **CONTINUE** message after the initial dial command. If you receive a **CONTINUE** message, you can enter additional digits.

Additional information may appear on your screen, such as:

```
CONNECT - MODE 2
FAR END SPEED - 9600
or
CONNECT
DATA MODE
```

Once you see the **CONNECT** message, you should ignore the message, **Type E to end call.**

You are now ready to communicate with the far end. Enter data to be transmitted.

5. To end a data call, rapidly type the Attention sequence: **+++** (see the description of the Attention option in Chapter 4, "Data Options and Profiles"). The **CMD:** prompt is displayed.

Type **e** or **end** to end the call.

Making a Data Call From a Data Terminal or PC Using AT Local Mode Commands

The Local Mode data option must be set for AT Local Mode. See the section “Setting Critical Options to Make a Data Call” earlier in this chapter.

1. Turn on your data terminal or PC. (If you are using a PC, make sure your communications software is configured properly at the speed and parity you want to use.)
2. Type **atd** and the telephone number. For example, type **atd 1234567**.
3. Press `[RETURN]`. The ADMs response will be similar to what is shown below.

CONNECT 9600

Supplementary circuit switched data features may require the entry of additional dialing information prior to the receipt of the **CONNECT** message. To facilitate the use of these features, the ADM allows you to enter additional ATD commands before the **CONNECT** message. Depending upon the network’s response to the initial dialed digits, you may or may not receive a **CONTINUE** message after the initial dial command. If you receive a **CONTINUE** message, you can enter additional digits.

Conventional Hayes® compatible applications abort data call attempts which have not yet connected upon receipt of any character. One consequence of allowing secondary dial commands is that in order to terminate (abort) such a call attempt, you must issue an ATH (hangup) command rather than typing any character.

You are now ready to communicate with the far end. Enter data to be transmitted.

4. To end a data call, rapidly type the Attention sequence: **+++** (see the description of the Attention option in Chapter 4, “Data Options and Profiles”).

The **OK** prompt is displayed.

Type **ath** to end the call.

Messages on the 8500 Series Display Terminal, the Attached Data Terminal, or the PC

This section describes various messages that may appear on your 8500 series display terminal, your attached data terminal, or your PC.

CONTINUE may appear when dialing a call or a particular feature access code. At this point, additional digits may be required to complete the call. For further information, call your system administrator.

DENIED, DTR IS OFF is displayed if you try to initiate a data call via `DATA` while the DTR indication is off. See the **DTR** section in Chapter 4, "Data Options and Profiles," for more information.

DIAL is displayed when call origination is performed via `DATA`.

LINK DOWN is displayed when you try to initiate a data call when a signaling link cannot be established to the network. For more information, see your system administrator.

INCOMING DATA CALL is displayed if you have an incoming call. In CMD Local Mode, this message and possibly additional information about the incoming call will be displayed prior to a **CONNECT** message. For example, an incoming internal automatically answered circuit switched data call from telephone number 908-555-2222 on July 18 at 3:41 pm may appear as follows on the display of your data terminal.

```
INCOMING DATA CALL
908-555-2222

                                InI
07-18                            3:41 pm
CONNECT
DATA MODE
```

Using the CMD and AT Commands

3

When to Type Commands

You can only type commands using the data terminal keyboard to dial calls, program, and maintain your system when your ADM is in Local Mode. When your ADM is in CMD Local Mode or AT Local Mode, you are not transmitting data; your ADM is interpreting and acting upon the instructions you type. If your Local Mode is set to CMD, then your terminal displays the **CMD:** prompt while you are in Local Mode. AT Local Mode does not display any prompt.

If you are on a data call, you can move to Local Data Mode by typing the attention sequence **+++** (default attention value) rapidly. The **CMD:** prompt or an **OK** response should appear on your screen depending on the Local Mode you have selected.

Using CMD Local Mode Commands

This section provides a list of the CMD commands, contains information on getting on-screen help with commands, and procedures for using the commands.

To execute a command, type the command, then press **(RETURN)**. You must press **(RETURN)** to execute a command.

If you make an error while typing, use **(BACKSPACE)** to correct it before pressing **(RETURN)**, or hold down the key labeled **(CTRL)** and type **x**, to cancel the command line.

Table 3-1. CMD Commands, Their Abbreviations and Descriptions

Command	Abbreviation	Description
continue	con	Returns the ADM to Data Mode from the Local Data Mode
copy	cop	Used to save active profiles, change a profile, store the last data number dialed
dial	d	Dials a data call
end	e	Ends a data call
help	h	Displays Help menus
program	p	Used to program profiles and data repertories
redial	r	Dials the last data number dialed
set	s	Sets a data option to a value in the active profile (pA)
test	t	Enables local loopback or remote loopback tests
view	v	Used to display a profile or a data repertory number
&&h	&&h	Used to invoke the AT Local Mode

Abbreviating CMD Commands

You can abbreviate command names. You need only type the “unique” part of the name (see Table 3-1). For example, **dial** becomes **d**, and **continue** becomes **con**. You can abbreviate option names in the same way.

Help for CMD Commands

You can ask for help any time you have a **CMD:** prompt on the screen. When you type **help**, the system displays the following screen:

CMD: help

Type HELP and the topic you want to learn more about.

Examples: help test, h attention

COMMANDS: continue copy dial end help &&H
 program redial set test view

OPTIONS: answer attention autoadjust break char.erase
 dcd dtr echo edit fcpn
 forwarding idle.timer line.erase local.echo match.speed
 min.timer mode rec.flow text trans.flow
 v120.ps v120.ws

EIA INTERFACE: speed parity

UNSTORED OPTIONS local.cr local.erase local.lf

X.25 CALL OPTIONS: cd cug rc rpoa

STORED DATA PROFILES: p0 p1 p2 p3 p4

STORED MEMORY NUMBERS: m1 m2 m3 m4 m5 m6 m7 m8 m9

Screen 3-1. Help Screen

You can get additional help in any of the following ways:

1. Type **help option** to display the possible values for the option:

CMD: help dtr

the ADM responds:

```
current value = ignore
possible values = follow ignore
```

2. Type **help** followed by a partial *command* to list all commands or options that begin with the letters typed:

CMD: help re and press .

The ADM responds:

```
redial rec.flow ?
```

3. Type **help command** to get a brief description of how to use the command or a brief description of the options available with the command:

CMD: help end and press .

The ADM responds:

```
Type END to end a data call in progress.
```

Suspending and Continuing Data Transmission

Once a data call has been established, you can suspend transmission and return to local mode so you can “talk” directly to the ADM. The procedure below explains how to do this.

Rapidly type the attention sequence: **+++**. (If you pause between keystrokes, the ADM will send the **+** characters as end-to-end data.) **CMD:** appears on your screen. This means that data transmission has been suspended; you can now issue commands to the ADM, using the commands explained in this chapter.

To exit the Local Mode and return to Data Mode, at the **CMD:** prompt, type:

continue and press **RETURN**.

To change the Attention sequence, see Chapter 4, “Data Options and Profiles.”

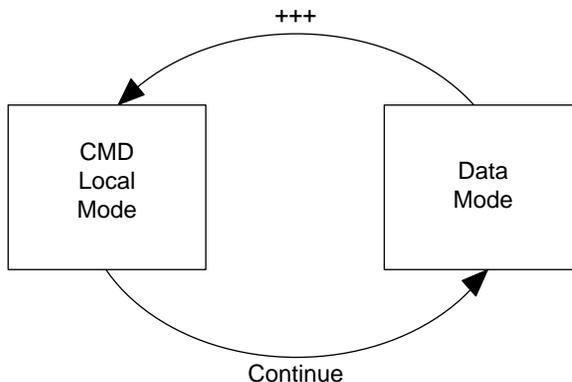


Figure 3-1. Changing Between CMD Local Mode and Data Mode During a Data Call

Changing from CMD Local Mode to AT Local Mode

To change from CMD local mode to AT local mode, at the **CMD:** prompt, type:

&&h and press **(RETURN)**.

The ADM responds:

AT COMMAND MODE

X.25 Call Options

If you are using the DX.25 Data Mode, you may need to specify call options when you dial a data call. The call options that can be used for DX.25 data calls are listed below. Abbreviations and values are given in parentheses.

- Closed User Group (cug: 0000 through 9999)
- Reverse Charge (rc: yes or no)
- Registered Private Operating Agency (rpoa: 0000 through 9999)
(1 or 2 RPOAs are allowed)
- Call User Data (cd: up to 12 characters)

Your system administrator will tell you if you should use any of the above call options with your data calls.

To make a data call using cug, rc, rpoa, or cd call options, at the **CMD:** prompt, type:

dial number;option1=x;option2=y;...

For example: **CMD: dial 5552222;cug=1234;rc=yes**

The format to specify two RPOAs is:

CMD: dial 5552222;rpoa=3333,4444;cug=1234;cd=blue

Programming Telephone Numbers for Memory Dialing

You can program up to nine telephone numbers for memory dialing of data calls and assign them customized names for easy access. Up to 30 digits can be entered. These numbers are labeled m1 through m9. Options associated with a memory dialing number include the telephone number, user selectable name, data profile, and X.25 call options described in the previous section, except call user data. To store a number in m1, do the following:

1. At the **CMD:** prompt, type:

program m1 and press `RETURN`.

The system displays the current values of m1 and the prompt:

```
MEMORY NUMBER m1
OPTION          VALUE
Name           unspecified
Number         unspecified
Profile        active
RPOA1          unspecified
RPOA2          unspecified
Closed User Group unspecified
Reverse Charging no
Type option name (or Q to quit):
```

2. Type the name of the option (for example, **number**) for which you want to insert a value. The ADM responds:

```
Current value = unspecified
Type new value (or Q to quit):
```

3. Type the value for that option (for example, **5552222**). The ADM responds by displaying a table of all values for this memory location and prompts again:

Type option name (or Q to quit):

4. Type in the next option name for which you want to assign a value and repeat Step 3. You will probably want to select a name (up to eight characters) to correspond with each number so you do not have to remember which number is stored in each memory location.
5. Type **Q** when you are done. The ADM responds:

Do you want to save the change(s) you made (Y or N)?

6. Type **y** to save the changes. The ADM saves your changes and displays the following message:

m1 updated

7. Type **n** to cancel the changes. The ADM displays:

No changes made to m1

Memory Dialing

The ADM dials the number and loads any data profile stored with the telephone number. For example, use the following command to dial a number stored at memory location 1:

At the **CMD:** prompt, type: **dial m1** or **dial name** or just simply **name** where *name* is the actual name you have assigned to the memory number.

To view all the memory locations, at the **CMD:** prompt, type:

view names and press .

The system displays the current memory locations and the prompt:

Data Options and Profiles

4

The 8500 series ADM stores data options (configuration information) to tell it how to communicate with the far end. The options, listed in Table 4-1 are explained in this chapter. For most applications, you will find that the CMD Local Mode factory default settings (those settings are in bold print in the table) will work for you.*

If you need to change any of the options, you can store them in a data option profile. Creating and using a profile is also discussed in this chapter.

* The default data mode, B2, may not work for your network configuration. Check with your system administrator for the data mode setting for your network configuration.

Table 4-1. Data Option Values

Option	Possible Values
Answer (AT)	auto, manual
Answer (CMD)	auto , manual
Attention	off, 3 of the same ASCII character (+++)
Autoadjust	on , off
Break	off, attention, interrupt, break , discard, reset
Char.erase	bs (Ctrl) - (H), delete (DEL), #, off
DCD	follow, ignore
DTR	follow, ignore
Echo	on, off
Edit	on, off
FCPN	on, off
Forwarding	off , cr, ctrl, alpha, all
Idle.timer	0.0 to 12.75 seconds
Line.erase	can (Ctrl) - (X), (Ctrl) - (U), @, off
Local.cr	Any ASCII character (default = CR)
Local.echo	on , off
Local.erase	Any ASCII character (default = BS)
Local.lf	Any ASCII character (default = LF)
Match.speed	on , off
Min.timer	on , off
Mode	B2 , BA, DX25, BV64U, BV64I, BV56U, BV56I
Parity	odd, even, mark, space
Rec.flow	eia, xon/xoff , off
Speed	1200, 2400, 4800, 9600 , 19200, 38400, 57600
Text	off, diagnostic, verbal , q2_diagnostic, q2_verbal
Trans.flow	eia, xon/xoff , off
V120.ps	128 , 256
V120.ws	1 - 7 (default = 3)

Data Option Definitions

The following descriptions assume single-stream operation which is the case when API is not being used. Refer to the *ISDN Application Programming Interface Programmer's Reference Manual* for more information on Single-Stream and AutoStream™.

Note that the examples used in this section assume the use of CMD mode.

Answer

- Option Values: **auto**, manual (Note, the AT mode default value is manual.)
- Applicable Data Protocols: All

Set Answer to **auto** if you want incoming data calls to be answered automatically. Set Answer to **manual**, if you want to answer data calls manually. If your ADM is attached to an asynchronous data terminal, type **y** on your data terminal or PC in response to the prompt **ANSWER?** or press the softkey associated with **Yes** on the screen that appears on the 8510, 8520, and 8528 display terminals.

ANSWER DATA CALL?	
Yes	No

ANSWER DATA CALL?	
Yes	No

Interactions with DTR:

- If the DTR option is set to **follow** and Answer is set to **auto**, then the ADM checks to make sure the DTR lead is on (usually indicating that your terminal is turned on) before automatically answering the call.
- If you have set the DTR option to **ignore** and Answer to **auto**, the ADM answers data calls whether or not the DTR lead is turned on.
- If the DTR option is set to **follow** and Answer is set to **manual**, the ADM will not let you manually answer the call unless DTR is on.

Attention

- Option Values: off, 3 of the same ASCII character (default = **+++**)
- Applicable Data Protocols: All

The Attention sequence is used to take the ADM out of the Data Mode enabling you to enter commands. The default setting is **+++**. You must type the sequence rapidly (all three characters within 1.5 seconds).

Before entering the Attention sequence, there must be—at least—a one second delay after typing your last character. Then the three characters composing the sequence must be typed within 1.5 seconds. Finally, no additional characters should be typed for one second after typing the Attention sequence. Failure to comply with these guidelines results in the Attention sequence characters being sent to the far-end as data.

To change the attention sequence to **@@@**, for example, type **set attention @** from an attached data terminal. Note that you need only type the new character once while changing the value.

Possible values include any printable or control characters except NUL (Ctrl) - (@), SOH (Ctrl) - (A), CAN (Ctrl) - (X), NAK (Ctrl) - (U), BS (Ctrl) - (H), DC3 (Ctrl) - (S), DC1 (Ctrl) - (Q).

Autoadjust

- Option Values: **on**, off
- Applicable Data Protocols: All

If Autoadjust is **on**, the ADM automatically adjusts to the speed and parity of your attached data terminal when you press (BREAK), type **AT**, then press (RETURN). After this sequence, the ADM transmits the **CMD:** prompt to your data terminal with the current (new) speed and parity.

⇒ NOTE:

Failure to complete this sequence within five seconds may result in improper speed setting.

If Autoadjust is **off**, you must set speed and parity with the **set** command.

Break

- Option Values: off, attention, interrupt, **break**, discard, reset
- Applicable Data Protocols: See below

This option determines what the ADM does when you press **BREAK** on your attached data terminal during data transfer.

For X.25 and Mode 3 data protocols: If you select **off**, the ADM does not respond to **BREAK**. If you select **interrupt**, the ADM sends an interrupt packet to the remote Packet Assembler Disassembler (PAD). If you select **break**, an interrupt packet is sent, followed by an indication of break X.29 message. If you select **discard**, the ADM sends an interrupt packet, an indication of break X.29 message, and discards any incoming data from the network. If you select **reset**, the ADM sends an X.25 reset packet to the network. If you select **attention**, the ADM escapes from the Data Mode to the Local Data Mode enabling you to enter commands. Use of **BREAK** as an attention sequence, is in addition to the three character attention sequence selected by the attention option. For Mode 2 and all V.120 data modes, **BREAK** is transported to the far-end regardless of the option setting.

Char.erase (Character Erase)

- Option Values: **bs** **Ctrl** - **H**, delete (DEL), #, off
- Applicable Data Protocols: X.25, Mode 3, BV64I, and BV56I

This option allows you to choose the character you will use as an erase character when Edit is **on**.

The selected character is not transmitted to the far end. See **Line.erase** later on in this chapter.

DCD (Data Carrier Detect)

- Option Values: follow, **ignore**
- Applicable Data Protocols: All

This option determines whether the ADM turns on the Data Carrier Detect (DCD) lead when a data call is in progress, and off when one is not (**follow**), or whether it keeps DCD on essentially all the time (**ignore**).

If your data terminal transmits data only when the DCD lead is on, set DCD to **ignore**. When the DCD lead is set to **ignore**, it appears to your terminal that a data call is always present, except for one second following termination of a call. This enables your data terminal to transmit commands to the ADM even when a data call is not present. This setting is appropriate for most users.

Set the DCD lead to **follow** only if your application requires that DCD be off

when a data call is not present. You may also select **follow** if your application will not enter data mode unless it sees the DCD go from off to on.

See the instruction manual for your data terminal or PC application package to determine which setting is appropriate.

DTR (Data Terminal Ready)

- Option Values: follow, **ignore**
- Applicable Data Protocols: All

Data Terminal Ready (DTR) lead is an electrical signal sent from your data terminal to the ADM. The DTR option determines how the ADM responds to the presence or absence of this electrical signal. The DTR lead is used by your data terminal to indicate to the ADM that it is ready for communication. Many data terminals turn the DTR lead on whenever the data terminal is turned on. If your data terminal works this way, setting the DTR option to **follow** enables you to end data calls by turning off your data terminal. If you want to retain active data calls when your data terminal is turned off or while you change EIA cables, set the DTR option to **ignore**.

If your application turns the DTR lead off during file transfer, set the DTR option to **ignore**.

Interactions with Answer: If the DTR option is set to **follow** and Answer is set to **auto**, the ADM automatically answers data calls only when the DTR lead is on. If the DTR option is set to **ignore** and Answer is set to **auto**, the ADM automatically answers whether the DTR lead is on or off.

Echo

- Option Values: on, **off**
- Applicable Data Protocols: All

This option determines whether characters sent from the data terminal in Data Mode are echoed by the ADM.

If you select **on**, the ADM echos characters sent by your data terminal during Data Mode.

Select **on** if your host computer or other data endpoint does not echo characters. In addition, you will want to turn your data terminal's echo capability off.

If you select **off**, the ADM does not echo characters sent during the Data Mode. Thus, if your host computer or other data endpoint echoes characters for you, select **off**. Otherwise, each character you type is displayed twice. If you are transferring files, you will probably want to turn Echo **off**.

Edit

- Option Values: on, **off**
- Applicable Data Protocols: X.25, Mode 3, BV64I, and BV56I

This option is used with the Forwarding option and allows you to correct characters and lines of text before transmitting data packets to the far end. If you type more than a full packet of data, then a packet is sent out automatically.

Select **on** if you want to be able to edit packets before you send them; select **off** otherwise. Note that Forwarding must be set **on** for Edit to work.

The characters you can use for editing are selected with the Char.erase and Line.erase options. These characters are acted on locally and are not sent out in packets.

Interactions with Char.erase and Line.erase: At least one of these options must be set to a value other than **off** for editing to work.

Flow Control Parameter Negotiation (FCPN)

- Option Values: **off**, on
- Applicable Data Protocols: X.25

A Flow Control Parameter Negotiation (FCPN) selection of **off** is used to enable the default values of the window size and the maximum packet size (2 and 128, respectively) by directing the ADM not to request the X.25 FCPN facility.

An FCPN selection of **on** is used to request a window size of three and a maximum packet size of 256 in the X.25 Flow Control Parameter negotiation facility. Check with your system administrator to find out if **on** is a selection that is available to you.

If this option is changed during an active data call, it does not take effect until the next data call.

⇒ **NOTE:**

An FCPN setting of **off** is recommended when more than four ISDN terminals connected to the same line are simultaneously using DX25 packet data communication. Otherwise, under the worst case load, packet congestion on the line may result in lost data.

Forwarding

- Option Values: **off**, cr (carriage return), ctrl (all control characters and DEL), alpha (all alphanumerics), all (all characters)
- Applicable Data Protocols: X.25, Mode 3, BV64I, and BV56I

The ADM sends data through the network in packets if the data protocol is X.25, Mode 3, BV56I or BV64I. This option allows you to select a data-forwarding character; a character used to signal that a data packet should be sent.

Set Forwarding to something other than **off** if you want a way to signal the ADM to send a less-than-full data packet. For example, if you set Forwarding to **carriage return**, the characters you type are stored until you press **RETURN** or **ENTER** on your data terminal keyboard. At that time, the characters are put into a packet and sent out.

If you set Forwarding to **ctrl**, when you press any control character or **DEL**, a packet is sent out.

Of course, if enough characters to fill a packet are typed before you enter the Forwarding character, the full packet is sent. The Forwarding character is included in the packet.

Typically, if you enable Forwarding, you will want some way to display characters at your data terminal as you type them, and you will want a way to do local editing. These could be features of your data terminal or you could use the Echo and Edit options provided by the ADM.

Forwarding cannot be **off** if you wish to use Edit, Char.erase, or Line.erase.

Interactions with Rec.flow: If Forwarding is set to **ctrl** and **xon/xoff** flow control is being used, then the **xoff** character **Ctrl** - **S** and the **xon** character **Ctrl** - **Q** are used for flow control and will not cause packets to be sent.

Idle.timer

- Option Values: **0.0** (off), .05 - 12.75 (seconds)
- Applicable Data Protocols: X.25, Mode 3, BV64I, and BV56I

When the Data Mode is set to X.25, Mode 3, BV56I or BV64I, the ADM sends data through the network in packets. If the time between characters exceeds the idle.timer, less than the full packet will be sent out.

Interaction with Min.timer: An Idle.timer value greater than .05 seconds takes precedence over the Min.timer.

Line.erase

- Option Values: **cancel** (Ctrl) - (X), NAK (Ctrl) - (U), @, off
- Applicable Data Protocols: X.25, Mode 3, BV64I, and BV56I

This option allows you to choose the character that erases the entire contents of the editing buffer.

Like Char.erase, Line.erase is enabled only when Edit is enabled. Select the character that best meets your needs. If you do not have (CANCEL) on your data terminal, you can hold down (CONTROL) and press (X). To use NAK, hold down (CONTROL) and press (U).

The Line.erase character is not sent out in the data packet.

Local.cr

- Option Values: Any ASCII character except NUL, SOH, (Ctrl) - (X), (Ctrl) - (U), (Ctrl) - (S), BS (default = CR)
- Applicable Data Protocols: N/A

This option selects the Local Mode command line termination character. Some PC communications packages access this option from the AT Local Mode. Individual users should not change this option value.

Unlike most data options, Local.cr is an unstored option (it is not stored in a programmable profile), and its setting reverts to the factory default value upon power-up.

Local.echo

- Option Values: **on**, off
- Applicable Data Protocols: N/A

This option selects whether characters entered in Local Mode are echoed back to the user. Some PC communications packages access this option from the AT Local Mode. Individual users should not change this option value.

Local.erase

- Option Values: Any ASCII character except NUL, SOH, **Ctrl** - **X**, **Ctrl** - **U**, **Ctrl** - **S**, (default = BS)
- Applicable Data Protocols: N/A

This option selects the character used to backspace (erase) a Local Mode command character. Some PC communications packages access this option from the AT Local Mode. Individual users should not change this option value.

Unlike most data options, Local.erase is an unstored option (it is not stored in a programmable profile), and its setting reverts to the factory default value upon power-up.

Local.lf

- Option Values: Any ASCII character except NUL, SOH, **Ctrl** - **X**, **Ctrl** - **U**, **Ctrl** - **S**, or BS (default = LF)
- Applicable Data Protocols: N/A

This option selects the character used as a linefeed during transmission of responses to Local Mode commands or when Local Mode commands are echoed. Some PC communications packages access this option from the AT Local Mode. Individual users should not change this option value.

Unlike most data options, Local.lf is an unstored option (it is not stored in a programmable profile), and its setting reverts to the factory default value upon power-up.

Match.speed

- Option Values: **on**, **off**
- Applicable Data Protocols: Mode 2

This option permits endpoints running at different speeds to communicate via the Mode 2 protocol. To establish a Mode 2 data call both endpoints must be at the same speed or the Match.speed option must be **on** at the endpoint with the higher speed.

The terminal adaptor connected to the higher-speed endpoint buffers up the data and meters it toward the network at the rate of the lower-speed endpoint, and controls the data flow from the attached equipment using the Trans.flow control mechanism. If Trans.flow is **off** or if the attached terminal does not support Flow Control, you are likely to lose data. Mode 2 protocol does not provide an end-to-end flow control mechanism for connection of endpoints with mismatched speeds. The lower speed endpoint must not send xon/xoff characters to control the flow of the high speed endpoint because these flow control characters become mixed with any xon/xoff characters sent to the higher speed endpoint generated locally by the higher speed ADM. If this condition occurs, data will be lost because two independent entities (the local

ADM and the remote endpoint) are trying to control the higher speed endpoint simultaneously.

If the conditions in the above paragraph cannot be met, then Mode 3 or V.120 are the recommended data protocols.

When Match.speed is set to **off**, a Mode 2 call to another endpoint can only be established if the other endpoint is running at the same speed. Other data modes use bidirectional flow techniques to connect endpoints of dissimilar speeds.

Min.timer (Minimum Delay Timer)

- Option Values: **on**, off
- Applicable Data Protocols: X.25, Mode 3, BV64I, and BV56I

Turning on this option optimizes packet data transmission initiated from either a person typing or from a computer.

If characters received from the attached data equipment are separated in time by more than approximately 10 milliseconds, then packets are transmitted to the network without artificial delay. This is the case for a person typing.

If characters are received more closely spaced in time than as described above, characters are assembled into packets. This may be the case of a computer answering a data base query or transferring a file. In general, the size of the packet equals the number of characters received prior to a gap in the reception or a full packet, whichever is less. An exception to the above occurs when the first packet after a gap is transmitted. This packet may contain fewer characters (possibly only one character).

Interaction with Idle.timer: An Idle timer value greater than .05 seconds takes precedence over the Min.timer.

Mode

- Option Values: **B2**, BA, DX25, BV64U, BV64I, BV56U, BV56I

If this option is changed during an active data call, it will not take effect until the next data call. Mode selects the preferred data protocol your ADM uses to originate a data call. This option refers to data call origination only. Incoming calls, in contrast, are always answered with the data protocol specified by the compatible caller. Unless clearly identified as DX.25, DMI Mode 2, or DMI Mode 3, the ADM assumes V.120 on incoming calls.

The Mode option setting must be matched to the capabilities administered on your ISDN telephone line and to that of the endpoint you are calling. To find out which values of the Mode option you should select, contact your system administrator. Data calls will *not* work unless your telephone line has been administered for the data mode(s) you wish to use (that is, ISDN D-channel

packet switched data service for Mode DX25 and ISDN B-channel circuit switched data service for the other Modes).

- **B2** An abbreviation for B-channel Mode 2, configures the ADM for establishment of outgoing data calls using AT&T's Mode 2 circuit switched data transmission protocol. B2 and BA are appropriate selections for circuit switched connections over 64 kbps facilities to endpoints supporting one or both of these protocols. Mode 2 protocol is not error corrected and does not provide bidirectional flow control when endpoint speeds are mismatched. Mode 2 does provide less delay than Mode 3 on transmitted and received data. Select B2 to establish a data call using Mode 2 protocol. If the user escapes to Local Mode while the far end is transmitting Mode 2 data, this data may be lost.
- **BA** An abbreviation for B-channel Adaptive, configures the ADM for establishment of outgoing data calls using AT&T's Mode 3/2 adaptive circuit switched data transmission protocol. B2 and BA are appropriate selections for circuit switched connections over 64 kbps facilities to endpoints supporting one or both of these protocols. Mode 3 protocol is error corrected and does provide bidirectional flow control when endpoint speeds are mismatched. Mode 3 can cause slightly higher delays than Mode 2 on transmitted and received data. Mode 3 is a packet-oriented protocol and uses the Packet Assembler Disassembler (PAD) data options. Select BA to attempt to establish a data call using AT&T Mode 3 protocol. If the endpoint you are calling cannot accept this type of call, the ADM then reattempts using AT&T Mode 2 protocol.

 **NOTE:**

Mode 2 and Mode 3 are defined in the *AT&T Digital Multiplexed Interface (DMI) Technical Specification*, 555-025-204. For a copy of this manual, call the GBCS Publications Fulfillment Center at 1 800 457-1235.

- **DX25** An abbreviation for D-channel X.25, configures the ADM for establishment of outgoing data calls using X.25 packet switched data on the D-channel. DX25 mode uses the PAD data options.
- **V.120** The remaining Mode values (whose names start with BV for B-channel V.120 protocol) are appropriate selections for circuit switched connections to equipment supporting this industry standard rate adaption protocol. Two different *frame* modes are supported: Un-numbered Information frame (UI-frame) mode, and Numbered Information frame (I-frame) mode. UI-frame mode is more efficient than I-frame, but is not error corrected, while I-frame mode is less efficient than UI-frame, but is error corrected. I-frame mode is packet-oriented and uses the PAD data options.

Two different channel bandwidths are supported: 64 kbps and 56 kbps.

Select **BV64U** for uncorrected (UI-frame) mode connections over 64 kbps facilities.

Select **BV64I** for error corrected (I-frame) mode connections over 64 kbps facilities.

Select **BV56U** for uncorrected (UI-frame) mode connections over 56 kbps facilities.

Select **BV56I** for error corrected (I-frame) mode connections over 56 kbps facilities.



NOTE:

For further information about the new industry standard V.120 rate adaption protocol, you can obtain *ANSI Standard T1.612* from Global Engineering Documents.

For inquiries within the USA

Global Engineering Documents
1990 M Street NW, Suite 400
Washington, DC 20036
1 800 854-7179 Voice
1 202 331-0960 FAX

For inquiries outside the USA

Global Engineering Documents
2805 McGaw Avenue
Irvine, CA 92714
1 714 261-1455

Parity

- Option Values: odd, even, mark, **space**
- Applicable Data Protocols: All

The ADM ignores parity received from your terminal in Local Mode. If a terminal connected to the ADM requires parity to display Local Mode text, match the parity of the ADM with your terminal.



NOTE:

The Parity setting of the ADM only affects local mode. The ADM **never** adjusts parity of data transmitted to the network in data mode. The ADM only adjusts the parity of X.25 data transmitted from the network if it is specifically requested to do so via an X.29 message from a remote X.25 host.

During a circuit switched data call, your ADM transports all eight bits of an asynchronous data character end-to-end as information, rather than checking or generating a parity bit. V.120 data calls are accepted by your ADM from endpoints provided the parity setting carried within the call setup information indicates a valid character size and parity combination: 8-bit none, 7-bit odd, 7-bit even, 7-bit mark, or 7-bit space. V.120 data calls initiated from your ADM contain parity setting information in the call setup information which is fixed at 8-bit no parity regardless of the local mode parity setting. In other words, no matter what the setting of the parity option (odd, even, mark, or space), your ADM always originates V.120 data calls with call setup information coded as 8-bit no parity. If the called V.120 endpoint requires an exact match in parity before it will accept an incoming call from your ADM, the called V.120 endpoint must be set to 8-bit no parity.

To set this option from an attached terminal, do the following:

1. Type **set parity value** (for example, **set parity odd**).
2. Change your data terminal's parity to match this value. (See your data terminal's operating manual for instructions.)
3. Press **RETURN**.

You can also change the parity option setting of the ADM (when the Autoadjust option is **on**) by pressing **BREAK**, typing **AT** and then pressing **RETURN**.

⇒ NOTE:

Using autoadjust only temporarily activates the current speed and parity. You can store speed and parity by setting the options through the voice terminal keypad or by copying data option profile pA to p1 (see "Data Option Profiles," later in this chapter).

Rec.flow (Receive Flow Control)

- Option Values: **xon/xoff**, eia, off
- Applicable Data Protocols: X.25, Mode 3, and all V.120 modes*

This option determines which method is used to control the flow of data from the ADM to your data terminal.

When you select **xon/xoff**, your ADM expects the data terminal to send an xoff character (with proper parity) when it is not ready to receive data. When it is ready to receive data, the data terminal sends an xon character (with proper parity) to the ADM to restart the flow of data. This setting is appropriate for most users.

Select **eia**, if your data terminal uses the Request-to-Send (RTS) lead to indicate whether it is ready to receive data. When it is not ready, your data terminal turns off RTS. When it is ready to receive data, it turns on RTS.

Once the data terminal turns off RTS, flow from the ADM to the data terminal stops immediately. (This applies to Single-Stream only.)

When you select **off**, your data terminal has no way to control the flow of data from the ADM.

Once the data terminal sends an **xoff** character, the ADM may transmit a maximum of 15 characters to the data terminal. (This applies to both Single-Stream and AutoStream.)

* Mode 2 Protocol does *not* support Receive Flow Control. This option should be set to **off** while using Mode 2 Protocol (Data Mode B2).

Speed

- Option Values: 1200, 2400, 4800, **9600**, 19.2, 38.4, 57.6 kbps
- Applicable Data Protocols: All

Use this option to change the speed at which data communications take place. To set this option from an asynchronous attached terminal, do the following:

1. Type **set speed value** (for example, **set speed 9600**) to tell the ADM the speed at which you want to communicate.
2. Change your data terminal speed. (See your terminal's operating manual for instructions.)
3. Press **RETURN**.

You can also change the speed from your asynchronous data terminal (when the Autoadjust option is **on**) by pressing **BREAK**, typing **AT** and then pressing **RETURN**.

⇒ NOTE:

Using autoadjust only temporarily activates the current speed and parity. You can store speed and parity by setting the options through the voice terminal keypad or by copying data option profile pA to p1 (see "Data Option Profiles," later in this chapter).

Short, high quality cables are strongly recommended for use with high speeds: 38.4 and 57.6 kbps.

Text

- Option Values: **verbal**, diagnostic, off, q2_verbal, q2_diagnostic
- Applicable Data Protocols: All

This option determines whether the ADM provides call progress and error messages to your attached terminal during call setup and disconnection.

Call progress and error messages describe the status of your call. Select **verbal** if you want verbal messages to appear on your attached terminal during call progress. Select **diagnostic** if you want only a numeric diagnostic code to appear in addition to the progress message. Select **off** if you do not want to see these messages.

Q2_verbal and q2_diagnostic are similar to verbal and diagnostic, except that in AT Local Mode, the Q register is set to value 2.

See Appendix A "Cause Code Tables" for a listing of the error messages.

Trans.flow (Transmit Flow Control)

- Option Values: **xon/xoff**, eia, off
- Applicable Data Protocols: X.25, Mode 3, all V.120 modes, and Mode 2*

This option determines which method is used to control the flow of data from your data terminal to the ADM.

When you select **xon/xoff**, the ADM sends your data terminal an **xoff** character (with current parity) when it is not ready to receive data. The ADM sends an xon character (with current parity) to your data terminal when it is ready to receive data. This setting is appropriate for most users.

Select **eia**, if you want the ADM to use the Clear-to-Send (CTS) lead to indicate whether it is ready to receive data from your data terminal. When it is not ready to receive data from your terminal, the ADM turns off CTS. When it is ready to receive data, it turns on CTS.

Once the ADM turns off CTS, flow from the data terminal to the ADM stops immediately. Any information sent after CTS drops is lost.

* For a Mode 2 call, this option is in effect only at the high-speed endpoint (see Match.speed).

When you select **off**, the ADM cannot control the flow of data from your data terminal.

Once the ADM sends an **xoff** character, it will continue to accept up to 32 more characters of data from the data terminal.

V120.ps

- Option Values: **128**, 256
- Applicable Data Protocols: BV64I and BV56I

The V.120 packet size option determines the maximum number of data characters transmitted in a V.120 I-frame. In general, greater throughput may be achieved by using 256 character packets, however some other V.120 endpoints may not accept this packet size.

If this option is changed during an active data call, it will not take effect until the next data call.

V120.ws

- Option Values: 1 through 7 (default = 3)
- Applicable Data Protocols: BV64I and BV56I

The V.120 window size option determines the maximum number of outstanding (unacknowledged) V.120 I-frames. Under normal circumstances you need not change this option value.

If this option is changed during an active data call, it will not take effect until the next data call.

Data Option Profiles

This section describes the available data option profiles and how to create and use your own profiles.

Types of Data Option Profiles

A data option profile is a group of option settings. You create a profile by selecting values for each option. Option settings determine in precise and specific ways how your ADM operates. Your ADM has the capability to access up to six profiles:

- active profile (pA)
- factory profile (p0)
- user programmable stored profile 1 (p1, the power-up profile)
- user programmable stored profile 2 (p2)
- user programmable stored profile 3 (p3)
- user programmable stored profile 4 (p4)

The very first time an ADM is powered up, p1 through p4 are identical to p0.

Active Profile, pA

The active profile, pA, contains the values of the options that are currently in use. To change the value of data options within pA, you must use the set command (see below); you cannot use the program command to change pA.



NOTE:

Changes to pA are not automatically saved. See the next section “User Programmable Stored Profiles”.

Factory Profile, p0

This profile, p0, contains the factory default option settings. The option values associated with the factory profile are stored permanently in memory and cannot be changed or programmed. Table 4-1 shows the option values for p0; the settings are in bold.

User Programmable Stored Profiles, p1 through p4

Profile 1 (p1) contains the option settings that are automatically loaded into the ADM each time it is powered up. Therefore, you need to put the option values in p1 that you will use most often. After a power failure, p1 automatically gets loaded into pA. Profiles p2 through p4 can be used to store additional profiles.

To use the option settings in a stored profile like p2, you must activate them; at the `CMD:` prompt, type: **copy p2 to pA** The system responds:

pA updated

To replace one stored profile with another, copy the replacement profile to the replaced profile; for example, type: ***copy p2 to p1***

The above command copies the values of p2 into p1 so they are identical.

Table 4-2 summarizes the information that is described in detail in the following sections.

Table 4-2. Data Option Profiles

Profile	Use	To view, type:	To edit, type:	To activate, type
Active Profile, pA	Settings used for data calls	view or view pA	setoption value (e.g., set parity even) To Store: copy pA to p1	(Activated for next data call)
p0	Stored Data Profile (Factory Profile)	view p0	Factory Profile (Cannot be changed)	copy p0 to pA
p1	Stored Data Profile (Copied to pA After self-test or power failure)	view p1	program p1	copy p1 to pA
p2	Stored Data Profile	view p2	program p2	copy p2 to pA
p3	Stored Data Profile	view p3	program p3	copy p3 to pA
p4	Stored Data Profile	view p4	program p4	copy p4 to pA

Creating (Programming) a Data Option Profile

It is possible for you to program profiles p1, p2, p3, and p4. Profile 1 (p1) is automatically loaded after a set self-test or power-up. The values of p1 should be set to your most frequently used settings.

To change the option values of any of the stored profiles use the program command. The program command provides a series of prompts to help you with this task.

The program command *cannot* be used to change option values in the active profile or the factory profile p0. To change the active profile, use the **set** command (see a later section in this chapter, "Setting Options: Changing Your Active Profile pA").

⇒ NOTE:

Speed and parity options can only be changed from your data terminal or PC by using the set command or by pressing **(BREAK)**, typing **AT** and pressing **(RETURN)** (providing the Autoadjust option is **on**).

To program any of the four stored profiles, follow this procedure.

1. At the **CMD:** prompt, type **program p1** and press **(RETURN)**.

The ADM displays the current option values for p1 and prompt:

Type option name (or Q to quit):

2. Type the name of the option (for example, **answer**) you want to change and press **(RETURN)**.

The ADM displays the current value and the possible values for that option and prompt:

Type new value (or Q to quit):

3. Type the new value (for example, **auto**) and press **(RETURN)** when you are finished.

- The ADM displays the new values and prompt again:

Type option name (or Q to quit):

- Type the name of the next option you want to change and repeat steps 2 and 3.
- When you are finished changing options, type **q** to quit.
- The ADM prompts:

Do you want to save the change(s) you must (Y or N)?

Type **y** to save new values.

The ADM responds:

p1 updated

Type **n** to cancel new values.

The ADM responds:

No changes to p1

- The ADM prompts:

Do you want to activate this profile now (Y or N)?

Type **y** to activate p1.

The ADM responds:

p1 copied to pA

Type **n** to not activate p1.

The ADM responds:

p1 not copied to pA

Setting Options: Changing Your Active Profile, pA

To change the option values in the active profile (pA), use the set command. The program command **cannot** be used to change options in pA.

To change an option value in pA, at the **CMD:** prompt type:

set option to value

For example:

set echo to on
set text to diagnostic

⇒ NOTE:

Values in pA are **not** automatically stored. Unless you only want to temporarily change options, it is important to save any changes by copying pA to one of the stored profiles. In the event of a power failure, pA values are overwritten by values in p1.

To store pA, at the **CMD:** prompt type: ***copy pA to p1*** or, for example, ***copy pA to p4***

⇒ NOTE:

In all of the above procedures, the word “to” is optional. Examples of the command without “to” are:

set echo on
set text diagnostic

Storing an Active Profile, pA

If you want to save the active profile as a stored profile, type: ***copy pA to p2***

The above command stores your active profile in p2. The system responds:

p2 updated

If you want to store your active profile in p1, repeat the steps above but substitute p1 for p2. Remember, in pA you cannot program your options; the settings in pA, therefore, are not automatically stored. You must copy pA to a stored profile (p1, p2, p3, or p4) so your active profile is not lost in the event of a power failure.

Activating a Stored Profile

To activate a stored profile, type the following command at the **CMD:** prompt:

copy profile to pA

For example, to activate p1, type: ***copy p1 to pA***. The ADM activates the profile requested and responds:

pA updated

Replacing One Stored Profile with Another

To replace one stored profile with another, type ***copy replacement profile to replaced profile***. For example, type: ***copy p0 to p1*** replaces the values of p1 with the values of p0.



NOTE:

In all of the above command procedures, the word “to” is optional. Examples of the command without “to” are:

```
copy p1 pA
copy pA p1
copy p0 p1
```

Viewing an Option Profile

To display the option values for any profile, use the view command. Type **view** to display the values of the active profile. Type **view p1** to display the values of stored profile p1. Replace p1 with p2, p3, p4, or p0 in the **view** command to display their values.



NOTE:

Remember that you can display the options on your data terminal screen and change them whenever you are in local mode (that is, **not** transmitting data). To suspend data mode and enter local mode, rapidly type the Attention sequence: **+++**. The system displays the **CMD:** prompt.

Viewing Individual Option Values within the Active Profile, pA

You can also use the view command to check the value of an option within the active profile. For example, to check the value of parity, type **view parity**. Both the current and possible values are displayed on your data screen, for example:

```
current value = even
possible values = even mark odd space
```

Typical Data Option Settings for Data Transfer

This section describes the options you may need to modify for three common types of data transfer.

Character by Character Transmission or ASCII File Transfer

For typical character by character data transmission, activate the factory profile (p0). Depending upon the network's configuration, it may be necessary to change the Mode option to DX25 or one of the V.120 modes. (Check with your system administrator for your system's configuration.)

Line/Block at a Time Transmission

You may want to either create or change a line or block of characters at a time before sending them to the far-end. (Typically, this operation is only applicable to X.25 data connections; see the explanation for Mode earlier in this chapter.)

First, activate the factory profile, p0. Second, set the Mode option to **DX25**. Third, set the Edit option to **on**. Fourth, change the Forwarding option from **off** to the desired value; typically this should be **cr**. Make sure the ADMs Echo option is set to **on** and the data terminal's echo option is set to off.

Binary (8-bit Data or Executable) File Transfer

Binary files may contain the xon/xoff characters which are normally used for flow control. Such file transfers require the flow control options, Rec.flow and Trans.flow, be set to **off** or **eia**. Many PC communications packages provide file transfer protocols which *mask* the xon/xoff characters for binary file transfers causing the files to appear as a text file to the ADM. Typically, such programs prompt you to specify if the file to be transferred is binary or text. You need to be concerned with the following constraints of binary file transfers only if you do not have such a program.

For a binary file transfer, both endpoints must be operating at the same speed and that speed must not exceed the effective throughput of the data channel.

If it does, **eia** flow control will be required. Note, however, that not all computer interfaces support **eia** flow control.

If your PC does not support **eia** flow control, you will have to set the flow control options to **off** and ensure that flow control is not required. That is, both endpoints must operate at the same speed and the speed cannot exceed the effective throughput capability of the data channel. (Even if these requirements are met, continuous file transfer without pauses can still fail because the speed of both endpoints are not exactly the same. This may result in buffer overflow at the receiving end.)

For D-channel packet data transmission, the effective throughput capability varies depending on network loading, but cannot exceed 18 kbps of asynchronous data. Therefore, for **DX25** mode, you must not set the speed of the endpoints greater than 9.6 kbps. Under significant network loading, the effective throughput capability may drop below this level and result in lost data. For Mode 2 protocol, the maximum effective throughput capability is 19.2 kbps of asynchronous data, therefore you must not set the endpoint speeds greater than 19.2 kbps. For Mode 3 and the V.120 modes, the effective channel throughput capability varies among endpoints but should be greater than 19.2 kbps. For these data modes, you may or may not be able to successfully transfer files at speeds as high as 38.4 or 57.6 kbps.

Worksheet — Option Profile Settings

Complete the following worksheet to record your desired option profile settings for p1, p2, p3, and p4. Information entered in this worksheet helps you when you are programming an option profile.

Table 4-3. Worksheet: Your Option Profile Settings

Option	p0 Values	p1 Values (power-up values)	p2 Values	p3 Value	p4 Values
Answer	automatic	_____	_____	_____	_____
Attention	+++	_____	_____	_____	_____
Autoadjust	on	_____	_____	_____	_____
Break	break	_____	_____	_____	_____
Char.erase	bs (Ctrl) - (H)	_____	_____	_____	_____
DCD	ignore	_____	_____	_____	_____
DTR	ignore	_____	_____	_____	_____
Echo	off	_____	_____	_____	_____
Edit	off	_____	_____	_____	_____
FCPN	off	_____	_____	_____	_____
Forwarding	off	_____	_____	_____	_____
Idle.timer	0	_____	_____	_____	_____
Line.erase	can (Ctrl) - (X)	_____	_____	_____	_____
Local.echo	on	_____	_____	_____	_____
Match.speed	on	_____	_____	_____	_____
Min.timer	on	_____	_____	_____	_____
Mode	B2	_____	_____	_____	_____
Rec.flow	xon/xoff	_____	_____	_____	_____
Text	verbal	_____	_____	_____	_____
Trans.flow	xon/xoff	_____	_____	_____	_____
v120.ps	128	_____	_____	_____	_____
v120.ws	3	_____	_____	_____	_____



NOTE:

We strongly recommend that after you complete the (Option Profile Settings) worksheet, you copy it and then post it where you can easily find it for reference.

Factory default speed and parity are set at 9600 bps and space, respectively. Speed and parity settings span **all** profiles. Speed and parity are stored across profiles by setting these options through the voice terminal keypad or by copying pA to p1 (even though speed and parity apply to all profiles, not just p1).

You can perform three tests on your 8500 series display set ADM: local loopback test, remote loopback test, and self-test. Taken together, these three tests help you isolate data communications problems.

Local Loopback Test

The purpose of the local loopback test is to ensure there are no data transmission errors in the local part of the data transfer circuit (between the data terminal and the ADM). When the local loopback test is initiated, data travels from the data terminal to the ADM, where it is looped back to the data terminal. You can do local loopback tests when the set is idle (local-idle mode) or when it is engaged in a data call (local-data mode).

To initiate a local loopback test, do the following:

1. At the **CMD:** prompt, type **test local** on your data terminal. The ADM displays:

```
LOCAL LOOPBACK TEST
ENTER ATTENTION SEQUENCE TO END TEST
```

2. Type characters on your terminal keyboard. They will be echoed on your screen.
 - If you find no errors, the ADM passed the test.
 - If you find errors, refer to Chapter 6, "Troubleshooting."
3. Rapidly type the Attention sequence (default value is +++) to end the test. The ADM displays:

```
LOCAL LOOPBACK TEST ENDED
```

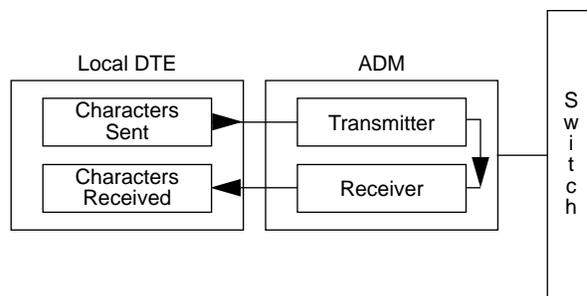


Figure 5-1. Local Loopback Test

Remote Loopback Test

This test requires compatible AT&T equipment at the remote end.

The remote loopback test ensures that no problems with data transmission are occurring in the data transfer circuit. When you initiate a remote loopback test, data is transmitted from the module at the far-end, where it is looped back to your ADM. A data call must be established before you initiate a remote loopback test.

To initiate a remote loopback test, do the following:

1. Establish a data call.
2. Rapidly type the Attention sequence (default value is +++).
3. At the **CMD:** prompt, type **test remote** on your data terminal. The ADM displays:

```
REMOTE LOOPBACK TEST
ENTER ATTENTION SEQUENCE TO END TEST
```

If you are not on a data call, the ADM displays:

```
Test Remote cannot be used at this time
```

4. Type characters on your terminal keyboard and check to see they are echoed as typed.
 - If you find no errors, the ADM passed the test.
 - If you find errors, refer to Chapter 6, "Troubleshooting."
5. Rapidly type the Attention sequence (default value is +++) to end the test. Ending the test does not end the call. You will return to local mode, and the ADM will be ready to transmit data. The ADM responds:

```
Call Status: Data Call Active
Type H for help.
```

6. At the **CMD:** prompt, type **continue** to return to Data Mode.

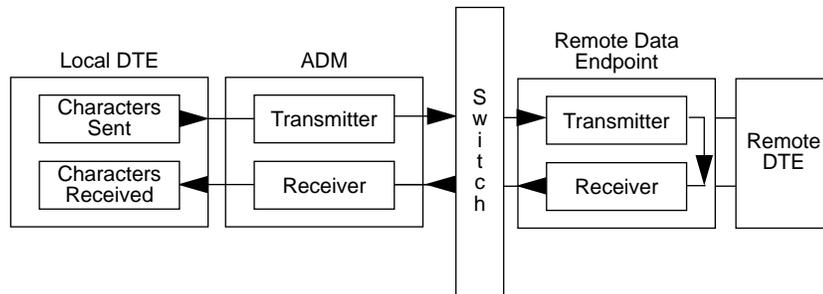


Figure 5-2. Remote Loopback Test

Self-Test

The self-test can be used to reset the data options in the Active profile. Unlike the Data Reset command (see “Use of the Data Reset Command to Clear a Lock-up ADM” in Chapter 6, “Troubleshooting”), which resets the options to factory default values, the self-test resets all the data options in the Active profile to their power-up (p1) values without unplugging the ADM. The self-test also loads the power-up values for the profile independent data options (speed, parity, and local mode) and the unstored data options (local.cr local.lf, and local.erase). Activation of the self-test will terminate any voice or data calls in progress.

The procedure for self-test is described in the appropriate User’s Manual as follows:

- *ISDN 8510 Display Terminal User’s Manual, 555-021-736*
- *ISDN 8520 Display Terminal User’s Manual, 555-021-758*
- *ISDN 8528 Voice Terminal User’s Manual, 555-021-776.*

Using Reset to Clear a Locked-up ADM

The following is a list of circumstances which can result in a lock-up condition between the ADM and your data terminal or PC. Note, there may be other similar conditions which will cause a lock-up as well.

- If you inadvertently issue some Enhanced AT commands, subsequent commands, or even keypad depressions on the 8500 series display set, the ADM may ignore or misinterpreted the command. This is because Enhanced AT applications can be used to monitor and control both voice and data.
- If the receive flow control option in the ADM is set to **EIA** and your data terminal or PC does not implement the request to send EIA lead, the ADM will be permanently in a flow controlled state.

- If the autoadjust option is off and your data terminal or PC is running at a different speed than the ADM, you will not be able to communicate.
- If you inadvertently set the local.cr option to the space character, you will not be able to set it back.

The Data Reset command allows you to reset all the data options in the active profile to their factory default (p0) values. It also loads the factory values for the profile independent data options (speed, parity, and local mode) and the unstored data options (local.cr, local.lf, and local.erase). The Data Reset command does not, however, change the data options in the stored profiles (p1 through p4). After you find the source of the lock-up, you will probably want to change the value of that option in one of the stored profiles.

To perform Data Reset to load the factory (p0) data option values into the Active profile follow this procedure:

1. If you have an 8510 or 8528 display terminal, press **Menu** to access the main softkey menu, and then press **Next ▶** to access the second menu display. The following is displayed on the 8510 and 8528 display terminal screen:

```
<          MENU
Test  Data
```

If you have an 8520 display terminal, press **Menu** to access the main softkey menu. The following is displayed on the 8520 display terminal screen:

```
          MENU
Directory          Data
Call Log          Set Spkr
Lock              Set Clock
Options          Home Screen
```

2. Press the softkey associated with Data.

The following is displayed on the 8510 and 8528 display terminal screen:

```
DATA      (Not Active)
DataOptions Call Done
```

The following is displayed on the 8520 display terminal screen:

```
DATA      (Not Active)

Data Options
Call                               Done
```

3. Press the softkey associated with DataOptions OR Data Options.

The following is displayed on the 8510 and 8528 display terminal screen:

```
DATA OPTIONS >
Change ViewCurrent Done
```

The following is displayed on the 8520 display terminal screen:

```
DATA OPTIONS

Indicator
Change Options      Reset
View Current        Done
```

4. If you have an 8510 or 8528 display terminal, press to access the second DATA OPTIONS screen.

The following is displayed on the 8510 and 8528 display terminal screen:

```
< DATA OPTIONS
Reset Indicator Done
```

5. Press the softkey associated with `Reset`.

The following is displayed on the 8510 and 8528 display terminal screen:

```
SET ACTIVE TO DEFAULT?
Yes No
```

The following is displayed on the 8520 display terminal screen:

```
SET ACTIVE PROFILE TO
DEFAULT VALUES?
Yes No
```

6. Press the softkey associated with `Yes`. A confirmation screen is displayed.

⇒ NOTE:

If you have an 8520 display terminal, you can choose to turn confirmation messages off.

Self-Test

Although it is not recommended, self-test can also be used to reset the data options in the Active profile. Unlike Data Reset, which resets the options to their factory default values, the self-test resets all the data options in the Active profile to their power-up (p1) values and loads the power-up values for the profile independent data options (speed, parity, and local mode) and the unstored data options (local.cr, local.lf, and local.erase). It also clears all the items stored in CallLog. Activation of the self-test will terminate any data call in progress. For more information on self-test, refer to “Self-Test” section in Chapter 5, “Testing.”



CAUTION:

Using Self-test will clear the call log.

Technical Information

7

EIA-232-D Lead Operation

The following description assumes single-stream operation, which is the case when API is not being used. Refer to the *ISDN Application Programming Interface Programmer's Reference Manual* for more information on single-stream and autostream.

This section describes the assignments of the EIA-232-D leads.

Table 7-1. Interface to Attached Terminal

Pin	Direction	Function	EIA Circuit Mnemonic
2	To ADM	Transmitted Data	BA
3	From ADM	Received Data	BB
4	To ADM	Request-to-Send	CA
5	From ADM	Clear-to-Send	CB
6	From ADM	DCE Ready	CC
7		Signal Ground	AB
8	From ADM	Received Line Signal Detector	CF
20	To ADM	DTE Ready	CD
22	From ADM	Ring Indicator	CE

Pin 2 — Transmitted Data (BA)

The ADM receives data from the attached data terminal at 98 to 101 percent of the selected speed. The data from the attached terminal must have one start bit, eight information bits, and at least one stop bit. The ADM ignores parity in the local mode (except for xon/xoff flow control) and transports it transparently in the data mode. The ADM supports only ASCII-formatted data in the local mode. The ADM recognizes a BREAK signal as 10 bits of spacing plus 20 milliseconds. The setting of the BREAK option governs the ADMs response to break in the data mode.

Pin 3 — Received Data (BB)

Signals on this circuit are generated by the ADM in response to data received from the remote data equipment or to user commands from the data terminal. This circuit is held in the MARK state when Received Line Signal Detect is OFF except for user testing and during the Local Mode. The ADM transmits the BREAK signal as 200 milliseconds of SPACE.

In the data mode, data transmitted to the data terminal consists of one start bit, eight information bits, and one stop bit. The parity of data received from the network is transported to the data terminal without alteration, except if requested to do so by X.29 message from a remote X.25 host.

In the Local Mode, data to the data terminal consists of one start bit, eight ASCII formatted information bits, and one stop bit. The parity is set as indicated by the parity option.

Pin 4 — Request-to-Send (CA)

For data modes other than Mode 2, the Request-to-Send circuit can be used by the data terminal to control data transmission depending on how the Receive Flow Control option is set. If the rec.flow option (Receive Flow Control option) has been set to **eia**, this lead is utilized as follows: ON - indicates the data

terminal is ready to receive data, OFF - indicates the data terminal is not ready to receive data.

If the Rec.Flow option has been set to **xon/xoff**, the Request-to-Send signal is ignored.

Pin 5 — Clear-to-Send (CB)

For data modes other than Mode 2, the Clear-to-Send circuit is controlled by the ADM to indicate when data can be received from the data terminal. If the trans.flow option (Transmit Flow Control option) has been set to eia, Clear-to-Send is used for flow control as follows: ON - the ADM is ready to receive data, OFF - the ADM is not ready to receive data. For Mode 2, this transmit flow control operation applies when the physical EIA port speed is higher than the current channel throughput (handshake) speed.

Pin 6 — Data Set Ready (CC)

Data Set Ready is ON while power is available.

Pin 7 — Signal Ground (AB)

This circuit provides the common reference level for all signals at this interface. Signal ground is direct current isolated from the power source.

Pin 8 — Received Line Signal Detect (CF)

This circuit indicates the presence of a data call connection. If the DCD option is set to IGNORE, the Received Line Signal Detect circuit is ON while power is available, turning OFF for one second after a call has been cleared. If the **DCD** option is set to FOLLOW, the signal on this circuit is ON after a call has been connected and goes OFF once the call has been cleared.

Pin 20 — Data Terminal Ready (CD)

This circuit allows the attached terminal to control the ADMs connection to the network. When the DTR option is set to FOLLOW, the ADM requires an ON condition to interact with the attached terminal or to initiate or maintain a data connection or test sequence (except the local self-test). If the attached terminal drops DTR for more than 50 milliseconds during data call setup, while in the data transfer mode, or during a test sequence, the ADM clears the call or terminates the test.

When the DTR option is set to IGNORE, the ADM ignores the DTR lead. Thus, dropping the DTR lead will not cause a call to be cleared.

Pin 22 — Ring Indicator (CE)

A pulsed signal appears on this circuit when the data terminal receives an incoming data call. This signal is maintained until the data terminal answers or clears the call, or until the network clears the call attempt. The cadence is designed to simulate ringing: two seconds on and four seconds off. The initial pulse remains on for a minimum of one second.

Packet Assembler Disassembler (PAD) Capabilities

The ADM options provide capabilities outlined in the CCITT X.3, X.28, and X.29 specifications. The local mode commands provide the functions analogous to those specified in X.28. The ADM supports receipt of X.29 SET and READ parameter messages received from a remote X.25 host.

Receipt of an X.29 SET command with no parameters (defined by CCITT to mean "load initial profile") causes the ADM to restore the PAD parameter values which were active at the start of the data call.

ADM Options Relative to CCITT Recommendation X.3 Parameters: CCITT Recommendation X.3 defines certain parameters for an X.25 PAD. The CCITT assigns reference numbers by which these parameters are identified and assigns different values to each parameter. The parameter values are also represented by a number. Table 6-1 gives the parameter reference numbers and parameter values that the ADM supports. Parameter 101 can be set via X.29, but is not an X.3 parameter. Other ADM options that are not in this table are not X.3 parameters and are not settable or readable via X.29.

Table 7-2. X.3 Parameters

Parameter Reference Number	Parameter Description	Selectable Values	Parameter Meaning	Class*		
				R/W	RO	NI
1	Pad Recall character	0 1 2-127, except 8,17,19,21,24	Pad Recall Disabled Character DLE As coded in ASCII	X		
2	Echo	0 1	No echo Echo	X		
3	Selection of data forwarding character	0 1 2 126 127	None Alphanumerics (A-Z, a-z, 0-9) Carriage Return All Control Characters + DEL All Characters	X		
4	Selection of idle timer delay	0 1-255	No Idle Timer Value in twentieths of a second	X		
5	Transmit Flow Control (PAD indicates to DTE)	0 1 2 127	None Use of X-ON/X-OFF Use of X-ON/X-OFF Use of EIA leads	X		
6	Control of PAD Service Signals	0 8 9	Off Verbose Mode Numeric Mode	X		
7	Selection of operation of the PAD on receipt of Break signal	0 1 2 5 8 21	Break ignored Interrupt Reset Interrupt and Indicate Break Pad Recall Discard output, interrupt and indicate Break	X		
8	Discard output	0 1	Normal data delivery Discard output	X		
9	Padding after carriage return	0 1-7	No padding after CR Number of padding characters (NULs) inserted after CR	X		
10	Line folding (CRLF insertion after N characters)	0 1 - 255	No line folding Number of characters per line	X		

(Continued)

* R/W = Read/Write, RO = Read Only, NI = Not Implemented

Table 7-2. X.3 Parameters (continued)

Parameter Reference Number	Parameter Description	Selectable Values	Parameter Meaning	Class*		
				R/W	RO	NI
11	Binary speed of start-stop DTE	3	1200 bit/s			
		12	2400 bit/s			
		13	4800 bit/s			
		14	9600 bit/s			
		15	19200 bit/s			
		19	38400 bit/s			
12	Receive Flow Control (DTE indicates to PAD)	0	None	X		
		1	Use of xon/xoff			
		127	EIA leads			
13	Linefeed insertion after carriage return	0	No line feed insertion	X		
		1	Insert LF after transmission of CR to DTE from DTE			
		4	Insert LF after echo of CR to DTE			
		5	Combination 1 + 4			
14	Padding after LF	0	No padding after linefeed	X		
15	Editing	0	No editing	X		
		1	Editing in Data Mode			
16	Character Erase	0	None (off)	X	X	
		8	Backspace (^H)			
		35	#			
		127	DELETE			
17	Line Erase	0	None (off)	X	X	
		24	CAN (^X)			
		21	NAK (^U)			
		64	@			
18	Line Display					X
19	Editing PAD service signals	2	Editing PAD service signals for display terminals	X		
20	Echo Mask					X
21	Parity Treatment	0	No checking or generation	X		
		2	Parity generation			
22	Page Wait					X
101	Remote Loopback	0	Remote Loopback disabled	X		
		1	Remote Loopback enabled			

Appendix A — Cause Code Tables

A

The Text option allows you to select numeric (diagnostic) or verbal formats for the ADMs presentation of network generated call progress and error code information. These tables are used to translate between numeric codes and their English text equivalents.

In the following tables, there are references to unknown numeric cause and diagnostic codes in the form of xxx and nnn. Both xxx and nnn refer to one, two, or three digit numeric values that may appear. At this time, no English translation exists for these codes.

Table A-1 shows CCITT X.25 cause messages associated with D-channel packet switched data calls. Tables A-2 and A-3 show CCITT Q.931 signal and cause messages associated with B-channel circuit switched data calls.

Table A-1. X.25 Cause Messages

Packet Type Stimulus			40 Character LCD & EIA Port Verbal Text	24 Character LCD Abbreviated Text
Clear Decimal Cause,Diag.	Reset Decimal Cause,Diag.	Restart Decimal Cause,Diag.		
ENDED	RESET	RESTART		
0,0 or 128,0 0,nnn or 128,nnn	0,0 or 128,0 0,nnn or 128,nnn		FAR END REQUESTED FAR END REQUESTED, nnn	FAR END REQUESTED FAR END, nnn
1,0 or 129,0 1,72 or 129,72 1,nnn or 129,nnn			BUSY CALL COLLISION BUSY, nnn	BUSY CALL COLLISION BUSY, nnn
3,0 or 131,0 3,65 or 131,65 3,66 or 131,66 3,nnn or 131,nnn			INVALID FACILITY REQUEST FACILITY CALL NOT ALLOWED FACILITY NOT ALLOWED INVALID FACILITY REQUEST, nnn	INVALID FACILITY CALL NOT ALLOWED FAC NOT ALLOWED INVALID FAC, nnn
5,0 or 133,0 5,nnn or 133,nnn	7,0 or 135,0 7,nnn or 135,nnn	3,0 or 131,0 3,nnn or 131,nnn	NETWORK BUSY NETWORK BUSY, nnn	NETWORK BUSY NETWK BUSY, nnn
9,0 or 137,0 9,nnn or 137,nnn	1,0 or 129,0 1,nnn or 129,nnn		OUT OF ORDER OUT OF ORDER, nnn	OUT OF ORDER OUT OF ORDER, nnn
11,0 or 139,0 11,nnn or 139,nnn			ACCESS BARRED ACCESS BARRED, nnn	ACCESS BARRED ACCESS BARD, nnn
13,0 or 141,0 13,67 or 141,67 13,68 or 141,68 13,nnn or 141,nnn			UNOBTAINABLE ADDRESS INVALID CALLED ADDRESS INVALID CALLING ADDRESS UNOBTAINABLE ADDRESS, nnn	UNOBTAINABLE # INVALID CALLED # INVALID CALLING # UNOBTAINABLE, nnn
17,0 or 145,0 17,nnn or 145,nnn	3,0 or 131,0 3,nnn or 131,nnn		REMOTE PROCEDURE ERROR REMOTE PROCEDURE ERROR, nnn	REMOTE ERROR REMOTE ERROR, nnn
19,0 or 147,0 19,34 or 147,34 19,67 or 147,67 19,68 or 147,68 19,nnn or 147,nnn	5,0 or 133,0 5,nnn or 133,nnn	1,0 or 129,0 1,nnn or 129,nnn	LOCAL PROCEDURE ERROR ONE WAY INCOMING ONLY INVALID CALLED ADDRESS INVALID CALLING ADDRESS LOCAL PROCEDURE ERROR, nnn	LOCAL ERROR ONE WAY IN ONLY INVALID CALLED # INVALID CALLING # LOCAL ERR, nnn
21,0 or 149,0 21,nnn or 149,nnn	29,0 or 157,0 29,nnn or 157,nnn		NETWORK OUT OF ORDER NETWK OUT OF ORDER, nnn	NETWORK DOWN NETWORK DOWN, nnn
25,0 or 153,0 25,nnn or 153,nnn			REVERSE CHARGES REJECTED REVERSE CHARGES REJECTED, nnn	REV CRGS REJECTED REV CRGS REJ, nnn
33,0 or 161,0 33,nnn or 161,nnn	17,0 or 145,0 17,nnn or 145,nnn		INCOMPATIBLE DESTINATION INCOMPATIBLE DESTINATION, nnn	INCOMPATIBLE DEST INCOMPAT DST, nnn
	15,0 or 143,0 15,nnn or 143,nnn	7,0 or 135,0 7,nnn or 135,nnn	NETWORK OPERATIONAL NETWORK OPERATIONAL, nnn	NETWK UP NETWK UP, nnn
	9,0 or 137,0 9,nnn or 137,nnn		REMOTE DTE OPERATIONAL REM DTE OPERATIONAL, nnn	REMOTE DTE UP REM DTE UP, nnn
xxx,0 xxx,nnn	xxx,0 xxx,nnn	xxx,0 xxx,nnn	CAUSE xxx CAUSE xxx, DIAGNOSTIC nnn	xxx xxx, nnn

Table A-2. Q.931 Signal Messages

Decimal Value	LCD and EIA Port Text
0	DIAL TONE ON
1	RINGING
2	INTERCEPT TONE ON
3	REORDER TONE ON
4	BUSY TONE ON
5	CONFIRM TONE ON
6	ANSWER TONE ON
7	CALL WAIT TONE ON
8	O-H WARNING TONE ON
9	CUSTOM TONE ON
11	BUSY VERIFY TONE ON
12	ERROR TONE ON
13	STUTTER DIAL TONE ON
26	RECALL DIAL TONE ON
127	UNSPECIFIED TONE
253	COSTLY ROUTE TONE ON
nnn	SIGNAL nnn

Table A-3. Q.931 Cause Messages

Decimal Value	EIA Port Text	LCD Text
1	Unassigned number	1
2	No route to specified network	2
6	Channel unacceptable	6
16	Normal, clearing	16
17	User busy	BUSY
18	No user responding	NO RESPONSE
19	No answer from user (user alerted)	NO ANSWER
21	Call rejected	21
22	Number changed	22
27	Destination out of order	27
28	Invalid number format (incomplete number)	28
29	Requested facility rejected	29
30	Response to STATUS ENquiry	30
31	Normal, unspecified	31
34	No channel available	34
35	Call queued	35
41	Temporary failure	41
42	Network congestion	42
43	Access information discarded	43
47	Resources unavailable, unspecified	47
50	Requested facility not subscribed	50
52	Outgoing calls barred	52
54	Incoming calls barred	54
58	Bearer capability not presently available	58
63	Service or option not available	63
65	Bearer service not implemented	65
66	Channel type not implemented	66
69	Requested facility not implemented	69
79	Service or option not implemented, unspecified	79
81	Invalid call reference value	81
82	Identified channel does not exist	82
85	Invalid digit value for number	85
86	Call having requested call identity has been cleared	86
88	Incompatible destination	88
91	Transit network does not exist	91
96	Mandatory information element is missing	96
97	Message type non-existent or not implemented	97
98	Message not compatible with call state	98
100	Invalid information element contents	100
111	Protocol error, unspecified	111
127	Interworking, unspecified	127
ALL OTHERS	nnn	Cause nnn

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A

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