AT&T

AT&T 7400A Data Module
User's Guide

FCC NOTICE

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

DOCUMENT ORDERING INFORMATION

> While reasonable efforts were made to ensure that the information in this document was complete and accurate at the time of printing, AT&T can assume no responsibility for any errors. Changes or corrections to the information contained in this document may be incorporated into future reissues.

IMPORTANT SAFETY INSTRUCTIONS

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

- Read and understand all instructions.

- Follow all warnings and instructions marked on the product.

- This product can be hazardous if immersed in water. To avoid the possibility of electric shock, do not use when you are wet. If you accidentally drop it into water, do not retrieve it until you have first unplugged the line cord from the modular wall jack. Do not plug the telephone back in until it has dried thoroughly.

- Avoid using the telephone (other than a cordless type) during electrical storms in your immediate area. There is a remote risk of electric shock from the lightning. Urgent calls should be brief. Even though your telephone company may be using protective measures to limit electrical surges from entering your building, absolute protection from lightning is impossible.

- If you suspect a 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 this telephone through housing slots as 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.

- To reduce the risk of electric shock, do not disassemble this product. There are no user serviceable parts inside. Opening or removing covers may expose you to hazardous voltages. Incorrect reassembly can cause electric shock when the telephone is subsequently used.

- Disconnect the cords on this product before cleaning. Do not use liquid cleaners or aerosol cleaner. Use a damp cloth for cleaning.

- Slots and openings in the housing and the back or bottom are provided for ventilation to protect it from overheating, these openings must not be blocked or covered. The opening should never be blocked by placing the product on a sofa, rug, or other similar surface. This product should never be placed near or over a radiator or heat register. This product should not be placed in a built-in installation unless proper ventilation is provided.

- This product 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 people walking on it.

- Do not overload wall outlets and extension cords as this can result in the risk of fire or electric shock.

- Disconnect the cords on this product and refer servicing to qualified service personnel under the following conditions:

    A.   When the power supply cord or plug is damaged or frayed.

    B.   If liquid has been spilled into the product.

    C.   If the product has been exposed to rain or water.

    D.   If the product does not operate normally by following the operating instructions. Adjust only those controls that are covered by the operating instructions because improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the product to normal operation.

    E.   If the product has been dropped or the housing has been damaged.

    F.   If the product exhibits a distinct change in performance.

⚠ **SAVE THESE INSTRUCTIONS**

When you see this symbol on the product, refer to the instruction booklet packed with the product for more information before proceeding.

List of Figures

1   Chapter 1: Introduction

2   Chapter 2: Installation

3 Chapter 3: Using the Front Panel

Contents

About This Guide

About This Guide

The purpose of this guide is to provide information for installing, operating, and maintaining the 7400A Data Module. Because the primary purpose of the 7400A is modem pooling, this document has been written accordingly.

AUDIENCE

This guide is written for technical people with a knowledge of data communications hardware used in asynchronous data transfers. The reader should have an understanding of the EIA-232-D* standard and modems with AT&T D-lead or Hayes-compatible AT command control.

TYPOGRAPHICAL CONVENTIONS

Several type styles are used in this guide to represent information presented on the front panel of the data module and data displayed on the screen of a terminal device. The following table shows examples of the type styles used in this guide.

Example	Usage Description
NEXT / NO o r *DCD*	Slanted, block-style characters in all capital letters are used for labels printed on the front panel of the data module. These labels are associated with the push buttons, light emitting diodes (LEDs), and specific character positions of the LED message display.
ANS/ORIG CALL?	Typewriter-style characters in all capital letters are used for messages presented on the 16-character LCD message display of the data module.
ath [Enter]	Typewriter-style characters in lowercase are used for commands that you type on the keyboard, if data terminal equipment is used with the data module. The [Enter] symbol indicates that you must press the "Enter" key on the terminal keyboard to complete or send the command.
O K	Italic characters in all capitals letters are used for responses returned to the terminal display, if data terminal equipment is used with the data module.

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* Formerly RS-232-C.

ORGANIZATION OF THIS GUIDE

The information in this guide is presented in seven chapters and three appendices, with a glossary and index at the rear. The chapters and appendices of this guide are organized as follows:

Chapter 1: Introduction. Provides an overview of the operating interfaces that make the 7400A Data Module suitable for a variety of data communications tasks and describes the external features that assist you in configuring the data module for your application.

Chapter 2: Installation. Outlines procedures for preparing and installing the data module for operation in DTE and DCE applications, in single and multiple installations.

Chapter 3: Using the Front Panel. Discusses how to configure and test the 7400A Data Module using the pushbuttons and display on the front panel. Also discussed is each option of the 7400A's main menu.

Chapter 4: DTE Operation — Modem Pool Applications. Discusses how to configure and operate the 7400A Data Module as a DTE device for use in modem pool applications.

Chapter 5: DTE Troubleshooting. Provides troubleshooting guidelines specific to operational problems that may be encountered when using the 7400A Data Module in a DTE application.

Chapter 6: DCE Operation — Terminal Device Applications. Discusses how to configure and operate the 7400A Data Module as a DCE device to connect a local terminal device to a far end device.

Chapter 7: DCE Troubleshooting. Provides troubleshooting guidelines specific to operational problems that may be encountered when using the 7400A Data Module in a DCE application.

Appendix A: AT Command Interface—AT Commands. Contains an explanation of each AT command accepted by the 7400A Data Module.

Appendix B: AT Command Interface—S-Registers. Contains an explanation of each S-register used by the AT Command Interface of the 7400A Data Module.

Appendix C: AT Command Interface—Quick Reference. Contains quick-reference summaries for the AT Command Set S-registers, and other data used by the AT Command Interface.

Appendix D: Hardware Wiring Configurations. Contains basic wiring configurations for 7400A cabling and circuitry.

RELATED PUBLICATIONS

The following is a list of other manuals that may provide helpful information while installing and using the 7400A Data Module. Since each user may have different equipment and software preferences or availability, only generic titles are given for the manuals.

If you are using a terminal device other than a personal computer (PC):

User's guide for your terminal device. You may need information about the configuration and capabilities of your terminal device from this manual during the installation and preliminary operation of the 7400A Data Module.

If you are using a PC as your terminal:

User's guide for Microsoft®MS-DOS®. You may need this reference for explanations of commands used by your PC to install, configure, and run your data communications software.

User's guide for your data communications software. You may need this guide for information on how to configure your terminal emulation software to access the 7400A Data Module.

If you are installing the data module in a rack-mounting:

This book, the **7400A Data Module User's Guide,** offers only basic installation information for the 77A Data Mounting. For more specific details, refer to the installation instructions for the 77A Data Mounting and associated hardware, titled **Installing the 7400A or 7500A Data Module in a 77A Data Mounting,** manual 555-020-101.

Once rack mounting is complete, you must option the modem. For this, use the instructions found in the **AT&T 7400A Data Module Modem Pool Installation Guide,** which has been packaged and delivered with the 7400A. Its order number is 555-020-708.

Application notes are available for administering AT&T PBX systems to recognize the 7400A Data Module:

AT&T DEFINITY Communications System Generic 1 and System 75 7400A Data Module Application Notes for External Modem Pooling, Order No. 555-209-016.

AT&T DEFINITY Communications System Generic 1 and System 75 7400A Data Module Application Notes for Host Access Operation, Order No. 555-209-015.

AT&T System 85 7400A Data Module Modem Pooling Operation Application Notes, Order No. 555-109-005.

AT&T System 85 7400A Data Module Host Access Operation Application Notes, Order No. 555-109-004.

1   Chapter 1: Introduction

Chapter 1: Introduction

This chapter provides an overview of the operating interfaces that make the 7400A Data Module suitable for a variety of data communications tasks and describes the external features that assist you in configuring the data module for your application.

The 7400A is a full-duplex asynchronous data module for the Digital Communications Protocol (DCP) environment and is designed to work where the integration of voice and data is not required. The 7400A supports asynchronous connections at speeds up to 19.2 Kbps via an EIA-232-D interface.

By means of a reversible circuit board, the 7400A can be configured for DTE or DCE use.

Data Terminal Equipment (DTE)

When configured as DTE, the 7400A is used in a PBX modem pool and supports:

- asynchronous modem pooling
- D-lead and AT-command modems
- both rack-mounted and stand-alone configurations for AT-command type modems
- rack-mounted configurations for D-lead modems
- a variety of AT-command modems of other manufacturers.

Data Communications Equipment (DCE)

When configured as DCE, the 7400A functions as a modem between a terminal device (DTE) and the PBX. In addition to a Hayes AT interface, the 7400A also supports a Keyboard Dial and an Answer Only interface.

Compatible AT&T PBX Systems

The following AT&T PBX systems can be administered to operate with the 7400A Data Module:

- DEFINITY ® Communications System Generic 1
- DEFINITY ® Communications System Generic 2
- AT&T System 75
- AT&T System 85

**FEATURES COMMON TO
ALL CONFIGURATIONS**

You can control the following operations via the 7400A's front panel:

- option settings (except for AT Command interface options)
- test modes
- adjustment of the contrast on the display
- Answer/Originate and busyout
- asynchronous full-duplex operation.

**Asynchronous DCE
Features**

The following features are available in DCE operation:

- ability to set data options from the keyboard of your data terminal equipment using the AT Command interface
- call control from the EIA interface
- automatic or manual answering of incoming data calls
- data rates of 300, 1200, 2400, 4800, 9600, and 19,200 bits per second.

**Asynchronous DTE
(Modem Pooling) Features**

The following features are available in DTE operation:

- data rates of 300, 1200, 2400, 4800, 9600, and 19,200 bits per second
- asynchronous full-duplex operation
- full asynchronous operation in a modem pool
- use of Hayes-compatible modems in a modem pool
- automatic answering of incoming data calls
- AT or D-lead originate, off-hook control of associated modems, including the following:
  - ➤ AT&T 212, 2224A, 2224G*, 2296A* modems
  - ➤ Hayes Smartmodem™ 1200, 2400
  - ➤ a variety of AT-command modems of other manufacturers.

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*Supports both D-lead originate or AT-command interfaces.

OPERATING INTERFACES   Several operating interfaces allow the 7400A Data Module to be configured for DCE or DTE applications. **A** block diagram of typical data module configurations with a DEFINITY PBX system is shown in Figure 1-1. The following paragraphs offer an overview of these interfaces and the applications for which they may be used.
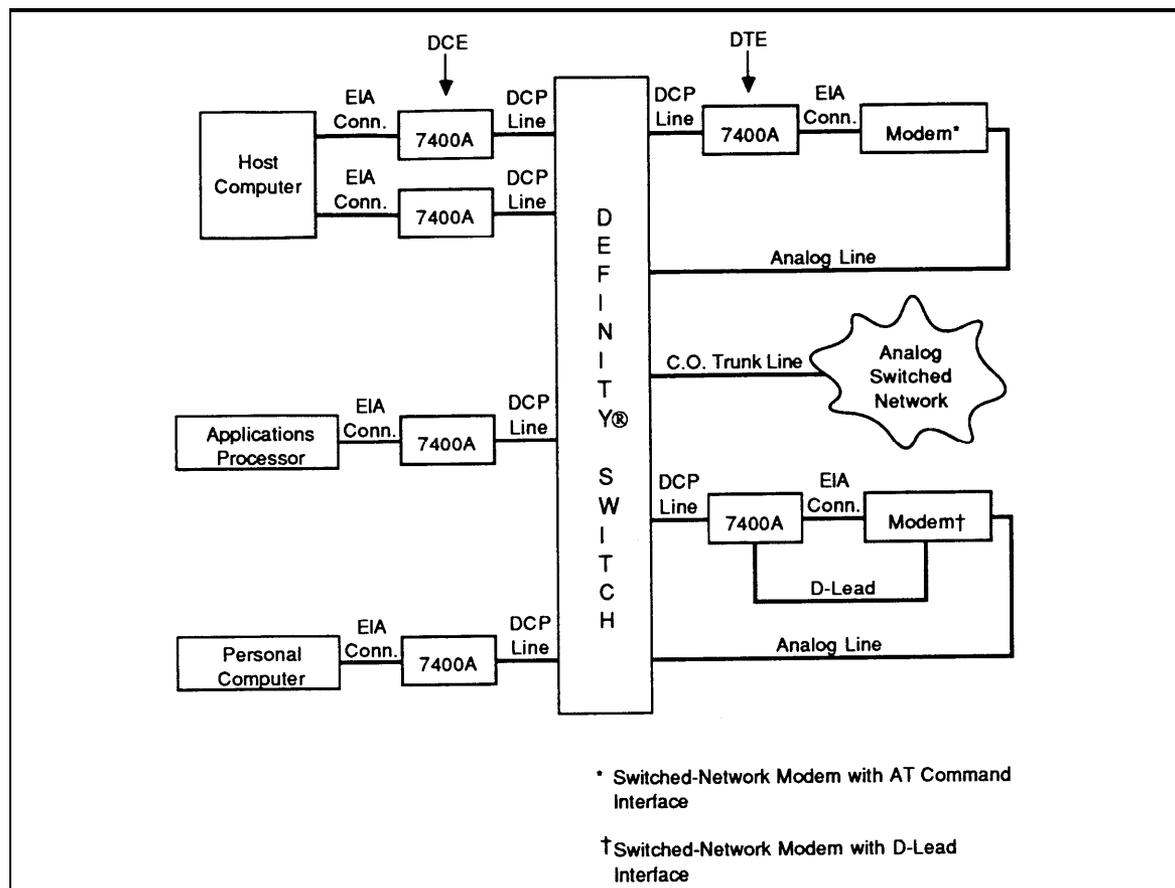
FIGURE 1-1
Typical Data Module Applications with a DEFINITY PBX system

DTE Interface   A DTE is an end-point device, such as a terminal, a printer, or a host computer, that sends and/or receives data from a DCE device. A DCE is a device, such as a modem, that provides the functions required to establish, maintain, and terminate a data communications connection.

Note: Unless a specific DTE device is intended, the words *terminal device* shall be used throughout this guide to represent any applicable DTE device, including a dumb terminal, a printer, a plotter, or a personal computer (PC) with an appropriate data communications software package.

The 7400A Data Module can be configured to operate as a DTE device to connect a modem to the PBX in a modem pool application. Procedures for installing the data module in the DTE configuration are included in Chapter 2, *"Installation,"* and instructions for using the data module in DTE applications are provided in Chapter 4, *"DTE Operation — Modem Pool Applications."*

DCE Interfaces

The 7400A Data Module can be configured for one of three DCE interfaces, which includes AT Command, Keyboard Dial, and Answer Only. Procedures for installing the data module for all DCE interfaces is included in Chapter 2, *"Installation,"* and instructions for using the data module in DCE applications are provided in Chapter 6, *"DCE Operation — Connecting to a Terminal Device.* The following paragraphs offer a brief description of each DCE interface.

Answer Only Interface

The 7400A Data Module can be configured to operate with a terminal device using the Answer Only interface. With this interface, the 7400A Data Module can be configured to answer incoming calls either manually or automatically.

AT Command Interface

The **ATtention** command interface uses many of the Hayes AT commands, which makes the data module perform similar to a Hayes compatible modem, but in a DCP (DCP) environment. Supplemental information for using the data module in AT Command Interface applications is provided in:

- Appendix A, *"AT Command Interface — AT Commands,"*

- Appendix B, *"AT Command Interface — S-Registers,"* and

- Appendix C, *"AT Command Interface — Quick Reference."*

Many data communications software packages, intended to make a PC operate as (emulate) a data terminal, offer predefine configuration setups for use with Hayes compatible modems. These packages will generally perform well with the 7400A Data Module with only minor configuration adjustments.

Keyboard Dial Interface

The 7400A Data Module can be configured to interface with a terminal device using the Keyboard Dial interface. If you are using a data terminal with this interface, you will be prompted by call progress messages from the PBX when you originate a data call.

EXTERNAL FEATURES

This section describes the external features of the 7400A Data Module, which include two LED indicators and a 16-character alphanumeric/graphic LCD display, a group of three pushbuttons, and four connectors.

LED Indicators and LCD Display

Figure 1-2 illustrates the two LED indicators and the 16-character LCD display on the front panel of the data module. Chapter 3, *"Using the Front Panel,"* provides a full description of the 7400A's front panel, its displays, features and functionality.
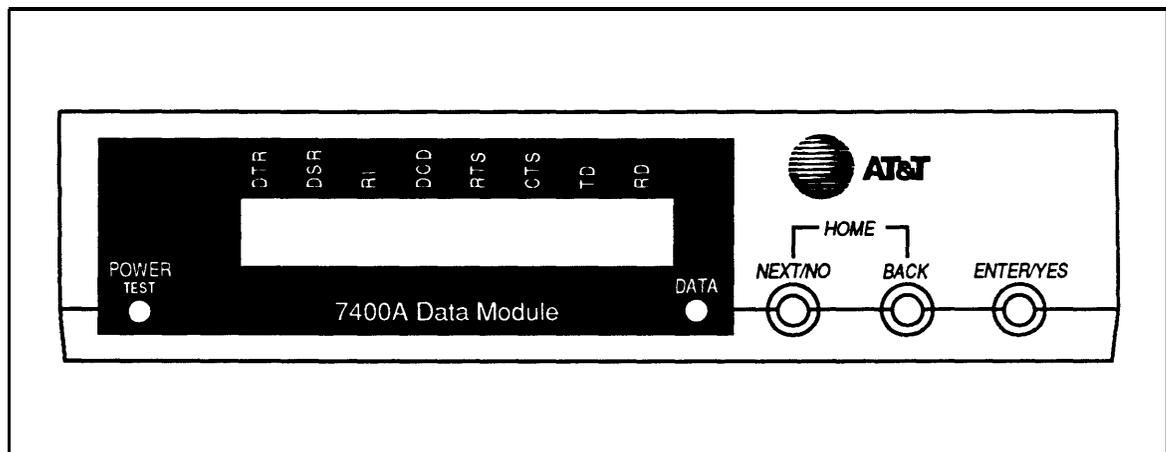
FIGURE 1-2
Front Panel LED Indicators and LCD Character Display

Rear Panel Connectors   Figure 1-3 illustrates the connectors on the rear panel of the data
module. Table 1-1 describes the purpose of each connector.
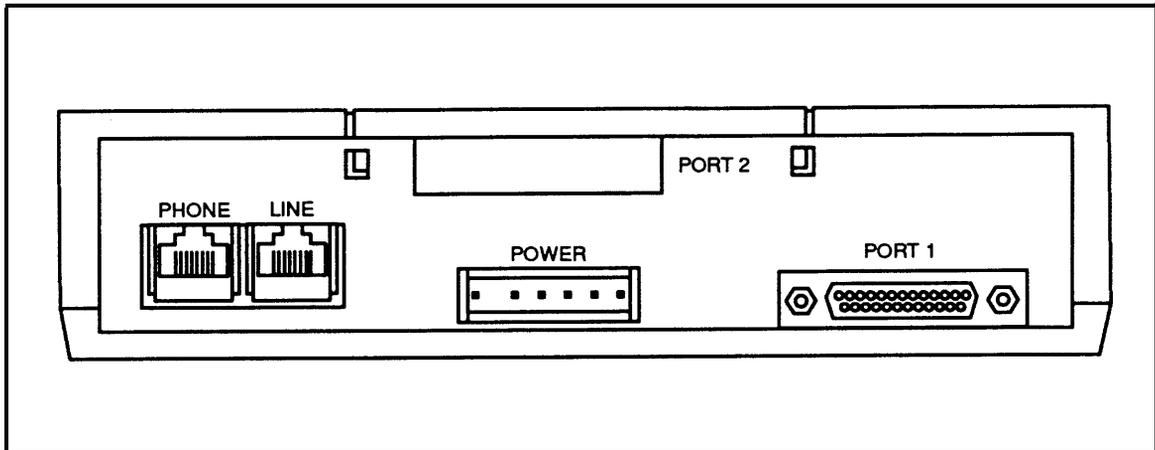
FIGURE 1-3
Rear Panel Connectors

TABLE 1-1
Rear Panel Connector Descriptions

Connector	Description
PHONE	Not used by the 7400A Data Module.
LINE	This connector accepts one end of the D8W telephone cord that connects between the data module and the PBX wall jack.
POWER	This connector accepts the output cable of the separate power supply unit used with the 7400A Data Module.
PORT 1	This connector accepts a male plug from the EIA-232-D (or RS-232-C) cable that connects between the data module and associated equipment.
PORT 2	Not used by the 7400A Data Module.

Power Supply Unit

An individual power supply unit is required with the 7400A Data Module only when it is used as a stand-alone module. When the 7400A is rack-mounted in a 77A rack-mount, the rack-mount provides powering capabilities for up to 8 units. The power supply unit connects between a grounded AC outlet and the "POWER" connector at the rear of the data module. This power supply unit provides the necessary operating voltages for the data module.

CAUTION: Make certain that the AC outlet to which you connect the power supply is not controlled by a light dimmer.
It is also highly recommended that the AC outlet *not* be controlled by a wall switch.

Instructions for connecting to the power supply unit are provided in the hardware installation section of Chapter 2, *"Installation."*

2   Chapter 2: Installation

IMPORTANT INSTALLATION SAFETY INSTRUCTIONS

⚠ **WARNING**

When this product is located in a separate building from the telephone communications system, a line current protector MUST be installed at the entry/exit points of ALL buildings through which the line passes.

The following are the ONLY acceptable devices for use in this application:

* AT&T 4-type protectors

* ITW LINX™ LP-type protectors

Never install telephone wiring during a lightning storm.

Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.

Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.

Use caution when installing or modifying telephone lines.

⚠ **WARNING**
RISK OF ELECTRIC SHOCK
EQUIPMENT MUST BE PROPERLY GROUNDED

Your AT&T equipment requires a properly grounded 3-prong AC power receptacle for safe operation. Do not cut or remove the third (ground) prong from the AT&T power cord. Do not use 2 wire extension cords or adapters to defeat the safety features of your equipment. If you have a 2-prong receptacle, it is very important to have it replaced with a 3-prong receptacle, installed by a qualified electrician.

Before equipment installation, a qualified technician should use an outlet tester or voltmeter to check the AC receptacle for the presence of ground as shown in the figure below.
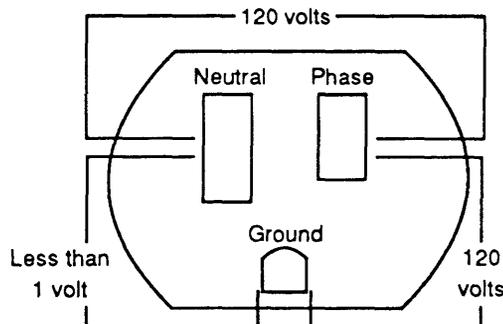
1. The voltage measured from Phase to Neutral should be 110 to 125 VAC.

2. The voltage measured from Phase to Ground should be 110 to 125 VAC.

3. The voltage measured from Neutral to Ground should be less than 1 VAC.

If the receptacle is not a properly grounded 3-prong type, stop the installation. Installation can only be completed after a qualified electrician corrects the problem.

Chapter 2: Installation

This chapter outlines procedures for preparing the data module for operation in DTE and DCE applications, in single and multiple installations. A typical DTE application is using the data module to connect a modem to the switch for modem pooling; a typical DCE application is using the data module to connect a terminal device to a host computer.

This chapter is divided into the following major sections:

- DTE/DCE Hardware Set Up

- Single Data Module Installation for DTE Operation

- Multiple Data Module Installation for DTE Operation

- Single Data Module Installation for DCE Operation

- Multiple Data Module Installation for DCE Operation

Refer to Appendix D, *"Hardware Wiring Configurations,"* while performing the procedures in this chapter.

DTE/DCE HARDWARE SET UP

Under the top access panel of the data module is a small circuit board inserted in a card-edge connector. The orientation of this circuit board, referred to as the EIA Connector Board, determines whether the data module is configured for DCE or DTE operation. Always verify that the EIA Connector Board is oriented correctly for your application prior to installation.

Procedure: Hardware Set Up

To determine the current orientation of the EIA Connector Board, and to reposition it if necessary, perform the following:

1   Disconnect the power cord, the line cord, and the EIA-232-D cable from the data module.

2   Refer to Figure 2-1 and remove the top access panel of the data module:

   a   While applying a gentle lifting pressure at the rear edge of the access panel, insert the tip of a ball-point pen or other suitable device into each of the two tab-lock holes in the rear panel to release the locking tabs.

   b   Lift and remove the access panel.
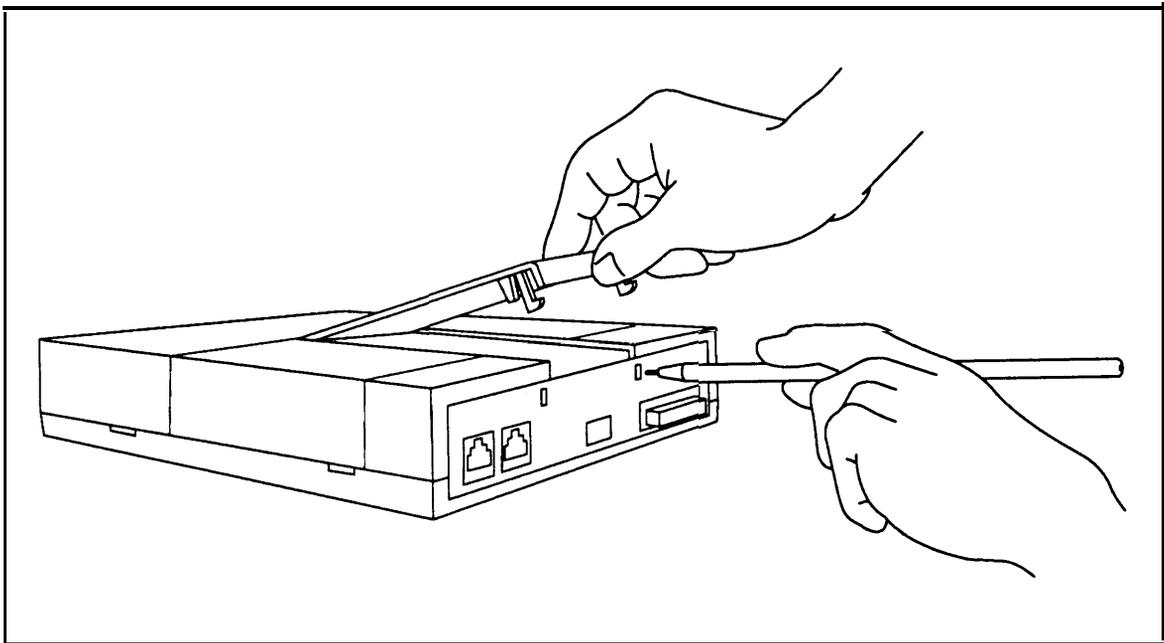
FIGURE 2-1
Removing the Top Access Panel

3 Turn the data module so that you are looking at it from the front.

4 Looking down into the access opening of the data module, locate the large silver arrow pointing toward the back of the unit; the arrow points to the EIA Connector Board.

5 Look at the board from the *front* of the data module and observe that either *DTE* or *DCE* is etched at the upper left corner of the board. The letters that you can read from this position indicate whether the board is oriented for DTE or DCE operation, as shown in Figure 2-2.
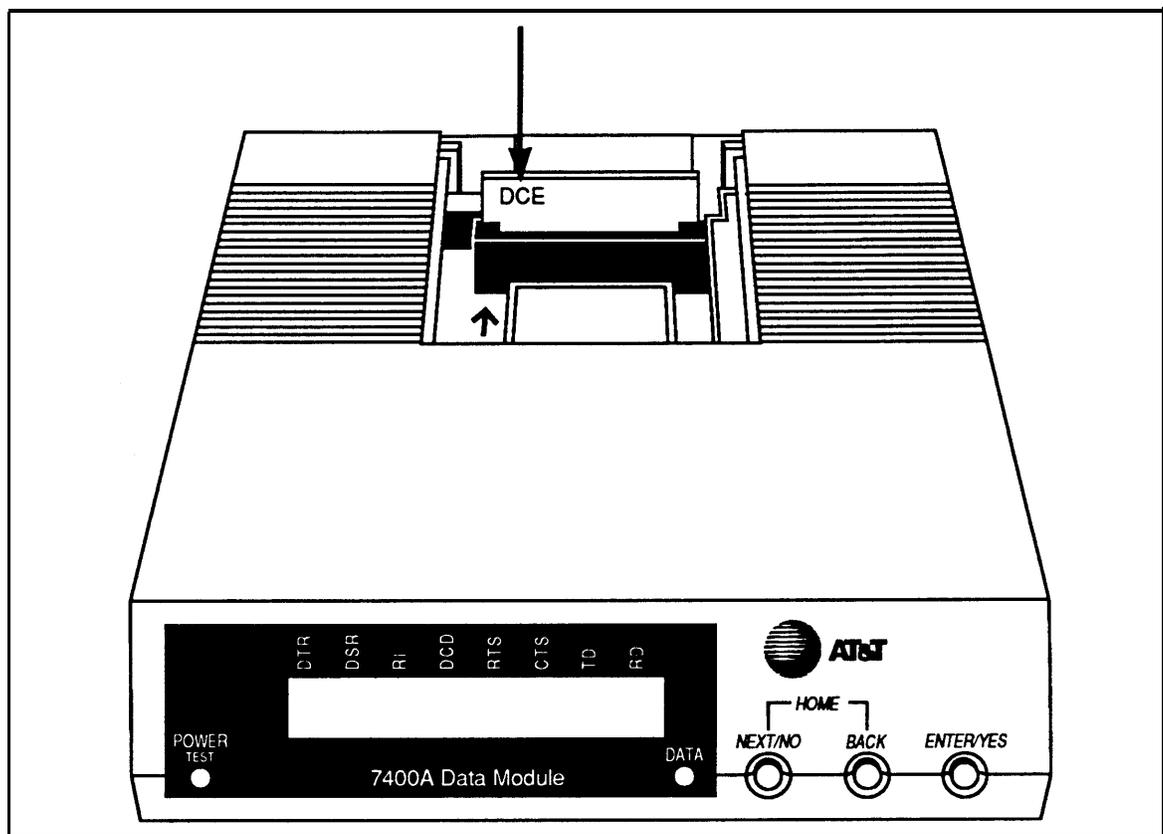
FIGURE 2-2
EIA Connector Board Shown in DCE Position

6 If the board is oriented correctly for your application, proceed to the next step; if the letters are incorrect for your application, reposition the board as follows:

   a Grasp the board firmly and pull up gently, as shown in the top half of Figure 2-3, until the board is completely free.
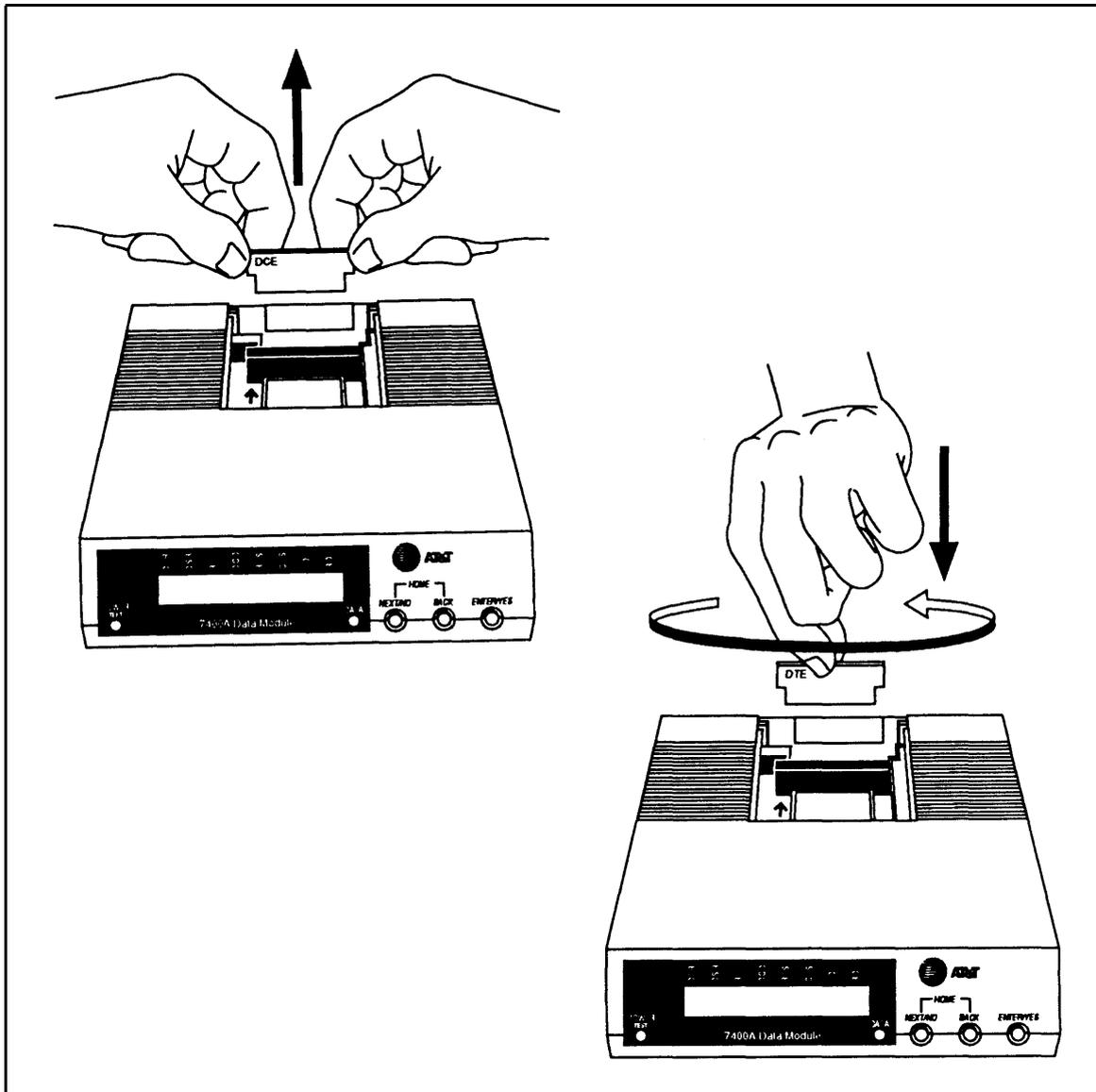
FIGURE 2-3
Repositioning the EIA Connector Board

b Turn the board around so that the correct letters for your application are facing you, as shown in the lower half of Figure 2-3.

c Reinsert the board into its connector.

7 Replace the top access panel by hooking the hinges under the edge of the housing toward the front of the unit, and then snapping the rear tabs into place.

SINGLE DATA MODULE INSTALLATION FOR DTE OPERATION

The parts required for installing a single 7400A Data Module are listed below and are shown in Figure 2-4:

- The data module

- AC power converter (PEC 21625)

- D8W telephone line cord

- EIA-232-D cable (formerly RS-232-C)*

- AT command-compatible modem (not shown)

Note: D-lead control modems cannot be used for single (stand-alone) data module DTE installations; only AT-compatible modems can be used in single (stand-alone) DTE installations.

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* Either the EIA-232-D or the RS-232-C cable will work with this system.
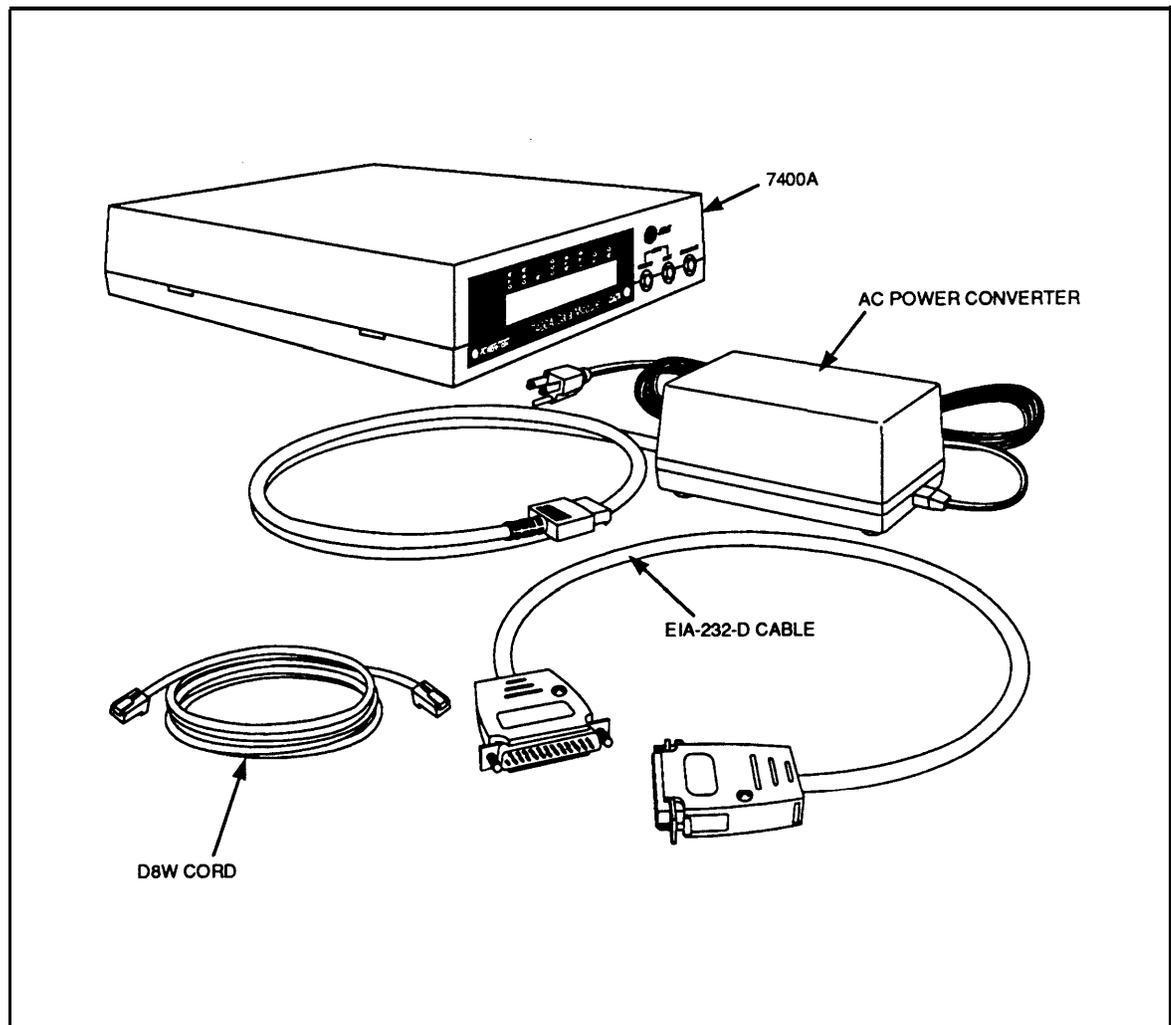
FIGURE 2-4
Installation Materials — Single 7400A Data Module

Procedure: Installing a Single DTE Module

Use the following procedure to install a single 7400A Data Module for DTE operation:

1   Plug one end of the D8W telephone line cord into the connector labeled "LINE."

2   Plug the free end of the telephone line cord into the telephone wall jack assigned to your 7400A Data Module.

3   Plug the EIA-232-D cable from the AT-compatible modem into the connector labeled "PORT 1" on the 7400A.

4   Plug the power supply cord plug into the connector labeled "POWER."

5 Plug the power supply cord into an AC power outlet.

The data module powers on as soon as the AC cord of the power supply is connected to a live AC power outlet. A series of messages display on the front panel as the unit performs its startup self-test.

a Observe the following messages:

```
SELF TESTING

SELF-TEST PASSED

7400A DTE MODE

FIRMWARE REL 2.0, VER 1.0 COPYRIGHT 1989
AT&T ALL RIGHTS RESERVED
```

Should the data module fail self-test, different messages than what is shown above are displayed. If this happens, refer to Chapter 5, *"DTE Troubleshooting."*

b The final display is the **Home** display. Figure 2-5 is a typical **Home** display.
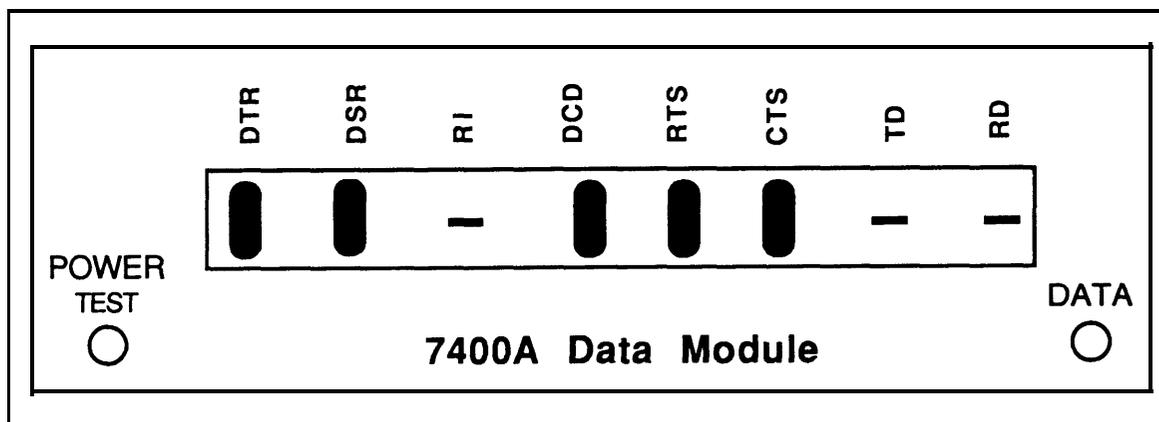
FIGURE 2-5
Typical Home Display

Note: The **Home** display shows the status of the 7400A's EIA interface leads. A solid oval indicates the control lead is on, while a dash indicates the lead is off. The abbreviations above the display translate as follows:

DTR	Data Terminal Ready
DSR	Data Set Ready
RI	Ring Indicator
DCD	Data Carrier Detect
RTS	Request to Send
CTS	Clear to Send
TD	Transmitted Data (display shows an oval when data is being transmitted)
RD	Received Data (display shows an oval when data is being received)

6 Proceed to Chapter 4, *"DTE Operation — Modem Pool Applications."*

MULTIPLE DATA MODULE INSTALLATION FOR DTE OPERATION

This section describes how to mount one or more 7400A Data Modules in a new or existing 77A Data Mounting for DTE modem pool applications. The data mounting is provided with a built-in power supply and cables for distributing power for up to 8 data modules.

Procedure: Installing the 77A Data Mounting

The following procedure is required only in new installations or when adding a new 77A data mounting to an existing installation.

1   If an OR-6316 bridging adapter is included in your installation package, the adapter should be installed *before* placing the data mounting in the cabinet or rack.

   Note: The bridging adapter is only used in installations with modems that have D-lead control. The adapter routes the D-leads to their proper connection points.

   Refer to Figure 2-6 and secure the bridging adapter as follows:
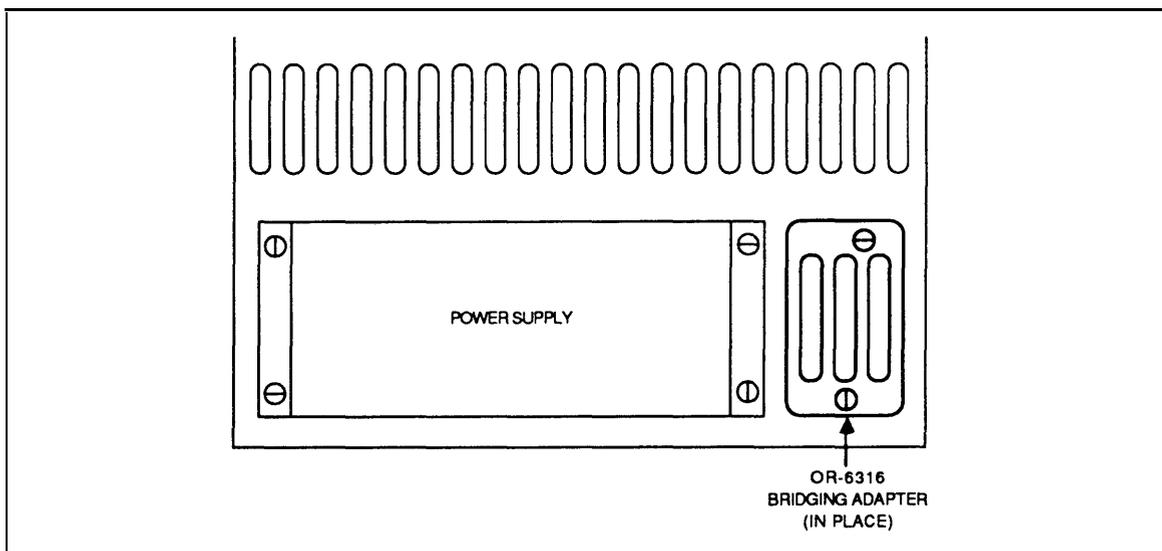
FIGURE 2-6
OR-6316 Bridging Adapter in Place

   a   Loosen the two cross-head mounting screws located in the holes to the right of the power supply, but do not remove them.

   b   Remove the cover of the bridging adapter.

   c   Position the adapter over the screws so that the connector numbers in the lower housing are near the rear of the mounting.

   d   Twist the adapter to lock the screw heads in, and then tighten the screws.

2 Refer to Figure 2-7 and install the 77A Data Mounting in the
cabinet or rack where it will be used

Note: The 77A Data Mounting has brackets (item 1 in Figure
2-7) that can be positioned for installing the unit in either
a 19-inch or a 23-inch rack mounting.
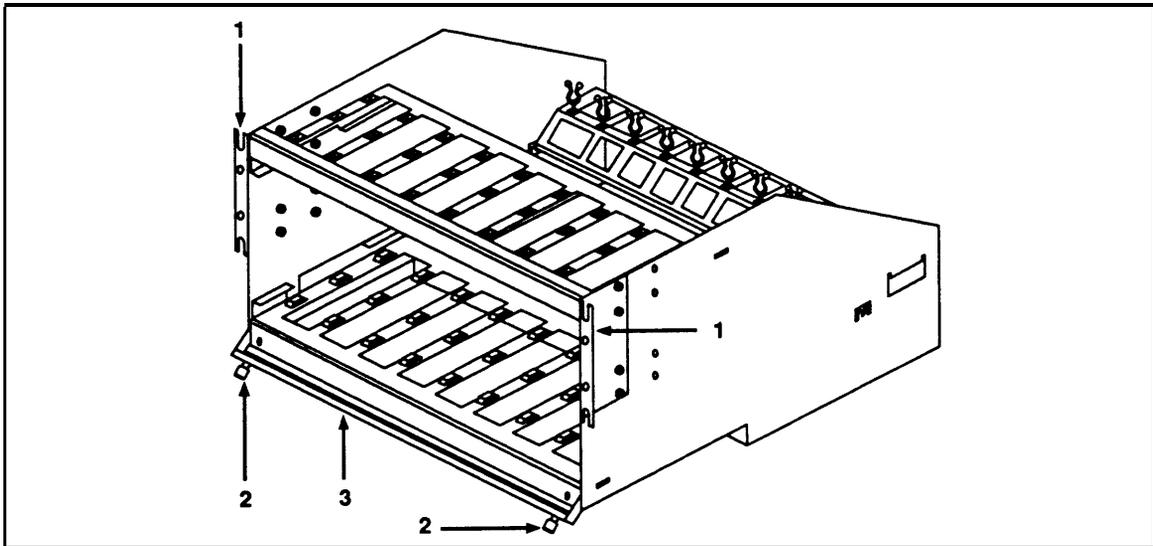
FIGURE 2-7
77A Data Mounting

Procedure: Placing 7400A Data Modules in the Data Mounting

The following procedure is required for placing one or more data
modules in a new or existing installation.

1 Determine that the EIA Connector Board is correctly positioned
for DTE operation (if necessary, refer to the earlier section titled
"DTE/DCE Hardware Set Up").

2 Install new data modules into the data mounting as follows:

   a From the front of the data mounting, pull out the left
   and right plungers (items labeled 2 in Figure 2-7) that
   hold the horizontal retaining bar (item 3 in Figure 2-7)
   against the rack.

   b Pull the retaining bar out and down to allow insertion of
   data modules into the data mounting.

   c Insert one or more data modules into successive slots of the
   data mounting by positioning the data module so the
   POWER/TEST LED is oriented towards the left uppermost
   corner, as shown in Figure 2-8.

Note: From the front of the 77A Data Mounting, start with slot 1 or the lowest numbered empty slot on the left and fill each slot in order.

CAUTION: Associated analog modems must be installed in a corresponding analog data mounting slot (i.e., if there is a 7400A in slot 1 of a 77A data mounting, there must also be an analog modem in slot 1 of the analog modem data mounting).
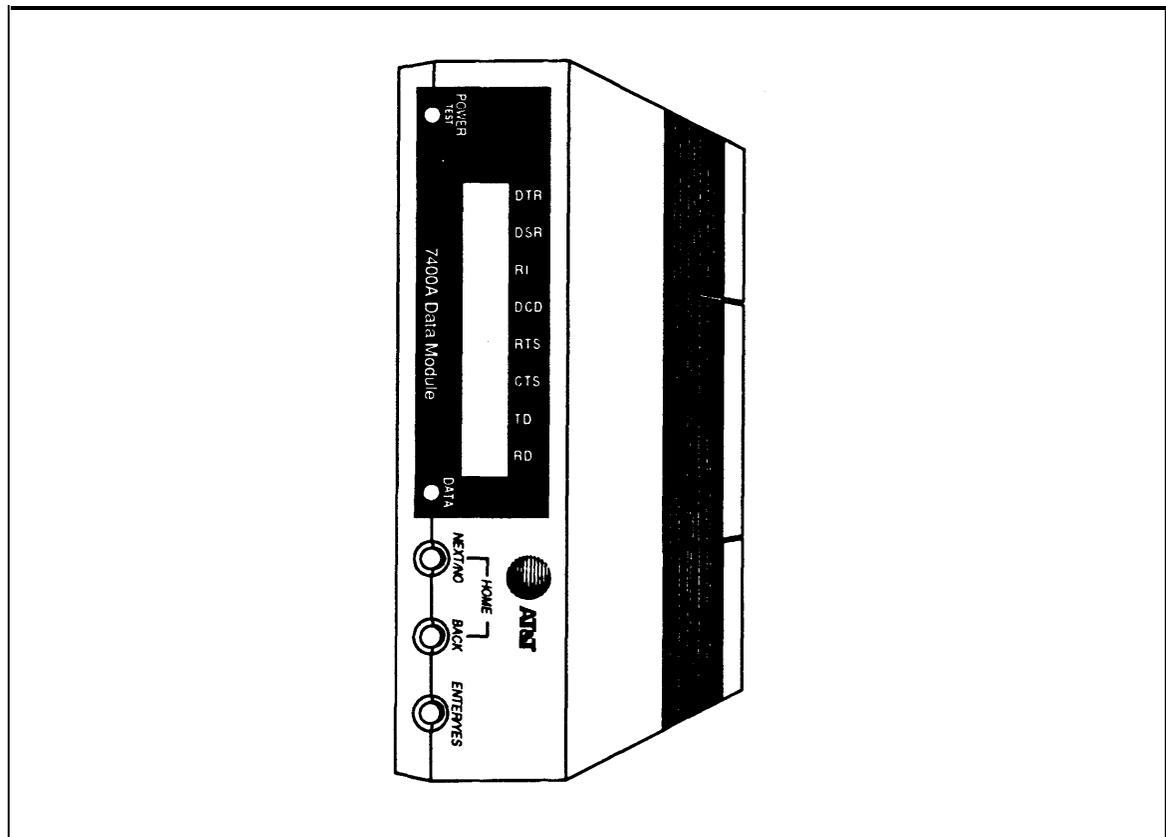
FIGURE 2-8
Position of Data Module for Multiple Installation

d   Move the retaining bar into its locking position and push in the left and right plungers to secure the data modules in the data mounting.

Connecting New Data Modules to the Switch

The 7400A Data Module can be connected to the switch in several ways, depending on the configuration of the data module and its associated equipment. Installation components supplied differ according to how the installation kit was specified at the time it was ordered. The following procedures cover each of several installation configurations.

New Installation: Ordered as Attribute 1 or 6

In this installation, the data module is configured for DTE Modem Pool operation with AT command controlled modems, including 2296 series modems.

The following items, specific to this installation, are required:

- WP90780L2 adapter harness (referred to as L2 in this procedure), supplied with the installation kit (attribute 1)

   or

- individual D8W telephone cords, one supplied with each data module (attribute 6)

Procedure: Connecting New Data Modules to the Switch

1   If you are using the L2 adapter harness (attribute 1):

   a   Attach the 50-pin connector to the B25-type cable from the switch as shown in Figure 2-9.

      Note: Refer to Table 2-1 at the end of this chapter for standard wiring information to the switch.
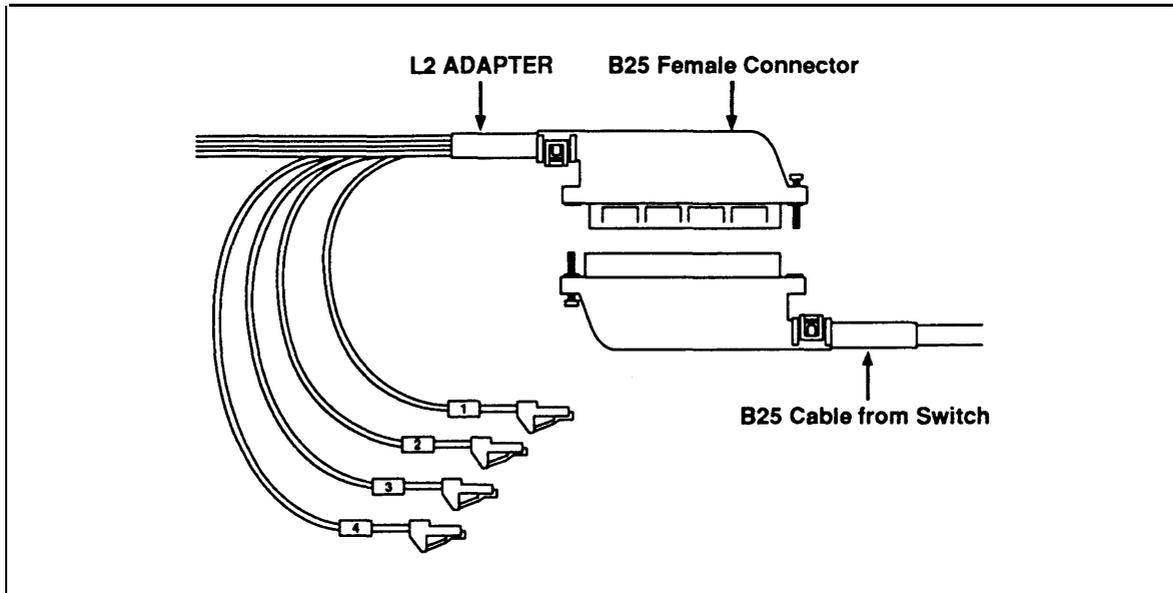
FIGURE 2-9
Connecting the L2 Adapter Harness to the B25 Cable

b Plug a D8W connector from the L2 adapter harness into the connector on the rear of each new data module labeled "LINE," and then skip to the section titled "Installing DC and AC Power Cords."

Note: Numbers labeling the D8W connectors should correspond to slot numbers on the 77A Data Mounting.

2 If you are using individual D8W cords (attribute 6):

a Plug one end of a D8W cord into the connector on the rear of the data module labeled "LINE."

b Plug the free end of the D8W cord into the assigned wall jack.

c Use the same procedure for connecting each new data module to the switch, and then skip to the section titled "Installing DC and AC Power Cords."

New Installation: Ordered as Attribute 2

In this installation, the data module is configured for DTE modem pool operation with any D-lead controlled modems *except* 2296 series modems. The following items, specific to this installation, are supplied with the installation kit:

- WP90780L2 adapter harness (referred to as L2 in this procedure)
- OR-6316 bridging adapter
- M10L distribution cord

Procedure: Connecting New Data Modules to the Switch with M10L Cord

1 Attach the 50-pin connector from the L2 adapter harness to P1 on the bridging adapter, as shown in the left-hand illustration of Figure 2-10.
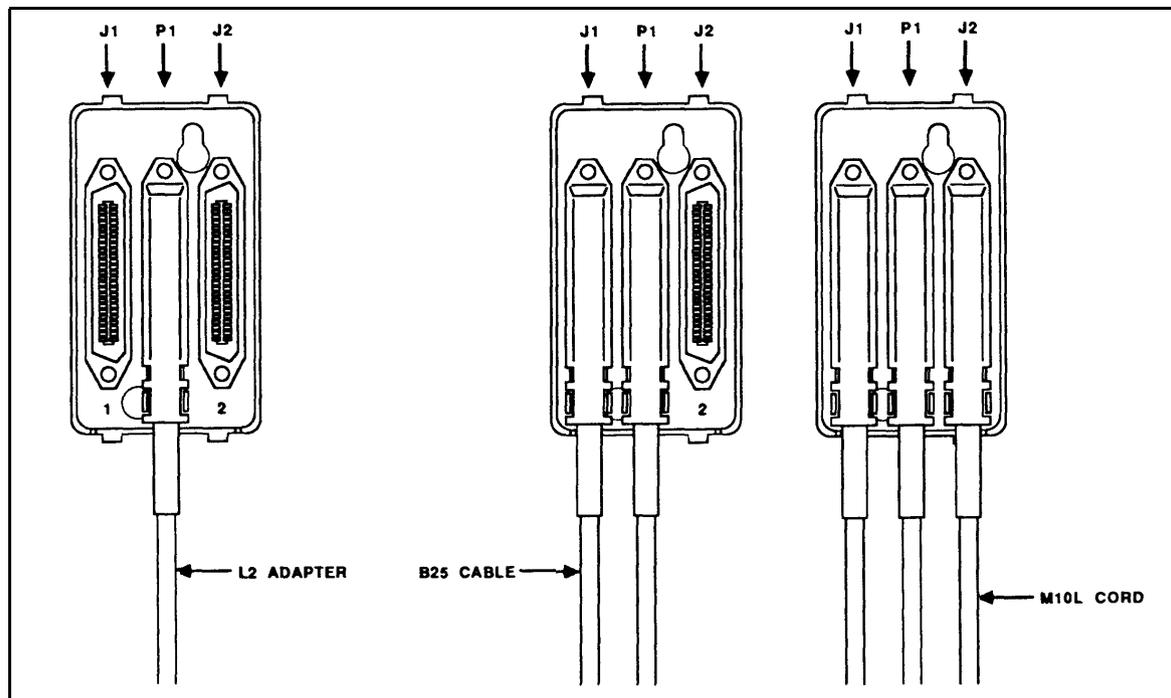
FIGURE 2-10
Connecting to the Bridging Adapter

2 Attach a B25-type cable from the switch to J1 on the bridging adapter, as shown in the center illustration of Figure 2-10.

Note: Refer to Table 2-1 at the end of this chapter for standard wiring information to the switch.

3 Connect the single plug end of the M10L cable to J2 on the bridging adapter, as shown in the right-hand illustration of Figure 2-10.

4 Place the cover on the bridging adapter.

5   Plug a D8W connector from the L2 adapter harness into the
     connector on the rear of each new data module labeled "LINE."

   Note: Numbers labeling the D8W connectors should correspond
              to slot numbers on the 77A Data Mounting.

6   Connect the P1 and P2 plugs of the M10L cable to the J1 and J2
     connectors, respectively, on the modem rack.

   Note: The plug numbers are on the Y-shaped sleeve of the
              M10L cable.

7   Skip to the section titled "Installing DC and AC Power Cords."

New Installation: Ordered as Attribute 3

In this installation, the data module is configured for DTE modem pool
operation with D-lead controlled 2296 series modems. The following
items, specific to this installation, are supplied with the installation kit:

- WP90780L2 adapter harness (referred to as L2 in this procedure)

- OR-6316 bridging adapter

- 2296 modem control cable

**Procedure: Connecting
New Data Modules to the
Switch with 2296 Cable**

1   Attach the 50-pin connector of the L2 adapter harness to P1 on the
     bridging adapter, as shown in the left-hand illustration of Figure
     2-11.
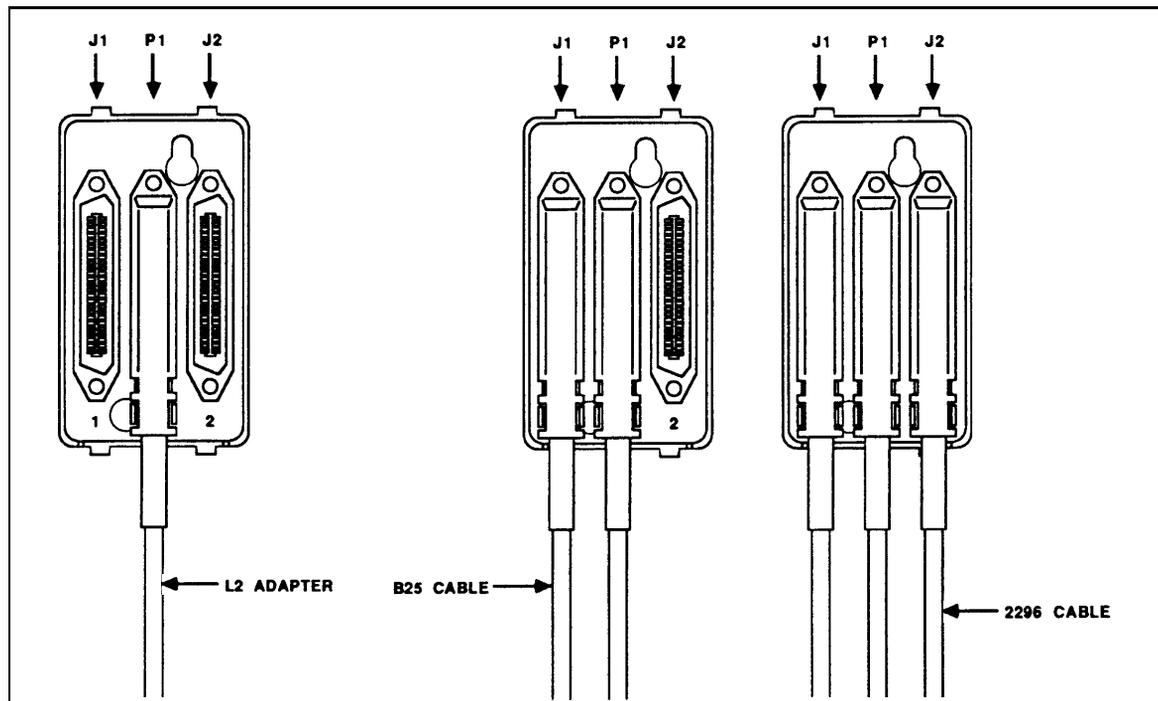
FIGURE 2-11
Connecting to the Bridging Adapter

2   Connect a B25-type cable from the switch to J1 on the bridging adapter, as shown in the center illustration of Figure 2-11.

Note: Refer to Table 2-1 at the end of this chapter for standard wiring information to the switch.

3   Connect the 50-pin plug of the 2296 control cable to J2 on the bridging adapter, as shown in the right-hand illustration of Figure 2-11.

4   Place the cover on the bridging adapter.

5   Plug a D8W connector from the adapter harness into the connector on the rear of each new data module labeled "LINE."

Note: Numbers labeling the D8W connectors should correspond to slot numbers on the 77A Data Mounting.

6   Connect the other end of the 2296 control cable to the appropriate connector on the modem rack.

7   Skip to the section titled "Installing DC and AC Power Cords."

Existing Installation

The following procedure is for connecting new data modules in an existing data mounting to the switch.

Procedure: Connecting Lines to the 7400A

1 If your installation uses the L2 adapter harness, plug a D8W connector from the L2 adapter harness into the connector on the rear of each new data module labeled "LINE," and then skip to the section titled "Installing DC and AC Power Cords."

> *Note:* Numbers labeling the D8W connectors should correspond to slot numbers on the 77A Data Mounting.

2 If your installation uses individual D8W cords:

   a Plug one end of a D8W cord into the connector on the rear of the data module labeled "LINE."

   b Plug the free end of the D8W cord into the assigned wall jack.

   c Use the same procedure for connecting each new data module to the switch, and then proceed to the section titled "Connecting the EIA Cable."

Procedure: Installing DC and AC Power Cords

The following procedure is for attaching DC power cords to data modules in new or existing installations, and for connecting the AC power cord to a newly installed 77A Data Mounting.

CAUTION: If adding modules to an existing installation and the data mounting already has power applied, do not disconnect AC power to the 77A data mounting; doing so shuts off existing modules and possibly interrupts data connections that may have been established.

---

1 (All installations) Insert one of the loose DC power cords from the data mounting power supply into the connector labeled "POWER" on the rear of each data module being installed.

2 (New or disconnected data mounting) Install the AC power cord as follows:

   a Plug the female end of the AC power cord into the AC connector at the rear of the data mounting power supply, as shown in Figure 2-12.
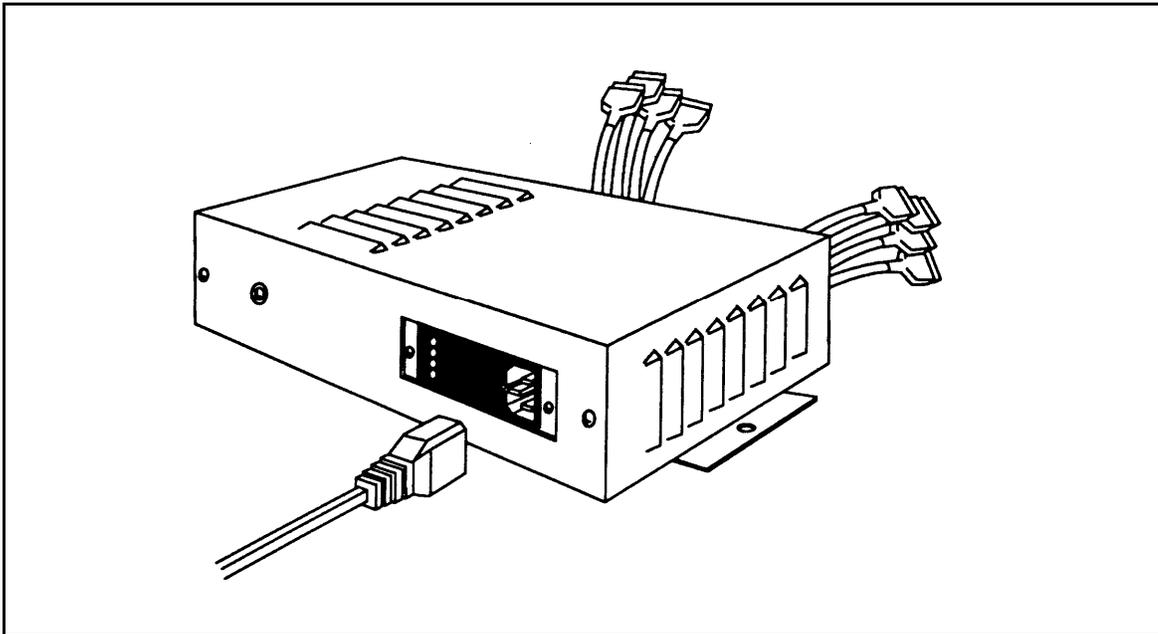
FIGURE 2-12
Inserting the AC Power Connector

b   Plug the male end of the AC power cord into an unstitched
AC outlet inside the equipment rack.

Note: All the data modules powers on as soon as the
AC cord of the power supply is connected to a live
AC power outlet. A series of messages display on
the front panel as the units perform their startup
self-test.

c   Observe the following messages:

        SELF TESTING

       SELF-TEST PASSED

        7400A DTE MODE

       FIRMWARE REL 2.0, VER 1.0 COPYRIGHT
       1989 AT&T ALL RIGHTS RESERVED

Note: Should the data module fail self-test, different
messages than those shown above are displayed.
If this happens, refer to Chapter 5, *"DTE
Troubleshooting."*

d   The final display is the **Home** display. (See Figure 2-5 for a
sample display.)

Procedure: Connecting the EIA Cable

Use the following procedure for connecting EIA cables between the new data modules and their associated modems.

1 Connect one end of an EIA cable to the connector on the rear of the data module labeled "PORT 1," and tighten the connector retaining screws.

2 Route the EIA cable toward the rear of the cabinet through the associate plastic twist lock at the rear of the 77A Data Mounting, and twist the top ends of the lock to secure the cable (see Figure 2-13).
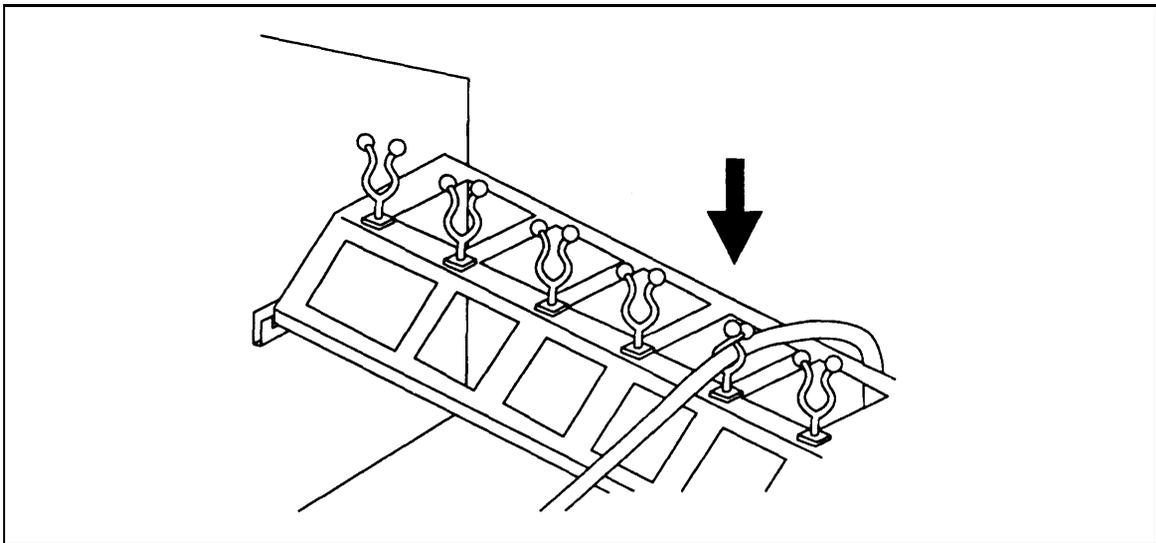
FIGURE 2-13
Securing the EIA Cables

3 Connect the other end of the EIA cable to the associated modem and tighten the connector retaining screws.

> **CAUTION:** EIA cables must be correlated (i.e., the EIA cable from a 7400A in slot 1 must be connected to the EIA interface of an associated modem located in slot 1 of an analog modem multiple data mounting).

4 Follow this same procedure to connect the EIA cable for each new 7400A Data Module.

5 Proceed to Chapter 4, *"DTE Operation — Modem Pool Applications.*

SINGLE DATA MODULE INSTALLATION FOR DCE OPERATION

The parts required for installing a single 7400A Data Module are listed below and are shown in Figure 2-14:

● The data module

● AC power converter (PEC 21625)

● D8W telephone line cord

● EIA-232-D cable (formerly RS-232-C)
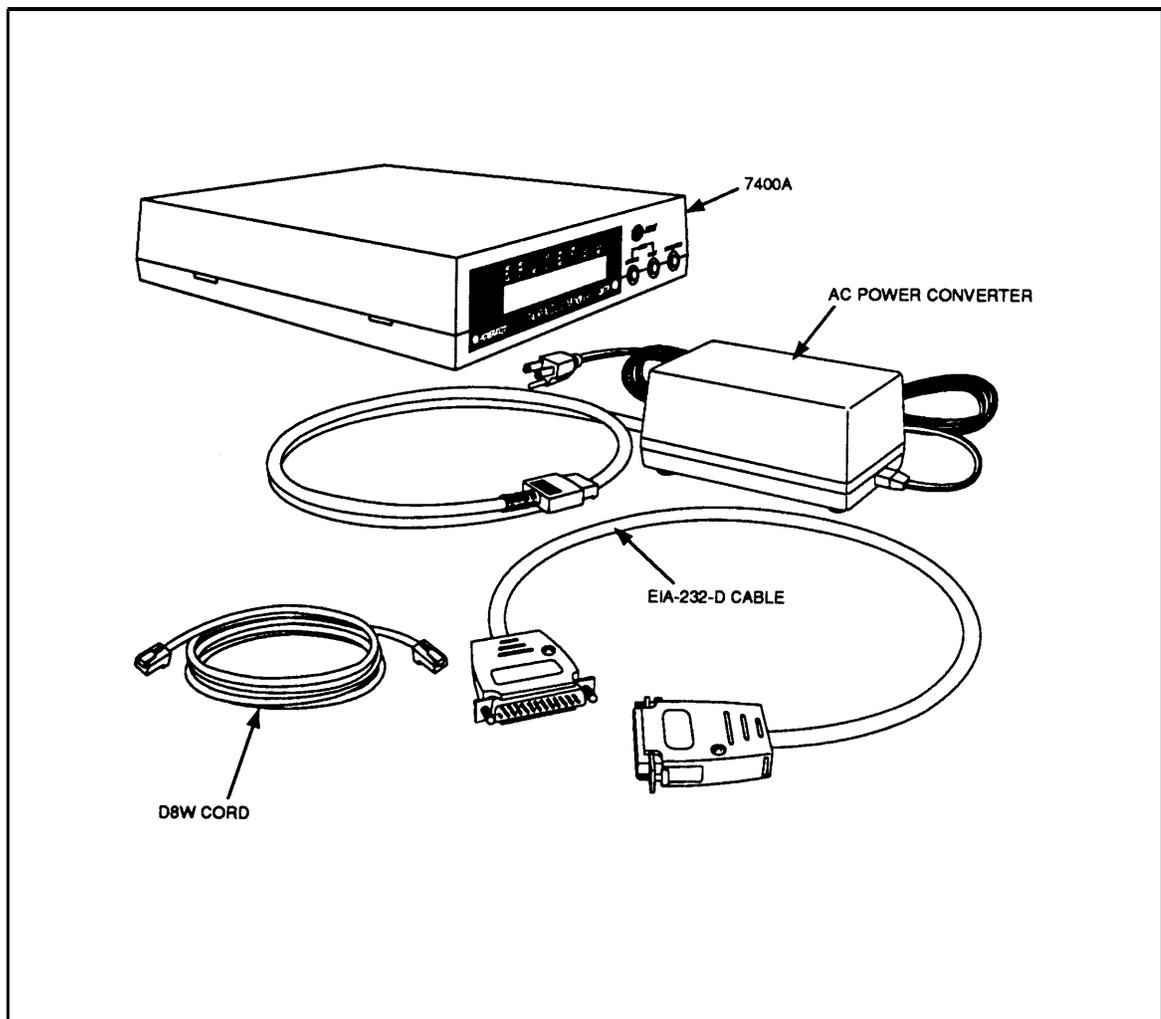
FIGURE 2-14
Installation Materials — Single 7400A Data Module

**Procedure: Installing a
Single DCE Data Module**

Use the following procedure to install a single 7400A Data Module
for DCE operation:

1   Plug one end of the D8W telephone line cord into the connector
labeled "LINE."

2   Plug the free end of the telephone line cord into the telephone
wall jack assigned to your 7400A Data Module.

3   Plug the EIA-232-D cable into the connector labeled "PORT 1."

4   Plug the other end of the EIA-232-D cable into the appropriate
data communications connector on your terminal device.

5   Plug the power supply cord plug into the connector labeled
"POWER."

6   Plug the power supply cord into an AC power outlet.

Note: The data module powers on as soon as the AC cord of the
power supply is connected to a live AC power outlet. A
series of messages display on the front panel as the unit
performs its startup self-test.

a   Observe the following messages:

```
    SELF  TESTING

  SELF-TEST  PASSED

   7400A DCE MODE

 FIRMWARE REL 2.0, VER 1.0 COPYRIGHT
 1989 AT&T ALL RIGHTS RESERVED
```

Note: Should the data module fail self-test, different
messages are displayed. If this happens, refer to
Chapter 7, *"DCE Troubleshooting."*

b   The final display is the **Home** display. (See Figure 2-5
for a sample display.)

7 Proceed following the instructions below:

INTERFACE CHOSEN	THEN
Keyboard and Answer-Only	Use the front panel to set the options of the 7400A so that they are compatible with the local terminal.*
AT Command	Use the terminal to set the 7400A options so they are compatible with the local terminal.*

8 Check that the PBX that you are connecting to is administered to support the 7400A Data Module in the DCE application as follows:

a Press the *NEXT/NO* and *BACK* buttons at the same time if it is necessary to return to the **Home** display.

b From the **Home** display, press *NEXT/NO* until `ANS/ORIG CALL?` is displayed. (See Figure 2-5 for a sample display.)

c Press *ENTER/YES* to select the displayed option.

d Proceed using the following table:

---

* Details on the front panel are provided in Chapter 3, *"Using the Front Panel".*

IF	THEN
The message DIAL TONE is followed by DISCONNECT CALL?	• Your PBX is correctly administered for the 7400A Data Module. • Press *ENTER/YES* and observe the message WAITING followed by DISCONNECTED • You are automatically returned to the ANS/ORIG CALL menu option.
The message WAITING then DISCONNECTED is displayed	Advise your system administrator of the line administration problem.

9 Proceed to Chapter 6, *"DCE Operation — Terminal Device Applications."*

MULTIPLE DATA MODULE INSTALLATION FOR DCE OPERATION

This section describes how to mount one or more 7400A Data Modules in a new or existing 77A Data Mounting for DCE to terminal device applications. The data mounting rack is provided with a built-in power supply and cables for distributing power for up to 8 data modules.

Installing the 77A Data Mounting

The following procedure is required only in new installations or when adding a new 77A data mounting to an existing installation.

Refer to Figure 2-15 and install the 77A Data Mounting in the cabinet or frame where it will be used.

Note: The data mounting has brackets (item 1 in Figure 2-15) that can be positioned for installing the unit in either a 19-inch or a 23-inch rack mounting.
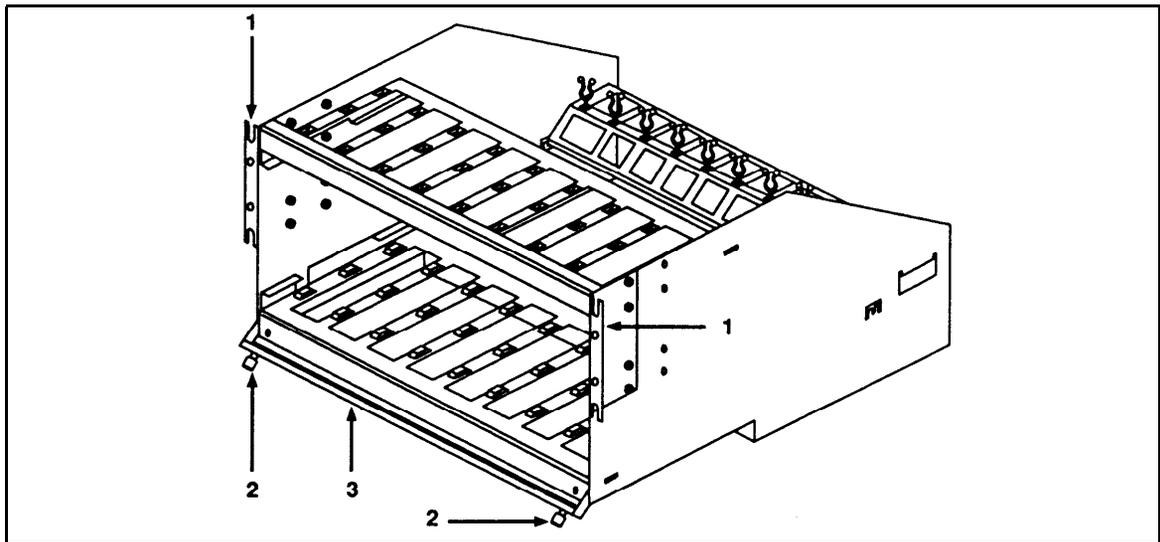
**FIGURE 2-15
77A Data Mounting**

Procedure: Placing 7400A Data Modules in the Data Mounting

The following procedure is required for placing one or more data modules in a new or existing installation.

1 Determine that the EIA Connector Board is correctly positioned for DCE operation (if necessary, refer to the earlier section titled "DTE/DCE Hardware Set Up").

2 Install new data modules into the data mounting as follows:

a From the front of the data mounting, pull out the left and right plungers (items labeled 2 in Figure 2-15) that hold the horizontal retaining bar (item 3 in Figure 2-15) against the rack.

b   Pull the retaining bar out and down to allow insertion of data modules into the data mounting.

c   Insert one or more data modules into successive slots of the data mounting, positioning each data module with its display window upward as shown in Figure 2-16.

Note: From the front of the 77A Data Mounting, start with slot 1 or the lowest numbered empty slot on the left and fill each slot in order.
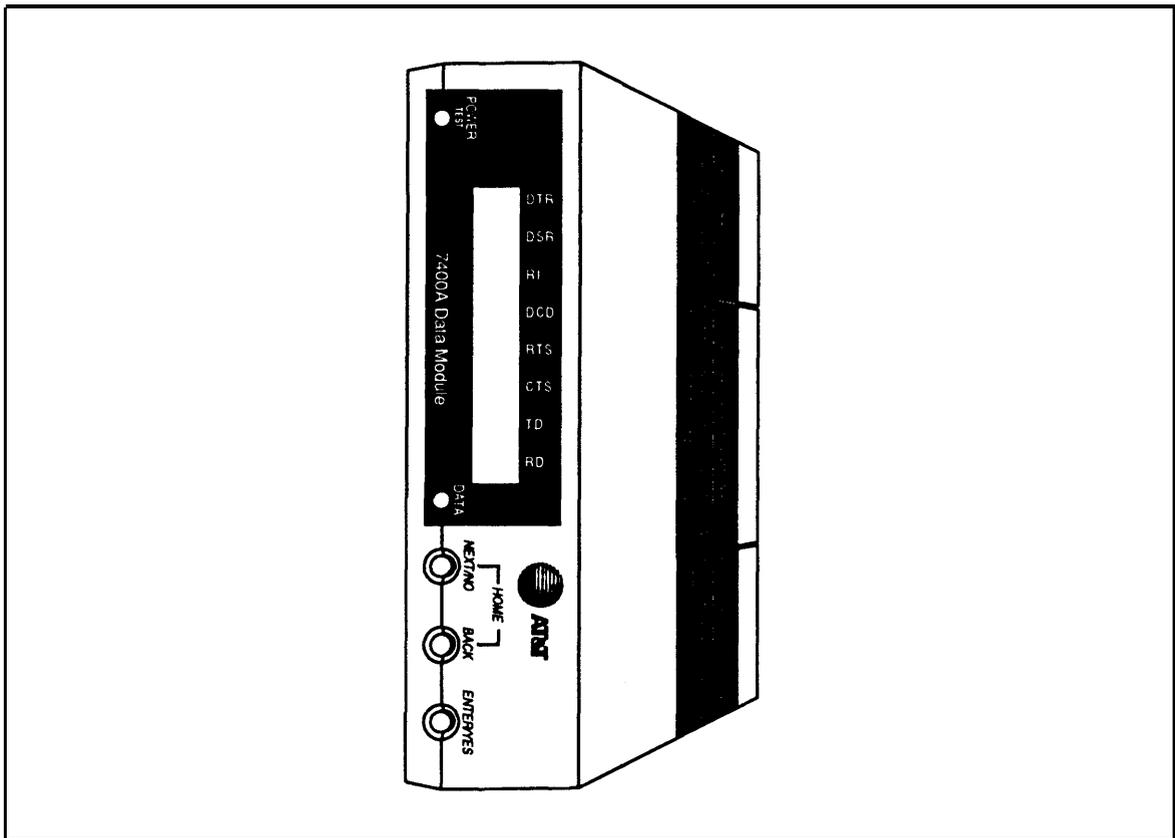
FIGURE 2-16
Position of Data Module for Multiple Installation

d   Move the retaining bar into its locking position and push in the left and right plungers to secure the data modules in the data mounting.

Connecting New Data Modules to the Switch

The 7400A Data Module can be connected to the switch in several ways, depending on the configuration of the data module and its associated equipment. Installation components supplied will differ according to how the installation kit was specified at the time it was ordered. The following procedures cover each of several installation configurations.

New Installation: Ordered as Attribute 1 or 6

In this installation, the data module is configured for DCE operation. The following items, specific to this installation, are required:

- WP90780L2 adapter harness (referred to as L2 in this procedure), supplied with the installation kit (attribute 1)

 or

- individual D8W telephone cords, one supplied with each data module (attribute 6)

Procedure: Connecting New Data Modules to the Switch

Use the following procedure for connecting new data modules to the switch with the items supplied in installation kit having attribute 1 or 6.

1   If you are using the L2 adapter harness (attribute 1):

   a   Attach the 50-pin connector to the B25-type cable from the switch as shown in Figure 2-17.

      Note: Refer to Table 2-1 at the end of this chapter for standard wiring information to the switch.
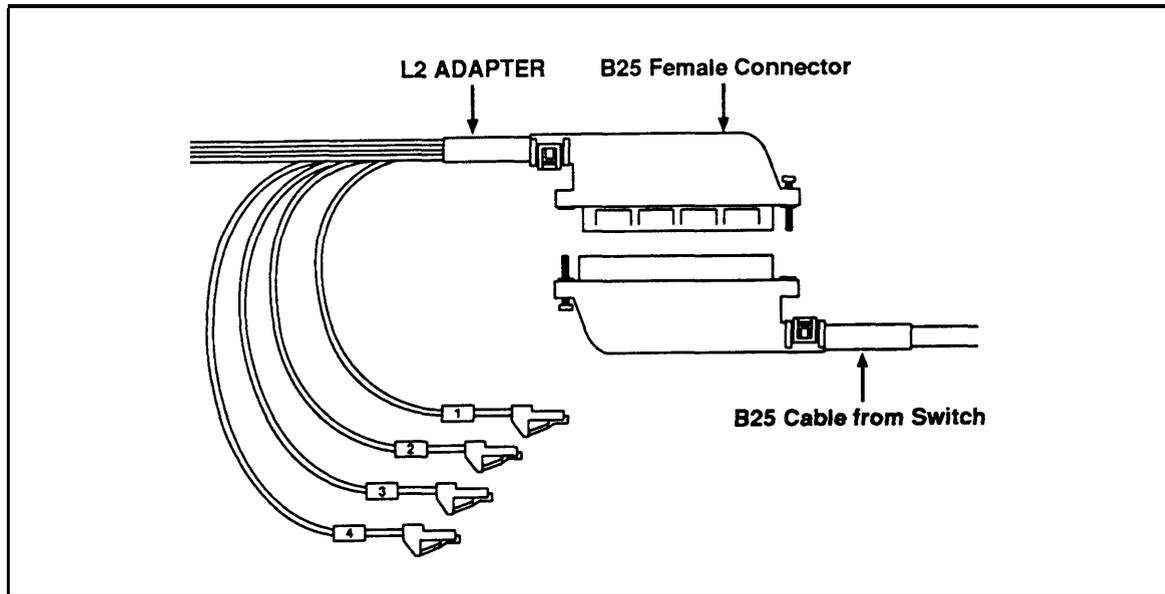
FIGURE 2-17
Connecting the L2 Adapter Harness to the B25 Cable

    b   Plug a D8W connector from the L2 adapter harness into the connector on the rear of each new data module labeled "LINE," and then skip to the section titled "Installing DC and AC Power Cords. "

        Note: Numbers labeling the D8W connectors should correspond to slot numbers on the 77A Data Mounting.

2   If you are using individual D8W cords (attribute 6):

    a   Plug one end of a D8W cord into the connector on the rear of the data module labeled "LINE."

    b   Plug the free end of the D8W cord into the assigned wall jack.

    c   Use the same procedure for connecting each new data module to the switch, and then skip to the section titled "Installing DC and AC Power Cords."

Existing Installation

The following procedure is for connecting new data modules in an existing data mounting to the switch.

Procedure: Connecting New Data Modules to the Switch

1 If your installation uses the L2 adapter harness, plug a D8W connector from the L2 adapter harness into the connector on the rear of each new data module labeled "LINE," and then skip to the section titled "Installing DC and AC Power Cords."

Note: Numbers labeling the D8W connectors should correspond to slot numbers on the 77A Data Mounting.

2 If your installation uses individual D8W cords:

a Plug one end of a D8W cord into the connector on the rear of the data module labeled "LINE."

b Plug the free end of the D8W cord into the assigned wall jack.

c Use the same procedure for connecting each new data module to the switch, and then proceed to the section titled "Connecting the EIA Cable."

Installing DC and AC Power Cords

The following procedure is for attaching DC power cords to data modules in new or existing installations, and for connecting the AC power cord to a newly installed 77A Data Mounting.

> **CAUTION:** If adding modules to an existing installation and the data mounting already has power applied, do *not* disconnect AC power to the 77A data mounting; doing so will shut off existing modules and possibly interrupt data connections that may have been established.

Procedure: Attaching Power Cords

1 (All installations) Insert one of the loose DC power cords from the data mounting power supply into the connector labeled "POWER" on the rear of each data module being installed.

2 (New or disconnect data mounting) Install the AC power cord as follows:

a Plug the female end of the AC power cord into the AC connector at the rear of the data mounting power supply (Figure 2-18).
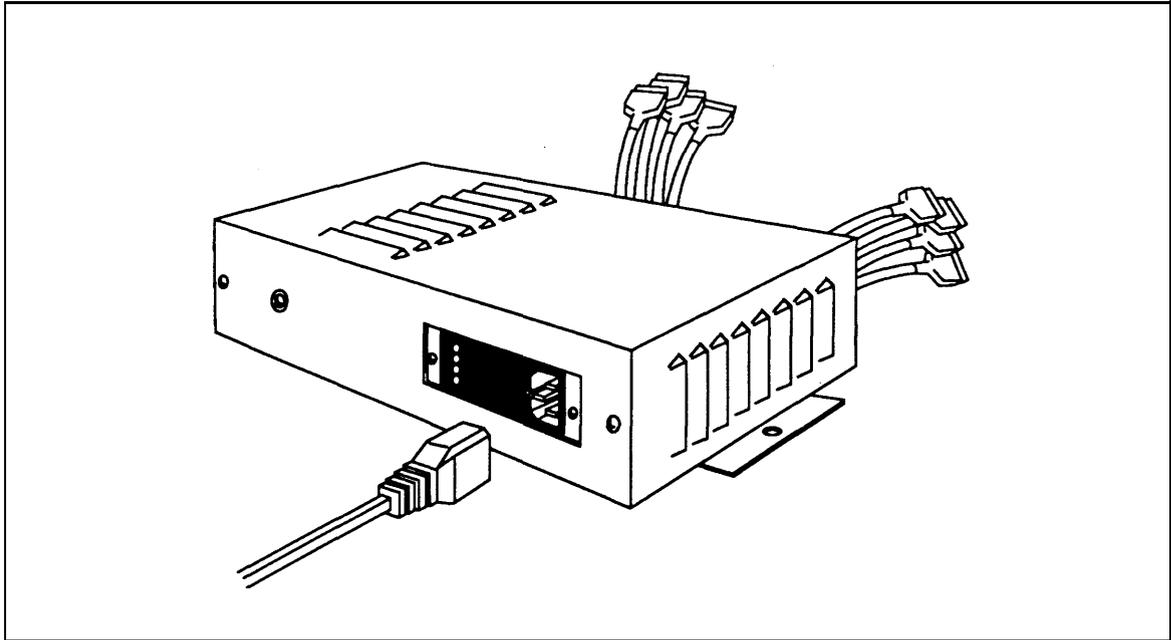
FIGURE 2-18
Inserting the AC Power Connector

b   Plug the male end of the AC power cord into an unstitched
AC outlet inside the equipment rack.

Note: The data module powers on as soon as the AC
cord of the power supply is connected to a live
AC power outlet. A series of messages display
on the front panel as the unit performs its startup
self-test.

c   Observe the following messages:

```
SELF TESTING

SELF-TEST PASSED

 7400A DCE MODE

FIRMWARE REL 2.0, VER 1.0 COPYRIGHT
1989 AT&T ALL RIGHTS RESERVED
```

Note: Should the data module fail self-test, different
messages display. If this happens, refer to
Chapter 7, *"DCE Troubleshooting."*

d   The final display is the **Home** display. (See Figure 2-5 for a
sample display.)

Procedure: Connecting the EIA Cable

Use the following procedure for connecting EIA cables between the new data modules and their associated terminals or ports on the host computer.

1   Connect one end of an EIA cable to the connector on the rear of the data module labeled "PORT 1" and tighten the connector retaining screws.

2   Dress the EIA cable toward the rear of the cabinet through the associate plastic twist lock at the rear of the 77A Data Mounting, and twist the top ends of the lock to secure the cable (see Figure 2-19).
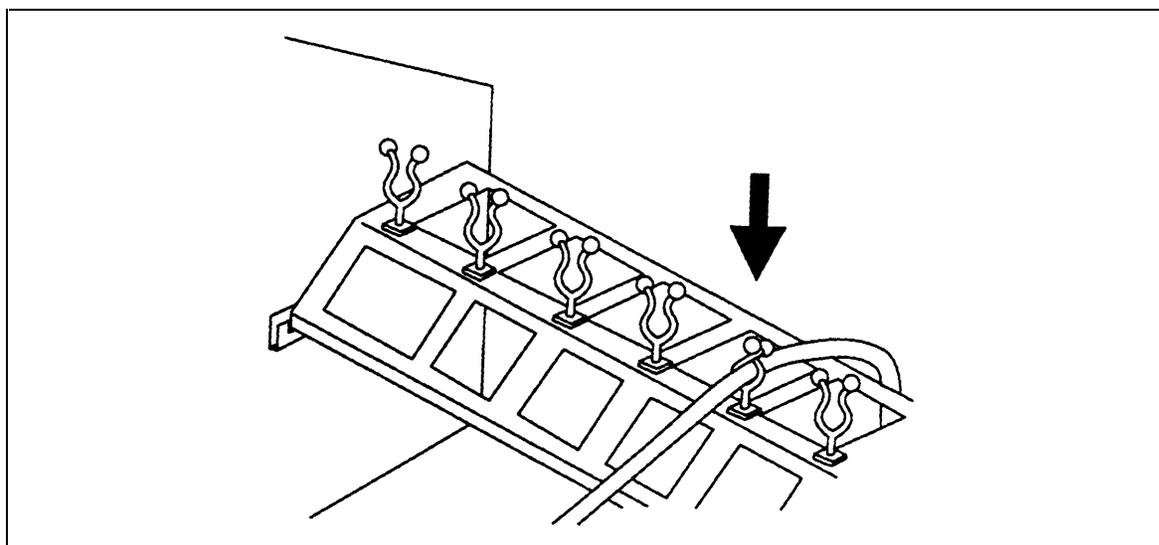
**FIGURE 2-19
Securing the EIA Cables**

3   Connect the other end of the EIA cable to the EIA port on the associated terminal device and tighten the connector retaining screws.

4   Follow this same procedure to connect the EIA cable for each new 7400A Data Module.

5   Proceed to Chapter 6, *"DCE Operation — Terminal Device Applications."*

TABLE 2-1
L2 Adapter Cable Pin Assignments*

77A Data Mounting Position	Modular Plug Pin Numbering	Signal Direction**	B25 Connector Pin Numbering
1	1	S ← M	27
	2	S ← M	2
	3	S → M	28
	6	S → M	3
	4	TDG	4
	5	D1	29
2	1	S ← M	30
	2	S ← M	5
	3	S → M	31
	6	S → M	6
	4	TDG	7
	5	D1	32
3	1	S ← M	33
	2	S ← M	8
	3	S → M	34
	6	S → M	9
	4	TDG	10
	5	D1	35
4	1	S ← M	36
	2	S ← M	11
	3	S → M	37
	6	S → M	12
	4	TDG	13
	5	D1	38

(Continued)

---

* Refer to Figures 2-9 or 2-17.

** S=Switch, M=Data Module, TDG and D1=Modem Control

L2 Adapter Cable Pin Assignments*

(Continued)

77A Data Mounting Position	Modular Plug Pin Numbering	Signal Direction**	B25 Connector Pin Numbering
5	1	S ← M	39
	2	S ← M	14
	3	S → M	40
	6	S → M	15
	4	TDG	16
	5	D1	41
6	1	S ← M	42
	2	S ← M	17
	3	S → M	43
	6	S → M	18
	4	TDG	19
	5	D1	44
7	1	S ← M	45
	2	S ← M	20
	3	S → M	46
	6	S → M	21
	4	TDG	22
	5	D1	47
8	1	S ← M	48
	2	S ← M	23
	3	S → M	49
	6	S → M	24
	4	TDG	25
	5	D1	50

* Refer to Figures 2-9 or 2-17.

** S=Switch, M=Data Module, TDG and D1=Modem Control

3   Chapter 3: Using the Front Panel

Chapter 3: Using the Front Panel

This chapter illustrates and discusses the front panel of the 7400A Data Module and how to use the panel's push buttons and front display to configure the data module for DTE or DCE operation. Also provided in this chapter is an explanation of the 7400A's main menu as well as its options and suboptions for both DCE and DTE operation.
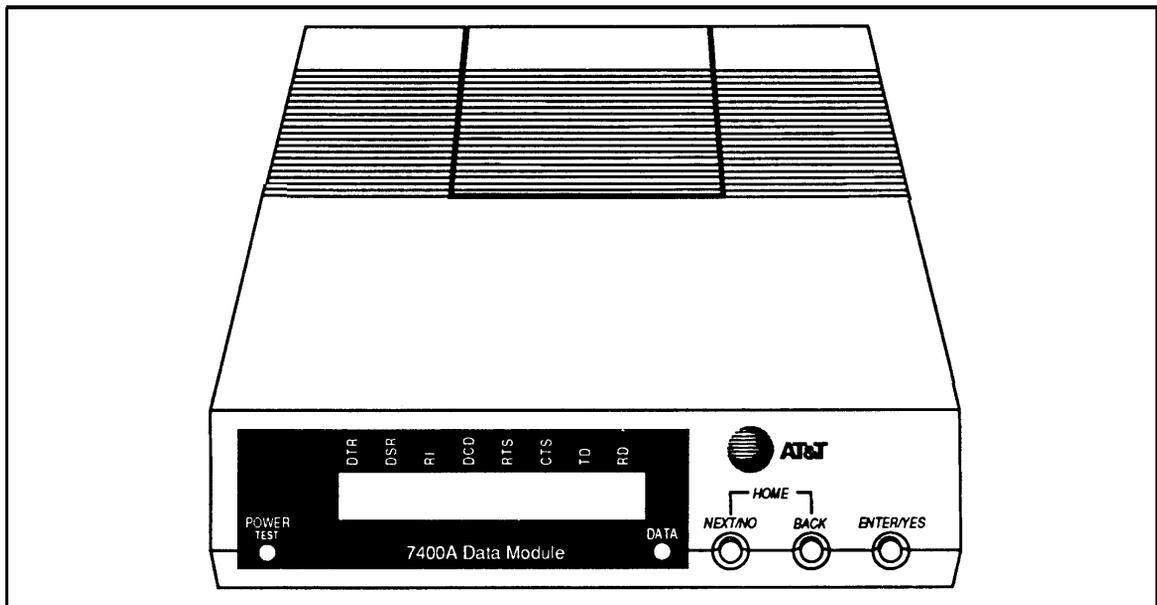
FIGURE 3-1
7400A Data Module

THE FRONT PANEL

The panel is comprised of:

- two light emitting diodes (LEDs), one red and one green

- a single line, sixteen character liquid crystal display (LCD)

- three non-locking push-buttons.

The front panel of the 7400A is shown below.

FIGURE 3-2
Front Panel

The red LED   Labeled *POWER/TEST,* this LED lights when there
                     is power to the 7400A and flashes during all tests.

The green LED   Labeled *DATA,* this LED lights steadily indicating a
                     data call is in progress and flashes when receiving an
                     incoming data call. This LED flashes synchronously
                     with the red LED indicating that the connection to
                     the PBX is lost.

The LCD display   This display first shows a startup sequence consisting
                     of self-test results, hardware configuration, software
                     release and version, and copyright information.
                     Following start-up, the **Home** screen is displayed.

                     Following the **Home** screen, the Main Menu begins.
                     (Full details on the **Home** screen and the main menu
                     are provided in following sections.)

Three push buttons   ● *NEXT/NO* is used to scroll forward through the
                          menu and/or reject the function displayed. By
                          keeping this button depressed, you are able to
                          quickly scroll through menu items.

                          ● *BACK* is used to scroll backward through the
                          menu. By keeping this button depressed, you are
                          able to quickly scroll back through menu items.

                          ● *NEXT/NO* and *BACK* pressed simultaneously
                          returns you automatically to the **Home** screen from
                          many menus. However, **do not** press these two keys
                          simultaneously while changing option values. If this
                          is done, rather than returning you to the Home
                          screen, the system queries if you want to save the
                          changes you have made.

                          ● *ENTER/YES* is used to set an option or execute
                          the function displayed.

THE MAIN MENU

The Main Menu has several levels of options and suboptions.
By pressing *NEXT/NO,* you are be able to scroll through the entire
first level to view each option shown in the flowchart below.

After scrolling to the desired main menu option and selecting it by
pressing *ENTER/YES,* you are now one level deeper within the
options; a suboption choice is presented to you.

Press *NEXT/NO* and *BACK* at any time to automatically return to
the **Home** display.

The remainder of this chapter is dedicated to the Main Menu and
its options.
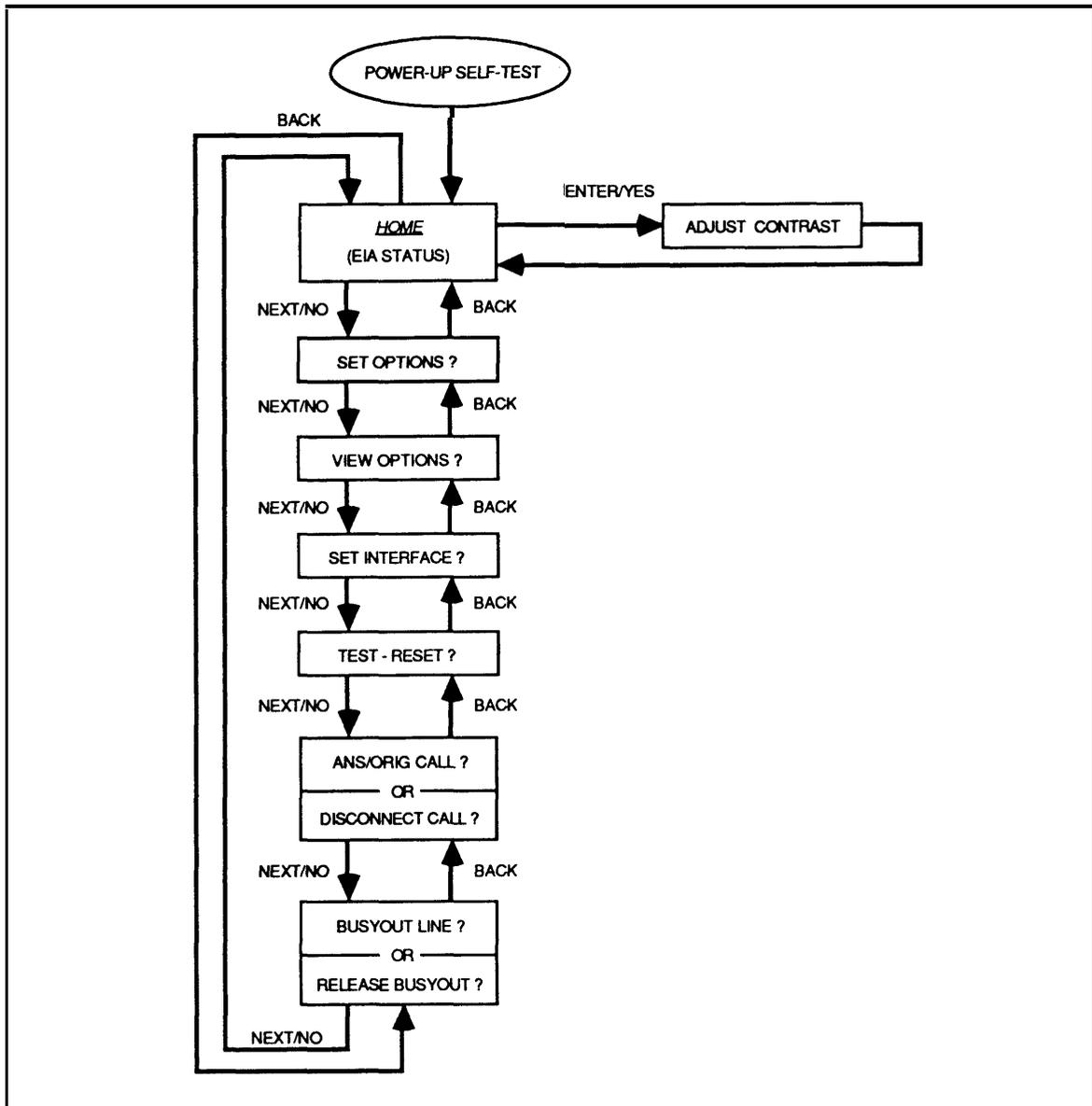
FIGURE 3-3
The Main Menu

---

* Set Interface is displayed only if the 7400A is configured for DCE operation.

The Home Display

The **Home** screen is the first item in the main menu and thereby the first item shown on the display. The **Home** screen is used to display the status of the 7400A's EIA interface leads. The display automatically updates at least once every 100 milliseconds.

The following is a typical **Home** display.
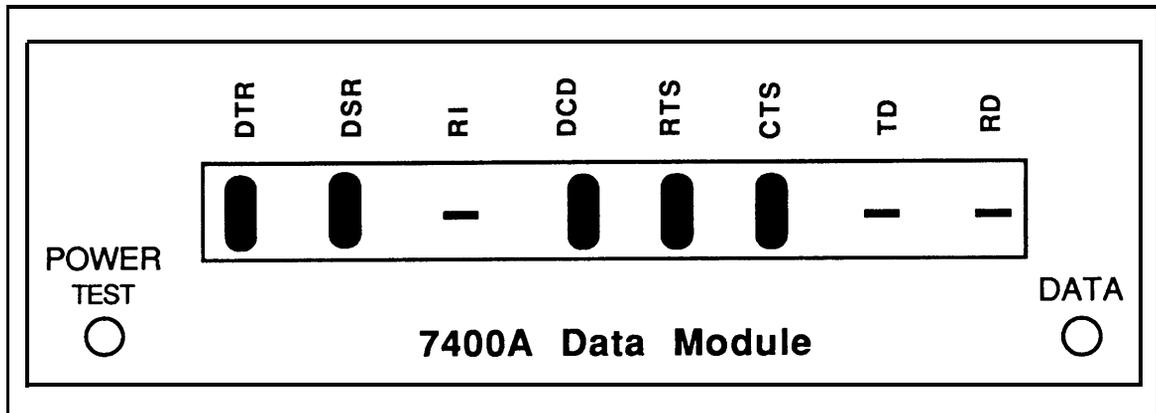
FIGURE 3-4
Typical Home Display

A solid oval indicates the control lead is on, while a dash indicates the lead is off. The abbreviations above the display translate as follows:

DTR	Data Terminal Ready
DSR	Data Set Ready
RI	Ring Indicator
DCD	Data Carrier Detect
RTS	Request to Send
CTS	Clear to Send
TD	Transmitted Data (display shows an oval when data is being transmitted)
RD	Received Data (display shows an oval when data is being received)

Adjusting the Contrast of the Display

The display contrast can be adjusted whenever the **Home** screen is on the display. (Reminder: To return to the **Home** screen from many menus, simultaneously press *NEXT/NO* and *BACK.)*

The 7400A has eight contrast settings. The first time the **Home** screen is displayed, the factory default of the darkest contrast is displayed, then when *ENTER/YES* is pressed, the lightest setting is displayed.

Pressing *ENTER/YES* scrolls through the contrast choices; the **Home** display's contrast increases each time *ENTER/YES* is pressed, unless you are at the darkest setting (in which case, the choices are cycled again starting with the lightest setting).

The current contrast setting is saved only when any menu option is changed and saved.

The Set Interface Menu

This menu enables you to select the desired user interface for **DCE operation only.** This menu is not displayed when the 7400A is configured for DTE operation.

Although this option is not the first displayed on the menu, your interface must be set immediately so that all subsequent changes during this session will be attributed to the correct interface.
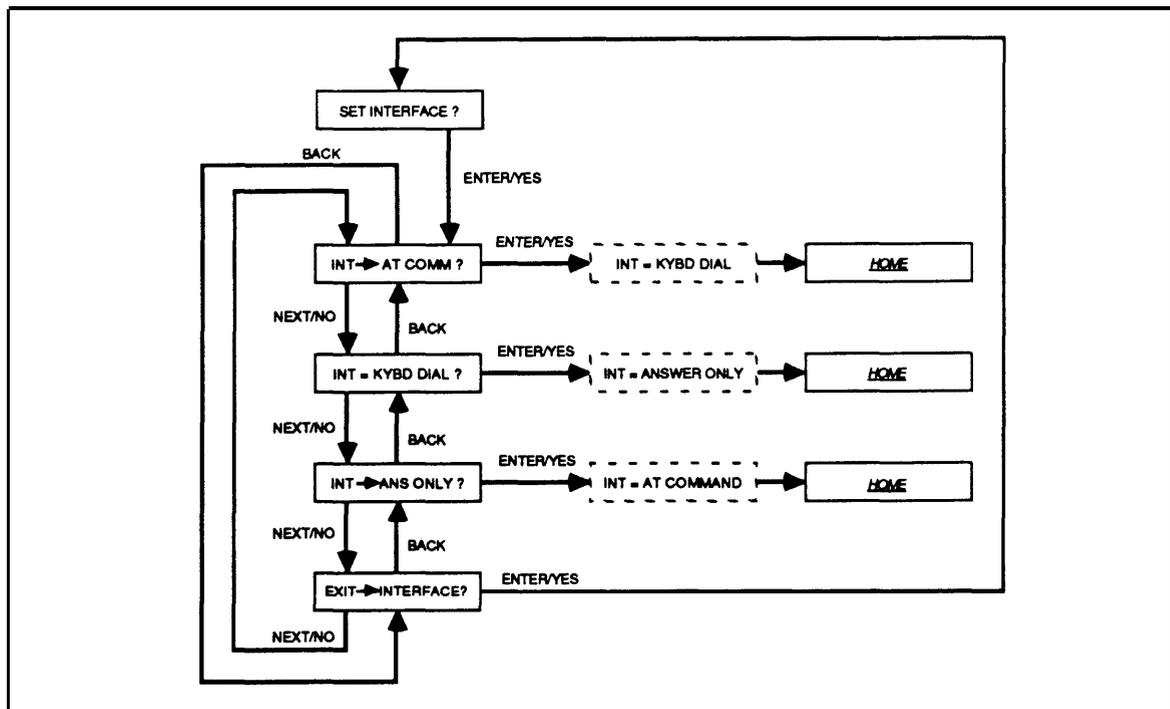
FIGURE 3-5
The Set Interface Menu

Procedure: Setting the Interface

Set the interface using the procedure below. As is often the case, pressing *NEXT/NO* and *BACK* simultaneously breaks you from this menu and returns you to the **Home** display.

1   From the **Home** screen, press *NEXT/NO* until SET INTERFACE? is displayed; once displayed, press *ENTER/YES.*

2   Proceed using the following table:

IF	THEN
You wish to select the displayed user interface	• Press *ENTER/YES.* • The system displays INT=\<chosen interface\>, automatically runs a self-test and reinitializes the 7400A, then returns you to the **Home** screen.
You do not wish to select the displayed user interface	• Press *NEXT/NO.* • The system displays the next menu option.

The Set Options Menu

With this menu, you are able to store one complete set of options using the front panel interface.*

Table 3-1 presents the options in the order that they are presented in the menu and indicates the interfaces to which the options apply. For the Keyboard Dial, Answer Only and Modem Pool interfaces, all options *must* be set from the front panel. AT Command interface permits EIA speeds to be enabled or disabled from the front panel; all other options must be set from an attached keyboard. Details are provided in Chapter 4, *DCE Operation.*

---

*   Using the AT Command interface, you can store an additional two option profiles. Use the AT commands shown in Chapter 6, *"DCE Operation — Terminal Device Application",* and Appendix A, *"AT Command Interface—AT Commands".*

TABLE 3-1
Options Available to Each Interface Via the Front Panel

Option	(DCE) Keyboard Dial	(DCE) Answer Only	(DTE Modem Pool	(DCE) AT Command
300 SPEED	X	X	X	X
1200 SPEED	X	X	X	X
2400 SPEED	X	X	X	X
4800 SPEED	X	X	X	X
9600 SPEED	X	X	X	X
19200 SPEED	X	X	X	X
AUTO ANSWER	X	X	—	—
AT CONTROL	—	—	X	—
BREAK DISCONNECT	X	X	—	—
CI LEAD	X	X	X	—
CI2 LEAD	—	—	X	—
CH LEAD	X	X	X	—
CH2 LEAD	—	—	X	—
CTS LEAD	X	X	—	—
DCD LEAD	X	X	—	—
DSR LEAD	X	X	—	—
DTR DETECTION	X	X	—	—
DTR LEAD	X	X	—	—
LL LEAD	X	X	X	—
PARITY	X	X	—	—
REMOTE LOOP	X	X	X	—
RI LEAD	X	X	—	—
RL LEAD	X	X	X	—
SIGNAL LOSS DISCONNECT	X	X	X	—
TM LEAD	X	X	X	—

X = option is available with this interface

— = option is not available with this interface

The following tables present the choices for each option of all three user interfaces. Factory default values are shown in larger type. Note the abbreviations used by the system.

Table 3-2   Options Available to the DCE AT Command Interface and Their Default Settings

Table 3-3   Options Available to the DCE Keyboard Dial Interface and Their Default Settings

Table 3-4   Options Available to the DCE Answer Only Interface and Their Default Settings

Table 3-5   Options Available to the DTE Modem Pool Command Interface and Their Default Settings

TABLE 3-2
Options Available to the DCE AT Command Interface and Their Default Settings

Set Option Displays	Possible Values
SET 300 SPEED?	ON, OFF
SET 1200 SPEED?	ON, OFF
SET 2400 SPEED?	ON, OFF
SET 4800 SPEED?	ON, OFF
SET 9600 SPEED?	ON, OFF
SET 19200 SPEED?	ON, OFF

TABLE 3-3
Options Available to the DCE Keyboard Dial Interface and Their Default Settings

Set Option Displays	Option Abbreviations	Possible Values
SET 300 SPEED?	300	ON, OFF
SET 1200 SPEED?	1200	ON, OFF
SET 2400 SPEED?	2400	ON, OFF
SET 4800 SPEED?	4800	ON, OFF
SET 9600 SPEED?	9600	ON, OFF
SET 19200 SPEED?	19200	ON, OFF
SET ANSWER?	ANS	AUTO, MANUAL
SET BREAK DISC?	BRKDISC	TRIPLE, LONG, NONE
SET CI LEAD?	CI	ON, OFF
SET CH LEAD?	CH	ON, OFF
SET CTS LEAD?	CTS	NORMAL, ON
SET DCD LEAD?	DCD	NORMAL, ON
SET DSR LEAD?	DSR	NORMAL, ON
SET DTR DETECT?	DTR	0, 10, 20, 30, 50, 100, MSEC
SET DTR LEAD?	DTR	EIA STANDARD, IGNORE
SET LL LEAD?	LL	ON, OFF
SET PARITY?	PARITY	EVEN, ODD, MARK, SPACE
SET REMOTE LOOP?	REMLOOP	GRANT, DENY
SET RI LEAD?	RI	CYCLE, ON
SET RL LEAD?	RL	ON, OFF
SET SIGLS DISC?	SIGLS DISC	ON, OFF
SET TM LEAD?	TM	ON, OFF

TABLE 3-4

Options Available to the DCE Answer Only Interface and Their Default Settings

Set Option Displays	Option Abbreviations	Possible Values
SET 300 SPEED?	300	ON, OFF
SET 1200 SPEED?	1200	ON, OFF
SET 2400 SPEED?	2400	ON, OFF
SET 4800 SPEED?	4800	ON, OFF
SET 9600 SPEED?	9600	ON, OFF
SET 19200 SPEED?	19200	ON, OFF
SET ANSWER?	ANS	AUTO, MANUAL
SET BREAK DISC?	BRKDISC	TRIPLE, LONG, NONE
SET CI LEAD?	CI	ON, OFF
SET CH LEAD?	CH	ON, OFF
SET CTS LEAD?	C T S	NORMAL. ON
SET DCD LEAD?	DCD	NORMAL, ON
SET DSR LEAD?	DSR	NORMAL, ON
SET DTR DETECT?	DTR	0, 10, 20, 30, 50, 100 MSEC
SET DTR LEAD?	DTR	EIA STANDARD, IGNORE
SET LL LEAD?	LL	ON, OFF
SET REMOTE LOOP?	REMLOOP	GRANT, DENY
SET RI LEAD?	RI	CYCLE, ON
SET RL LEAD?	RL	ON, OFF
SET SIGLS DISC?	SIGLS DISC	ON, OFF
SET TM LEAD?	TM	ON, OFF

TABLE 3-5
Option Available to the DTE Modem Pool Command Interface and Their Default Settings

Set Option Displays	Option Abbreviations	Possible Values
SET 300 SPEED?	300	ON, OFF
SET 1200 SPEED?	1200	ON, OFF
SET 2400 SPEED?	2400	ON, OFF
SET 4800 SPEED?	4800	ON, OFF
SET 9600 SPEED?	9600	ON, OFF
SET 19200 SPEED?	19200	ON, OFF
SET AT CONTROL?	AT	ON, OFF
SET CI LEAD?	CI	ON, OFF
SET CI2 LEAD?	CI2	ON, OFF
SET CH LEAD?	CH	ON, OFF
SET CH2 LEAD?	CH2	ON, OFF
SET LL LEAD?	LL	ON, OFF
SET REMOTE LOOP?	REMLOOP	GRANT, DENY
SET RL LEAD?	RL	ON, OFF
SET SIGLS DISC?	SIGLS DISC	ON, OFF
SET TM LEAD?	TM	ON, OFF

Procedure: Setting Options Perform the following steps to set the options shown in Table 3-1 above.

1 From the **Home** screen, press *NEXT/NO* until SET OPTIONS? is displayed.

2 To work within the SET OPTIONS menu, press *ENTER/YES.*

- SET 300 SPEED? is displayed.

3 Proceed using the following table.

IF	THEN

You wish to activate this data transmission speed or option	• Press *ENTER/YES.*
	• The system verifies that you wish to activate this option by displaying <speed> = on?
	• Press *ENTER/YES* if this speed is to be activated.
	• The system then responds CONTINUE?
	  − If you wish to set more options, press *ENTER/YES* and the next option is displayed.
	  − If you have completed setting options, press *NEXT/NO* and go to Step 5.

You do not wish to activate this data transmission speed or option	• Press *NEXT/NO.* • The system displays the next option.

4 Repeat the table above until you have set all desired options.

5 Once you have run through all options, the system prompts DONE?

IF	THEN

You have completed this session	• Press *ENTER/YES.*
	
	• The system displays SAVE CHANGES?
	
	   – If you are satisfied with all changes made, press *ENTER/YES.*
	
	   – If you do not wish to save any of the changes made during this session, press *NEXT/NO.*
	
	• The system automatically returns you to the **Home** screen.

There are other options you must set	• Press *NEXT/NO.* • The system displays SET 300 SPEED? • Return to Step 3 in this procedure and continue this work session.

Note: The system does not allow you to leave the **Set Options** menu if you inadvertently set all speeds to *off.* The system displays SET SPEED OPTION if you press *ENTER/YES* when DONE? is displayed. You must set at least one speed to *on* to leave the menu.

The View Options Menu

This menu allows only the viewing of option values currently set.

Shown in the menu below are the factory default settings. With time and use, your menu will differ.

The options set will vary depending upon the interface chosen. Figure 3-6 below is an example of options set for an AT command interface.
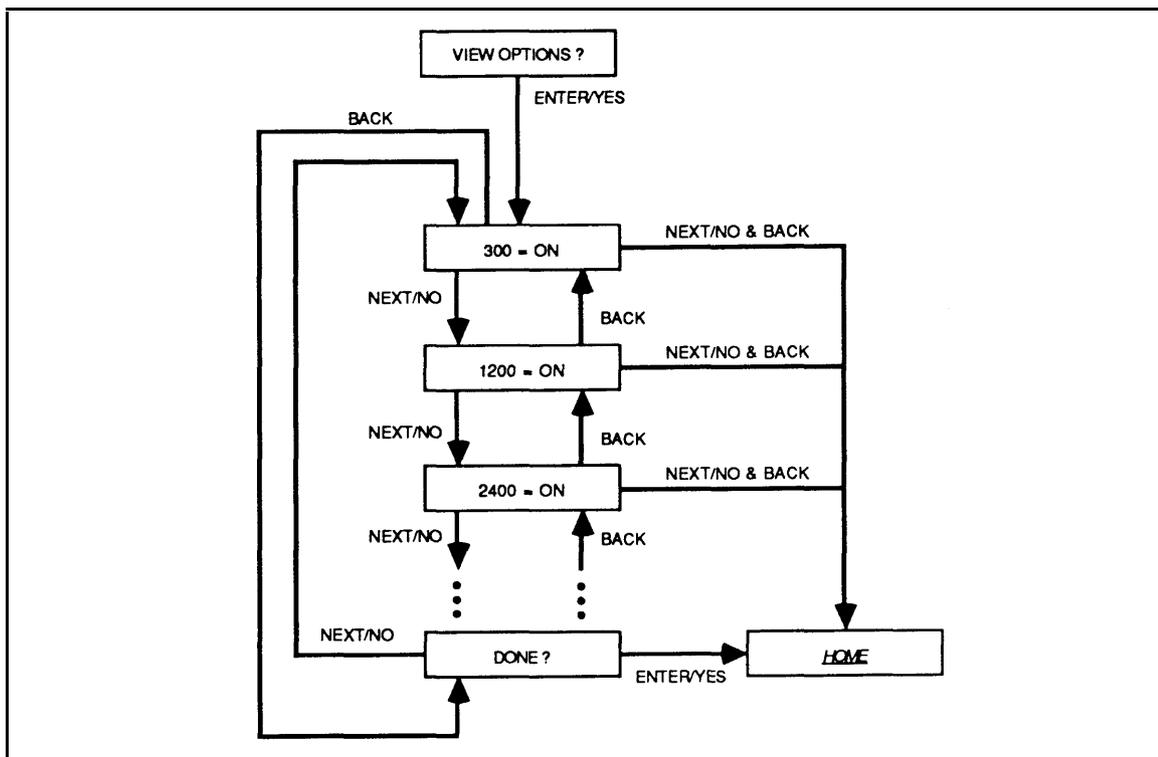
FIGURE 3-6
The View Options Menu

Procedure: Viewing Options

Perform the following steps to view the current option settings:

1   From the **Home** screen, press *NEXT/NO* until VIEW OPTIONS? is displayed; once displayed, press ENTER/YES.

2   Scroll forward and backward using the *NEXT/NO* and *BACK* keys, respectively.

3   Once you are finished viewing the set options, press

●   *NEXT/NO* and *BACK* simultaneously OR

●   *NEXT/NO* until the DONE? query is displayed; press *ENTER/YES.*

4   The system automatically returns you to the **Home** screen.

The Test-Reset Menu   This menu provides access to the test-mode menu. Test are
                                 suggested when

- there is a suspected or known system problem

- you replace a 7400A

- you repair a DCP line wiring

- you repair the remote endpoint.
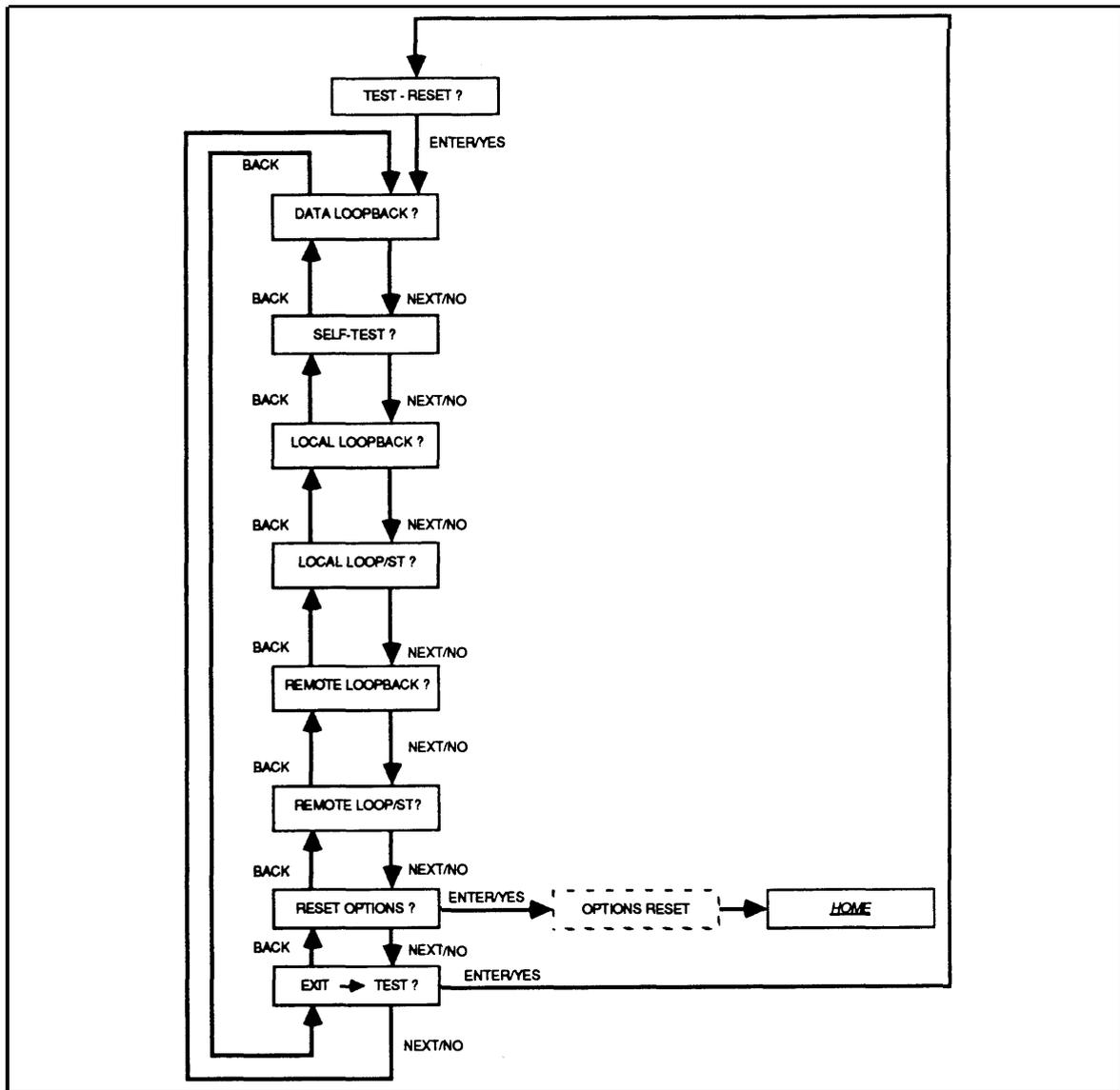
FIGURE 3-7
The Test-Reset Menu

Procedure: Selecting a Test

Use the procedure below to select a test:

1 From the **Home** screen, press *NEXT/NO* until TEST-RESET? is displayed; once displayed, press *ENTER/YES.*

2 Press *NEXT/NO* to scroll through the available tests.

Notes: Only one test may be activated at a time, and a test must end before another can be activated.

Details of each test follow.

Data Loopback Test

The data loopback test is a test that aids the remote user. It excludes the local EIA interface and local data terminal equipment. The remote equipment sends a test message that is received at the local 7400A and looped back to the remote endpoint for verification that the remote endpoint and telephone line are operating properly. (See also *Remote Loopback Test* later in this section.)

You must be on a data call to run a data loopback test.
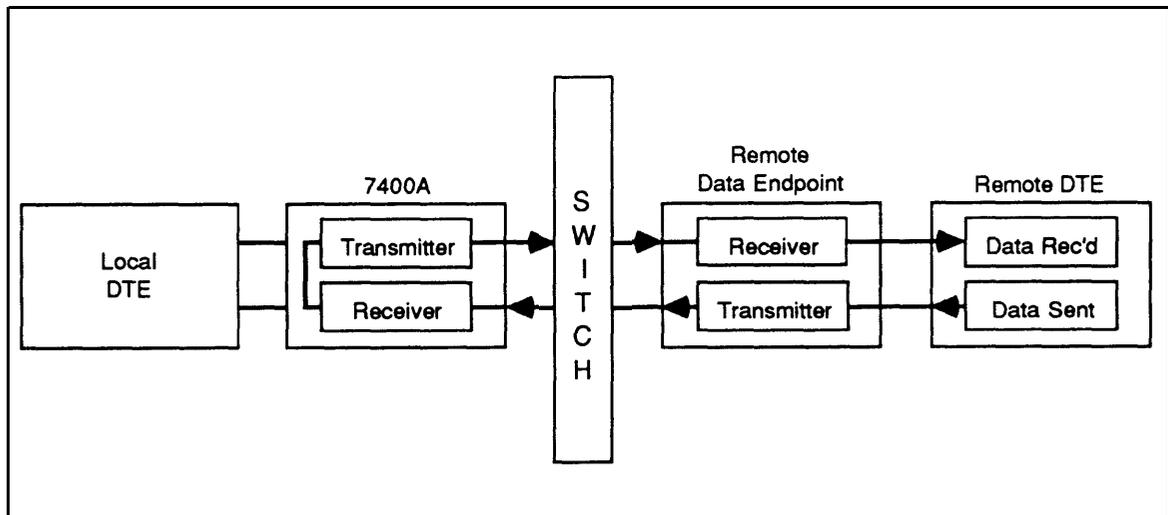
FIGURE 3-8
Data Loopback Test

Procedure: Running a Data Loopback Test

1 From the TEST-RESET menu, press *NEXT/NO* until DATA
LOOPBACK? is displayed.

2 Press *ENTER/YES* to begin the data loopback test.

- The system briefly displays TEST STARTED and then
  END DATA LOOP? when the system is running a data
  loopback test.

- The *POWER/TEST* lamp blinks rapidly during the test and
  stops blinking when the test is completed.

Notes: If you attempt to start a data loopback test when not on a
data call or when another test is active, the system
displays one of the following messages:

DENIED: NOT IN DATA MODE

DENIED: TEST IN PROGRESS

If you are using the AT command interface, you can
start the data loopback test using the &T3 command.
(See Appendix A for command details.) The system
responds OK.

If you attempt to end a data loopback test when the
switch is running a remote loopback test, the system
displays DENIED: PBX TEST IN PROGRESS
and then shows the previous display.

To terminate the test prior to its completion type
at&t0. The system responds OK.

At the end of the test, you can return immediately to
the **Home** display by pressing *NEXT/NO* and
BACK simultaneously.

3 To proceed to the next test when the data loopback test is finished,
press *ENTER/YES* while END DATA LOOP? is displayed.

- The system scrolls TEST ENDED across the display and then
  shows DATA LOOPBACK?

4 Press *NEXT/NO* to display the next test, the self-test.

Self-Test

The self-test is an internal check of the unit to check the read-only
memory (ROM), the random-access memory (RAM), and internal
circuits.

CAUTION: The self-test causes a reset; a call in progress will
be disconnected, and a stored option profile or,
if none, the factory default options will be reloaded.

The self-test is also activated automatically:

- after a power-on reset when the EIA interface board is inserted

- when the DCP cord has been disconnected and reconnected

- when the DCE interface has been changed.
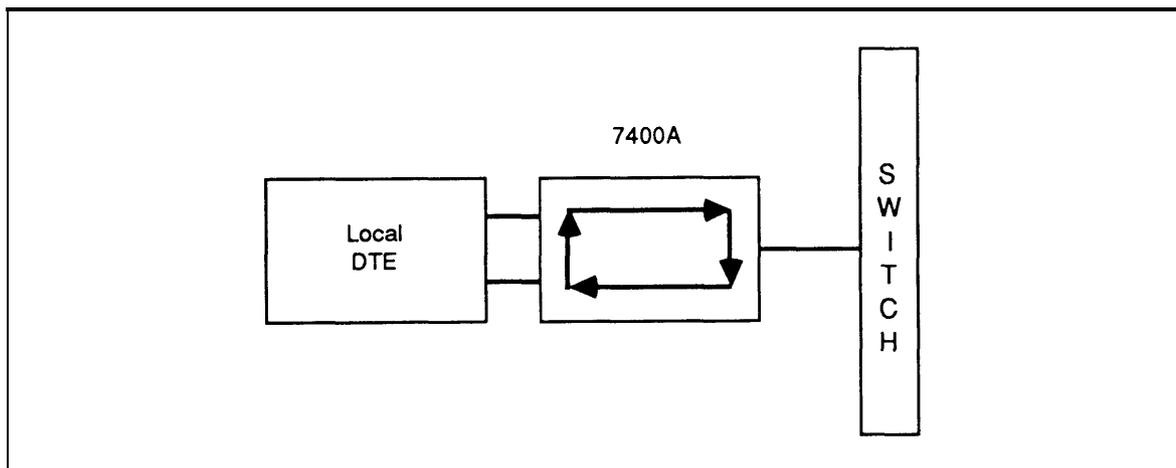
FIGURE 3-9
Self-Test

Procedure: Running a Self-Test

1 From the TEST-RESET menu, press *NEXT/NO* until
SELF-TEST? is displayed.

2 Press *ENTER/YES* to begin the self test.

- The two lamps on the front of the 7400A blink during
the self-test.

Notes: The following message is displayed during the test:

```
SELF TESTING
```

When the test is complete, the unit enters the start-up sequence depicted below:

```
SELF TESTING

SELF-TEST PASSED

7400A DCE MODE (or) 7400A DTE MODE

FIRMWARE REL 2.0, VER 1.0 COPYRIGHT 1989

AT&T ALL RIGHTS RESERVED
```

Note that the display shows you whether the 7400A is configured for DCE or DTE operation. The system then automatically returns you to the **Home** display.

Failing the Self-Test

If the self-test fails because of the non-volatile memory check, the system scrolls the following message across the display and then shows the **Home** display:

```
MEMORY ERROR:   DEFAULT OPTIONS LOADED
```

This message means that option values changed and stored by a user cannot be recalled from storage. The 7400A loads a set of factory values instead.

If the self-test fails because the EIA is missed or loose, the system displays the following series of messages:

```
SELF TESTING

SELF-TEST FAILED

CHECK EIA BOARD [flashes]
```

The board must be installed correctly or the 7400A will not operate.

Except for notice of a loose or missing EIA board, a failure of the self-test means that the 7400A is defective.

Local Loopback Test

Data terminal equipment and the 7400A are required for this test.
(Be aware that the switch can initiate its own local loopback test
independent of the user.)

In the local loopback test, characters are sent from the local data
terminal equipment on a loop through the 7400A on the local side of the
switch; the switch and remote endpoint are excluded from this test.
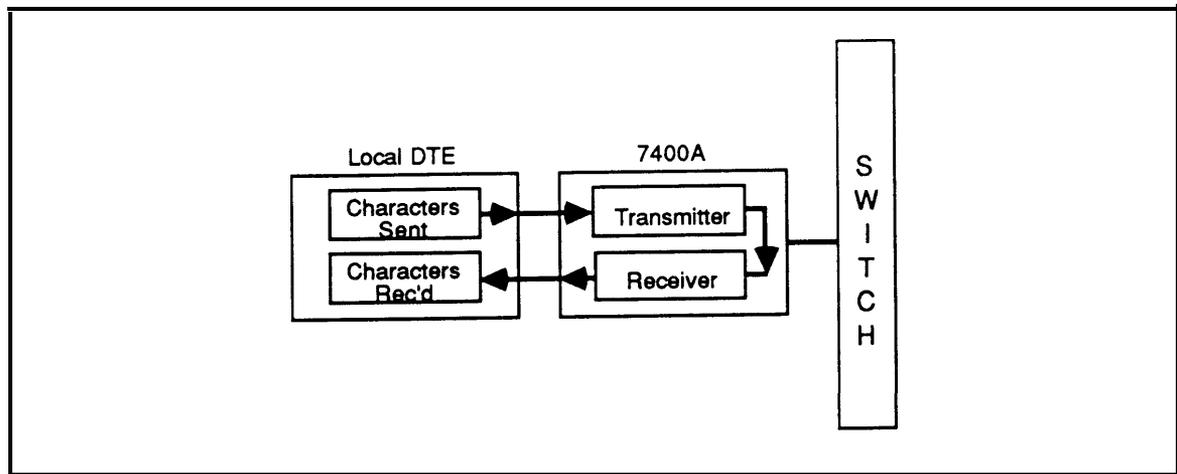
FIGURE 3-10
Local Loopback Test

Procedure: Performing a Local Loopback Test

1 From the TEST-RESET menu, press *NEXT* until
LOCAL LOOPBACK? is displayed.

2 Press *ENTER/YES* to begin local loopback test.

- The 7400A briefly displays TEST STARTED and then
displays END LOCAL LOOP? when it is running a local
loopback test.

- The *POWER/TEST* lamp blinks rapidly during the test and
stops blinking when the test is completed.

Notes: If you attempt to start a local loopback test when another
test is active, the 7400A displays one of the following
messages and then displays its previous screen:

DENIED: TEST IN PROGRESS

You must wait until the other test is finished, or you
must end the first test. If you attempt to end a local
loopback test when the switch has begun the test, the

system displays DENIED: PBX TEST IN
PROGRESS, and then displays its previous screen.

If the 7400A is off-hook when the test is started, the
system disconnects the call and scrolls
DISCONNECTED − TEST STARTED across the
display.

Your attached equipment displays the characters
returned. If they do not match the characters sent,
there is either a problem with the equipment or a
speed mismatch between the 7400A and the attached
terminal. If the two speeds match, the problem is in
the local data terminal equipment.

Except for the AT Command interface, EIA interface
speed while in the local loopback test is controlled by
the speed leads. If you are using the AT Command
interface, you can start the local loopback test by using
the &T1 command. (See Appendix A for command
details.) The system responds with OK. In the AT
Command interface, speed and parity differences
between the 7400A and local data terminal equipment
are automatically adjusted; thus, if the test fails while
you are using the AT Command interface, the problem
is in your local data terminal equipment.

To terminate the test prior to its completion:

- Type +++

The system responds OK.

- Type at&t0

The system responds OK.

At the end of the test you can return immediately to the
Home display by pressing *NEXT/NO* and *BACK*
simultaneously.

3   To proceed to the next test when the local loopback test is
finished, press *ENTER/YES* while the END LOCAL LOOP? is
displayed.

- The system scrolls TEST ENDED across the display and
then shows LOCAL LOOPBACK?

4   Press *NEXT/NO* to display the next test, the local loopback
self-test.

Local Loopback with Self-Test

A local loopback with self-test is used to verify the correct operation of the 7400A. In this test, an internal character generator and error checker are used to transmit data and then check the data received at the end of the loop (the user does not type the data).
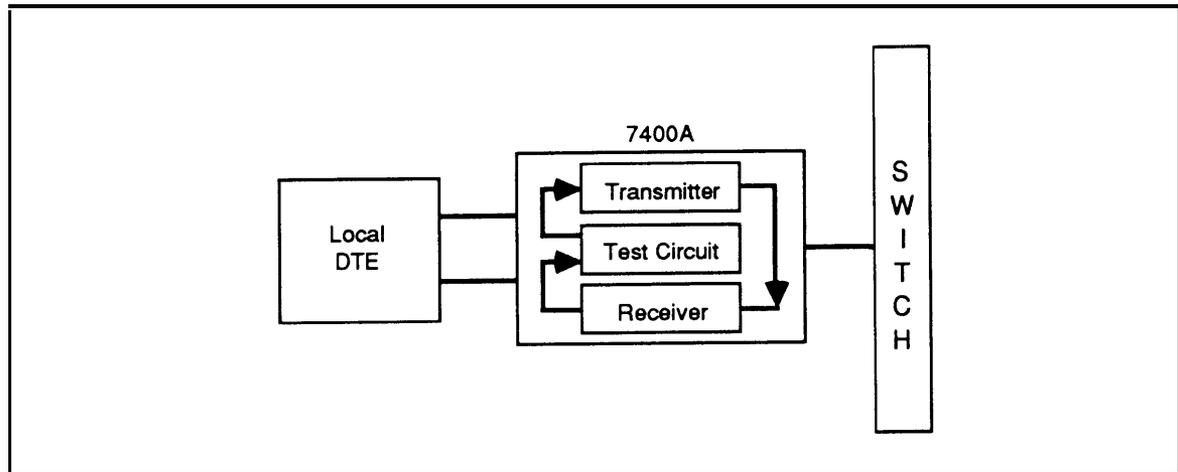
FIGURE 3-11
Local Loopback with Self-Test

Procedure: Running a Local Loopback with Self-Test

1 From the TEST-RESET menu, press *NEXT/NO* until
LOCAL LOOP/ST? is displayed.

2 Press *ENTER/YES* at LOCAL LOOP/ST? to begin the local loopback with self-test.

● The system briefly displays TEST STARTED and END LOC LOOP/ST? when the 7400A is running a local loopback self-test.

● The *POWER/TEST* and *DATA* lamps blink rapidly during the test and stop blinking when the test is completed.

● The number of character errors detected during the test will be shown on the display when the test is finished.

● If there is an incoming call during the test, the *DATA* lamp blinks signaling the incoming call. The display will not show the character errors detected while the *DATA* lamp is blinking.

Notes: If you attempt to start a local loopback with self-test when another test is active, the system displays one of the following messages and then displays the screen previously displayed:

```
DENIED:   TEXT IN PROGRESS

DENIED:   PBX TEST IN PROGRESS
```

You must wait until the other test is finished, or end it.

If the 7400A is off-hook when the test is started, the system disconnects the call and scrolls `DISCONNECTED – TEST STARTED` across the display.

Except for the AT Command interface, EIA interface speed while in the local loopback test with self-test is controlled by the speed leads. If you are using the AT Command interface, you can start the local loopback with self-test by the EIA interface LL input lead or by using a `&T8` command. (See Appendix A for command details.) The system responds with `OK`. In the AT Command interface, speed and parity differences between the 7400A and local data terminal equipment are automatically adjusted.

If the test started and ended from the front panel, the results of the test are shown on the 7400A's display. If you started and ended the test using the AT command `&T8`, the results are sent to your data terminal equipment. One or more errors indicates that the 7400A is defective.

To terminate the test prior to its completion:

• Type `at&t0`

The system responds first with the result code, then the completion signal.

```
000

OK
```

If anything other than 000 is returned, a problem was found. The number presented is the number of received characters with errors. Consult an AT&T data technician.

At the end of the test, you can return immediately to the **Home** display by pressing *NEXT/NO* and *BACK* simultaneously.

3   To proceed to the next test when the local loopback with self-test is finished, press *ENTER/YES* while END LOCAL LOOP/ST? is displayed.

●   The system scrolls TEST ENDED across the display and then LOCAL LOOP/ST?

4   Press *NEXT/NO* to display the next test; the remote loopback test.

Remote Loopback Test

The remote loopback test determines the quality of the data transmission channel The test includes the EIA interface at the local end and excludes the EIA interface at the remote end

You, as the user at the equipment generate your own test message. Once a call has been established and you initiate the test, data from the equipment are transmitted through the 7400A to the remote endpoint, which is put into remote loopback mode; the data is looped back through the 7400A to the local data terminal equipment. You then compare the received message with the transmitted message.

You must be on a data call to run a remote loopback test.
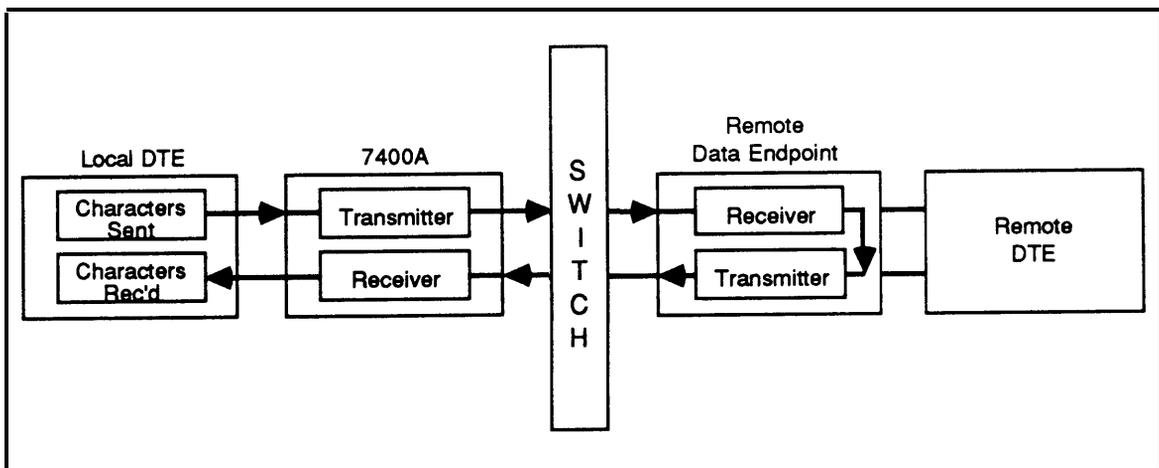
FIGURE 3-12
Remote Loopback Test

Procedure: Performing a Remote Loopback Test

1   From the TEST-RESET menu, press *NEXT/NO* until
REMOTE LOOPBACK? is displayed.

2   Press *ENTER/YES* to begin the remote loopback test.

  • The system briefly displays REQUESTING TEST and the TEST STARTED.

  • END REMOTE LOOP? is displayed when the system is requesting the remote data endpoint to take part in the remote loopback test. Otherwise, it displays REMOTE LOOPBACK?

Notes: If you attempt to start a local loopback with self-test when another test is active, the system displays one of the following messages and then displays the screen previously displayed:

```
DENIED:  NOT IN DATA MODE

DENIED:  TEST IN PROGRESS
```

The system aborts the request for the test if the remote endpoint does not respond to the request within five seconds.

If you are using the AT Command interface, you can start the remote loopback test by the RL input lead or by using the `&T6` command. (See Appendix A for command details.) The system responds with `OK`. In the AT Command interface mode, the speed and parity differences between the 7400 and local data terminal equipment are automatically adjusted.

Passing the test indicates that all elements of data transmission are operating properly, at least through part of the remote endpoint. If data errors occur during normal data-transmission mode, the problem is further into the remote endpoint or its attached data terminal equipment.

Failing this test does not necessarily indicate that the 7400A is defective. If this test fails, but the remote loopback with self-test passes, the fault is possibly a speed mismatch between your data terminal equipment and the 7400A. Do a local loopback test to attempt to isolate the problem to the data terminal equipment and 7400A EIA interface.

When using the Keyboard Dial and Answer Only interfaces, you must inform the remote user of the state of the 7400A's EIA speeds (CI and CH leads) so that the remote user's speed leads can be set to agree with yours. Because of this potential problem it may also be desirable to option the 7400A for only one data-transmission speed when using the Keyboard Dial or Answer Only interfaces. (This would confirm a speed mismatch.)

To terminate the test prior to its completion:

● Type +++

The system responds OK.

● Type at&t0

The system responds OK.

At the end of the test, you can return immediately to the **Home** display by pressing *NEXT/NO* and *BACK* simultaneously.

3 To proceed to the next test when the local loopback with self-test is finished, press *ENTER/YES* while END REMOTE LOOP? is displayed.

  ● The system scrolls TEST ENDED across the display and then REMOTE LOOP?

4 Press *NEXT/NO* to display the next test; the remote loopback with self-test.

Remote Loopback with Self-Test

The remote loopback with self-test determines the quality of the data
transmission channel and the proper operation of the 7400A at the local
endpoint. You cannot send or receive data during this test.

Once a call has been established and you initiate the test, the 7400A
generates a test message and transmits it to the remote endpoint, where
it is looped back to the 7400A. The 7400A then compares the received
message with the transmittal message for errors.
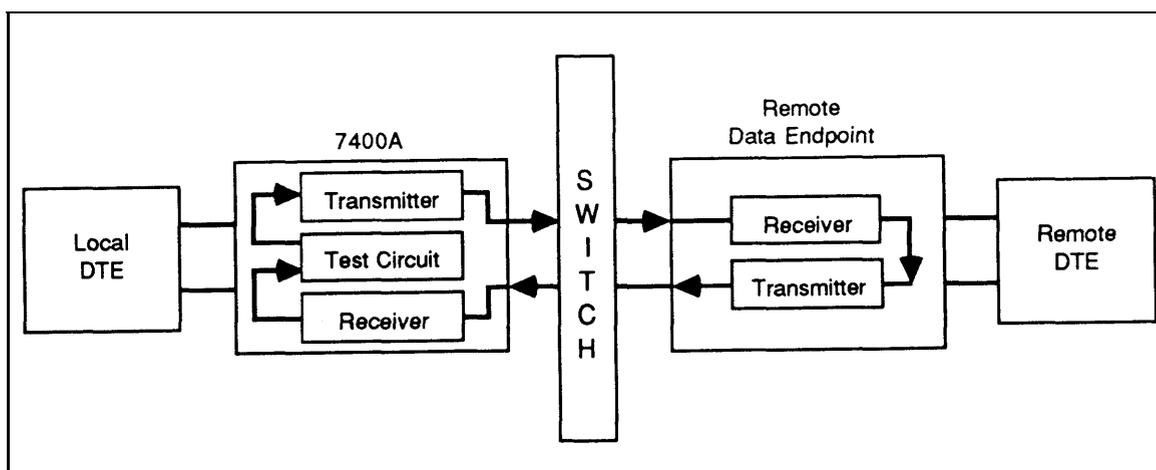
FIGURE 3-13
Remote Loopback with Self-Test

Procedure: Running the Remote Loopback with Self-Test

1 From the TEST-RESET menu, press *NEXT/NO* until
REMOTE LOOP/ST? is displayed.

2 Press *ENTER/YES* to select the remote loopback with self-test.

- The system briefly displays REQUESTING TEST and then
  TEST STARTED.

- END REM LOOP/ST? is then displayed when the system
  is requesting the remote data endpoint to take part in the
  remote loopback with self-test. Otherwise, it displays
  REMOTE LOOP/ST?

Notes: You must be on a data call to run a remote loopback with
self-test. If you attempt to start a remote loopback test
when not on a call or when another test is active, the
system displays one of the following messages

DENIED: NOT IN DATA MODE

DENIED: TEST IN PROGRESS

The system aborts the request for the test if the remote
endpoint does not respond to the request within five
seconds.

If the test started and ended from the front panel,
the results of the test are shown on the 7400A's display.
If you started and ended the test using the AT
command &T7, the results are sent to your data
terminal equipment.

Failing this test does not necessarily indicate that the
7400A is defective. The problem is probably in the
communication channel or the remote endpoint.

When using the Keyboard Dial and Answer Only
interfaces, you must inform the remote user of the
state of the 7400A's EIA speeds (CI and CH leads)
so that the remote user's speed leads can be set
to agree with yours. Because of this potential problem,
it may also be desirable to option the 7400A for
only one data-transmission speed when using the
Keyboard Dial or Answer Only interfaces. (This would
confirm a speed mismatch.)

If you are using the AT Command interface, you can
control the remote loopback test by using the &T7
command. (See Appendix A for command details.) In
the AT Command interface mode, speed and parity
differences between the 7400A and local data terminal
equipment are automatically adjusted.

To terminate the test prior to its completion:

- Type at&t0

The system responds first with the result code, then the
completion signal.

```
000

OK
```

If anything other than 000 is returned, a problem
was found. The number presented is the number of
received characters with errors. Consult an AT&T
data technician.

At the end of the test, you can return immediately to the
Home display by pressing *NEXT/NO* and *BACK*
simultaneously.

3   To proceed to the next test when the local loopback with self-test is finished, press *ENTER/YES* while END REM LOOP/ST? is displayed.

   • The system scrolls TEST ENDED across the display and then REMOTE LOOP/ST?

4   Press *NEXT/NO* to display the next test.

Reset Options

Reset Options is used to set the values of all options except the Command Interface Option to their factory default settings. These values are reset for **all interfaces** in one step.

Procedure: Resetting Options

1   From the TEST-RESET menu, press *NEXT/NO* until RESET OPTIONS? is displayed.

2   Press *ENTER/YES* to reset options.

   • The system loads the factory default option values for all interfaces.

   • The system then briefly displays OPTIONS RESET and returns to the **Home** display automatically.

The Answer/Originate Menu   The Answer/Originate mode enables you to place the 7400A off-hook
(to manually answer a call) or on-hook (to manually disconnect a call).
This feature also enables you to verify that the line has been
administered properly.

If the unit is off-hook, DISCONNECT CALL? is displayed. If the unit
is on-hook, ANS/ORIG CALL? is displayed.

Procedure: Going Off-
Hook/Returning to On-Hook

Perform the following steps:

1   From the **Home** screen, press *NEXT/NO* until ANS/ORIG
CALL ? is displayed.

• Proceed using the following table:

IF	PRESS	SYSTEM RESPONDS
You wish to place the 7400A off-hook	*ENTER/YES* at the ANS/ORIG CALL? prompt.	WAITING is briefly displayed followed by DIAL TONE and DISCONNECT CALL? (If you wish to disconnect this call, follow the directions in the box below.)
You wish to return the 7400A on-hook	*ENTER/YES* at the DISCONNECT CALL? prompt.	WAITING followed by DISCONNECTED. You are automatically returned to the ANS/ORIG CALL? menu option.

The Busyout Menu

Busyout mode removes the 7400A from service. Busyout the 7400A for maintenance reasons or for a physical inspection of the 7400A's wiring or internal components.

DO NOT attempt to enter the busyout mode when the 7400A is in the process of handling a call or running a test, otherwise you will receive an error message stating why you cannot enter the busyout mode.

Procedure: Busy out the 7400A

To busyout the 7400A, perform the following steps:

1 From the **Home** screen, press *NEXT/NO* until BUSYOUT LINE? is displayed.

2 Proceed using the following table.

IF	PRESS	SYSTEM RESPONDS
You wish to busyout the 7400A	*ENTER/YES* at the BUSYOUT LINE? prompt.	BUSYOUT MODE and the red *POWER/TEST* LED flashes
You wish to release the 7400A from the busyout mode	*ENTER/YES* at the RELEASE BUSYOUT? prompt.	BUSYOUT RELEASED and the red *POWER/TEST* LED stops flashing

3 The system automatically returns you to the **Home** screen.

4   Chapter 4: DTE Operation —
        Modem Pool Applications

Chapter 4: DTE Operation — Modem Pool Applications

This chapter explains how to configure and operate the 7400A Data Module as a DTE device for use in modem pool applications.

The modem control option may be set for compatibility with modems having either D-lead or AT command control interfaces. Once the data module is properly configured for your application, it becomes an integral part of the PBX environment and operates completely without user interaction.

The chapter contains the following sections:

- DTE Option Descriptions
- Viewing Current Option Settings
- Changing Option Settings

For further information, see **AT&T 7400A Data Module Modem Pool Installation Guide,** order number 555-020-708.

DTE OPTION DESCRIPTIONS

These options are categorized as follows:

- Data Transfer Speeds
- Modem Control
- Data Signal Rate Select Leads
- Maintenance Test Options
- Signal Loss Disconnect
- Test Mode

Data Transfer Speeds

The data transmission speed options of the 7400A Data Module must be set to match the speeds supported by its associated modem. Speeds available with the data module are 300, 1200, 2400, 4800, 9600, and 19200 bps (bits-per-second). The speed options of the data module allow you to individually set each speed to ON (activate the speed) or OFF (deactivate the speed).

Modem Control

In the DTE operating mode, the 7400A Data Module is used to control the operation of an associated modem. Depending on the hardware characteristics of the modem used, the data module may need to be configured for AT command control or D-lead control. For modems that use AT command control, the AT Control option of the data module is set to ON, and for modems that use D-lead control, the AT Control option is set to OFF.

Data Signal Rate Select Leads

In the D-lead control mode, the 7400A Data Module uses four specialized leads of the EIA interface to select amoung and acknowledge data transmission speeds that are currently activated. The four leads used by the data module are labeled CI, CI2, CH, and CH2. You can set each of these four option leads to ON or OFF, depending on how many speeds are activated. However, if a single speed has been chosen, these leads are not needed.

- For two-speed modems, set CI and CH to ON.

- For modems with greater than two speeds, set CI, CH, CI2 and CH2 to ON.

Maintenance Test Options

The 7400A Data Module has several options for local and remote loopback testing. These options include setting the LL and RL leads to ON or OFF and setting remote loopback option to GRANT or DENY.

Signal Loss Disconnect

Signal Loss Disconnect provides the 7400A with the capability to identify and respond to any signal loss occurring for more than 4.5 seconds.

Test Mode

The 7400A has a two-mode (TM) circuit that monitors pin 25 on the EIA interface. When that lead is asserted and the 7400A is optioned with TM on, then the 7400A will not answer an incoming call.

VIEWING CURRENT
OPTION SETTINGS

Before or after changing any option settings on the data module, you may wish to look at how the options are currently set.

Note: For an overall discussion of the menu system provided by the front panel display and pushbuttons of the data module, refer to Chapter 3, *"Using the Front Panel."*

To select the *VIEW OPTIONS* menu and scroll through the options, start from the **Home** display and do the following (if you are not at the **Home** display, see comments under step 3 first):

Step	To Display:	Press:	Comments
1	VIEW OPTIONS?	*NEXT/NO* or *BACK* and then *ENTER/ YES*	Repeatedly press or hold the button indicated until the name of the desired menu is displayed, and then press the *ENTER/YES* button to start viewing options.
2	300 = ON . . . REMLOOP = GRANT . . . DONE ?	*NEXT/NO* or *BACK*	Press the indicated buttons to step or scroll through until the desired option information has been observed. All options will be either *ON* or *OFF,* except *REMLOOP* (remote loopback), which will be either *GRANT* or *DENY.*
3	*"HOME"*	*NEXT/NO* and *BACK* (or *ENTER/YES)*	Many menus allow you to press *NEXT/NO* and *BACK* together to return to the "HOME" display (at the menu message *DONE?,* you can press *ENTER/YES* to return "HOME").

CHANGING OPTION SETTINGS

Option setting enables the customizing of the 7400A to suit the environmental requirements.

Options include EIA data speeds, AT control on or off (when AT control is set to off, D-Lead control is in effect), EIA Data Signal Rate Select and indicator leads if under D-Lead control, disconnect and test options (if supported by the modem).

EIA Data Speeds

If AT Control option is on, select any speed combination by chosing on or off at each speed. Note that any speed combination is possible, except setting all speeds to off. Supported speeds are 300, 1200, 2400, 4800, 9600 and 19200 bps.

If AT Control option is off, see the section in this chapter, *Selecting Data Signal Rate Select EIA Leads.*

The only criteria for a DTE operating environment is that the set speed(s) *must* match the associated modem's speed capability and at least one speed of the calling data module's speed.

DTE default setting is *300, 1200* and *2400 ON*.

Procedure: Setting EIA Data Speeds

1   From the **Home** display, press *NEXT/NO* until SET OPTIONS? is displayed; press *ENTER/YES.*

   ● The system then displays SET 300 SPEED?

2   Proceed using the following table:

IF	THEN
The displayed speed is desired	● Press *ENTER/YES.* ● The system verifies the entry by displaying <speed> = ON? ● Press *ENTER/YES* again.
The displayed sped is not desired	● Press *NEXT/NO.* ● The next speed is displayed.

3 Once you have cycled through all the speeds, the system queries
CONTINUE?

IF	THEN
You want to proceed and set the AT control	• Press *ENTER/YES.* • The system displays SET AT CONTROL? • Go to Step 2 of following section, *Modem Control Option.*
You want to end this work session	• Press *NEXT/NO.* • The system queries if you want to the changes from this session. • Press *ENTER/YES* if you are satisfied with the changes; *NEXT/NO* if you want to exit the session **without** saving the changes.

Modem Control Option

If the modem being used with the 7400A has an AT command
(Hayes or Hayes-compatible) interface, use the following procedure
to set the 7400A control option to AT on. Use the same procedure
to set the 7400A control option to AT off if the modem is not
Hayes or Hayes-compatible.

Procedure: Setting Modem Control Options

1 From the **Home** display, press *NEXT/NO* until SET OPTIONS?
is displayed; press *ENTER/YES* at the display.

  • The system displays SET 300 SPEED?

2 Press *NEXT/NO,* scrolling through the speeds, until SET AT
CONTROL? is displayed; press *ENTER/YES* at the display.

  • The system then displays the current setting for the
   AT control.

3   Depending upon the current setting now displayed, press
ENTER/YES or *NEXT/NO* to set AT control on or off.

● The system verifies the entry by repeating your choice;
AT = ON ?

  o r

AT = OFF ?

● If this entry is correct, press *ENTER/YES,* otherwise press
NEXT/NO.

4   Once set, the system queries CONTINUE?

IF	THEN
You want to proceed and set the CI leads	● Press *ENTER/YES.* ● The system displays SET CI LEAD? ● Go to Step 2 of the following section, *Data Signal Rate Select EIA Leads.*
You want to end this work session	● Press *NEXT/NO.* ● The system queries if you want to save the changes from this session. ● Press *ENTER/YES* if you are satisfied with the changes; *NEXT/NO* if you want to exit the session **without** saving the changes.

Data Signal Rate Select EIA Leads

Setting Data Signal Rate Select EIA leads is necessary only when AT control option is off. If AT control has been selected, EIA leads (i.e., CI, CH, CI2, CH2) should be set to off. Note that EIA leads can match between two and four speeds. CI leads indicate the modem's operating speed, while CH leads indicate the 7400A's operating speed.

CI and CH must be on when 2 or more data speeds are selected, off when only 1 speed is selected.

CI2 and CH2 must be on when 3 or 4 data speeds are selected, off when 1 or 2 speeds are selected.

Procedure: Setting EIA Leads

1   From the **Home** display, press *NEXT/NO* until SET OPTIONS? is displayed; press *ENTER/YES* at the display.

   • The system displays SET 300 SPEED?

2   Press *NEXT/NO,* scrolling through the speeds and AT control, until SET CI LEAD? is displayed; press *ENTER/YES* at the display.

   • The system then displays SET CI LEAD?

3   Proceed using the following table:

IF	THEN
The displayed lead is desired	• Press *ENTER/YES* • The system verifies the entry by displaying `<lead> = ON?` • Press *ENTER/YES* again.
The displayed lead is not desired	• Press *NEXT/NO* • The next lead is displayed.

4   Once you have cycled through all the leads, the system queries `CONTINUE?`

IF	THEN
You want to proceed and set the maintenance test options	• Press *ENTER/YES.* • The system displays `SET LL LEAD?` • Go to Step 2 of the following section, *Maintenance Test Options.*
You want to end this work session	• Press *NEXT/NO.* • The system queries if you want to save the changes from this session. • Press *ENTER/YES* if you are satisfied with the changes; *NEXT/NO* if you want to exit the session without saving the changes.

Maintenance Test Options

These tests are utilized by AT&T DEFINITY® Communications System Generic 2. For further information and a list of equipment needed, see the Analog Digital Facility Test Circuit (ADFTC) documentation:

● DEFINITY® Communications System Generic 2 Maintenance Procedure, Order No. 555-104-117.

● DEFINITY® Communications System Generic 2 Maintenance Repair Strategies, Order No. 555-104-118.

If the modem supports test options, they can be set; however setting test options *is not required* for successful DTE operation.

SET LL LEAD?   (Local Loopback) The choices for this lead are ON or OFF. When on, this option allows the 7400A to accept a command from the PBX to turn on EIA pin 18 forcing the associated analog modem into analog loopback testmode. The LL Lead option should be on if the modem has a Local Loopback lead on pin 18, and should be off if the modem does not.

SET REMOTE LOOP?   The choices for this option are GRANT or DENY. When set to grant, this option allows the remote data module to initiate a remote loopback. When off, this option prohibits the remote data module from placing the 7400A in the remote loopback mode.

Note: This option does not affect the remote loopback feature activated by the PBX.

SET RL LEAD?   (Remote Loopback) The options for this lead are ON or OFF. When on, this option allows the 7400A to accept a command from the PBX to turn on EIA pin 21 forcing the associated analog modem to place the remote modem in the remote loopback test mode. The RL Lead option should be on if the modem has a Remote loopback lead, and should be off if the modem does not.

Procedure: Setting
Maintenance Test Options

1 From the **Home** display, press *NEXT/NO* until SET OPTIONS? is displayed; press *ENTER/YES* at the display.

  • The system then displays SET 300 SPEED?.

2 Press *NEXT/NO* until SET LL LEAD? is displayed.

IF	THEN
The displayed maintenance test is desired	• Press *ENTER/YES* • The system verifies the entry by displaying <test> = ON? • Press *ENTER/YES* again.
The displayed maintenance test is not desired	• Press *NEXT/NO* • The next test is displayed.

3 Once you have cycled through all the tests, the system queries CONTINUE?

IF	THEN
You want to proceed and set the Signal Loss Disconnect option	• Press *ENTER/YES.* • The system displays SET SIGLS DISC? • Go to Step 2 of the following section, *Signal Loss Disconnect Option.*
You want to end this work session	• Press *NEXT/NO.* • The system queries if you want to save the changes from this session. • Press *ENTER/YES* if you are satisfied with the changes; *NEXT/NO* if you want to exit the session **without** saving the changes.

Signal Loss Disconnect Option

This option controls the response of the 7400A to any signal loss on the DCP line for more than 4.5 seconds.

When this option is set to on, the call disconnect sequence is entered whenever the 7400A detects signal loss exceeding 4.5 seconds. When this option is off, the signal loss disconnect feature is disabled. This option should be set to on when it is desirable to have the call automatically disconnected when the signal from the remote data module is lost.

The default setting is on.

Procedure: Setting Signal Loss Disconnect Option

1   From the **Home** display, press *NEXT/NO* until SET OPTIONS? is displayed; press *ENTER/YES* at the display.

    • The system then displays SET 300 SPEED?.

2   Press *NEXT/NO* until SET SIGLS DISC? is displayed; at the display press *ENTER/YES.*

    • The system then displays the current signal loss setting.

3   Depending upon the displayed setting, press *ENTER/YES* or *NEXT/NO* to change the signal loss disconnect setting.

    • The system verifies the entry by repeating your choice;
      SIGLS DISC = ON ?

        or

      SIGLS DISC = OFF ?

    • If this entry is correct, press *ENTER/YES,* otherwise press *NEXT/NO.*

4 Once set, the system queries `CONTINUE?`

IF	THEN
You want to proceed and set the test mode option	• Press *ENTER/YES.* • The system displays `SET TM LEAD?` • Go to Step 2 of the following section, *The Test Mode.*
You want to end this work session	• Press *NEXT/NO.* • The system queries if you want to save the changes from this session. • Press *ENTER/YES* if you are satisfied with the changes; *NEXT/NO* if you want to exit the session **without** saving the changes.

The Test Mode

The options for this lead are on and off. When on, this option instructs the 7400A to not answer an incoming call while pin 25 on the EIA interface is on. The TM Lead option should be on if the modem has a Test Mode lead, and should be off if the modem does not

In general, this option should be set to on when the SET LL LEAD or SET RL LEAD options are set to on.

Procedure: Setting the Test Mode

1 From the **Home** display, press *NEXT/NO* until `SET OPTIONS?` is displayed; at the display press *ENTER/YES.*

   • The system then displays `SET 300 SPEED?.`

2 Press *NEXT/NO* until the system displays `SET TM LEAD?;` at the display press *ENTER/YES.*

   • The system then displays the current test mode setting.

3 Depending upon the displayed setting, press *ENTER/YES* or *NEXT/NO* to change the test mode setting.

- The system verifies the entry by repeating your choice;

  TM = ON ?

     or

  TM = OFF ?

- If this entry is correct, press *ENTER/YES,* otherwise press *NEXT/NO.*

4 Once set, the system queries CONTINUE?

IF	THEN
You want to return to the top of the menu to set speeds	- Press *ENTER/YES.* - The system displays SET 300 SPEED? - Go to the first procedure of this chapter.
You want to end this work session	- Press *NEXT/NO.* - The system queries if you want to save the changes from this session. - Press *ENTER/YES* if you are satisfied with the changes; *NEXT/NO* if you want to exit the session **without** saving the changes.

5   Chapter 5: DTE Troubleshooting

Chapter 5: DTE Troubleshooting

This chapter provides troubleshooting guidelines specific to operational problems that may be encountered when using the 7400A Data Module in a DTE application.

HOW TO USE THIS CHAPTER

Use the following guidelines to isolate and correct a problem:

1   Scan through the "Symptom" column in the chart on the following pages to find the description that best describes the problem situation you have encountered.

2   In the "Problem" column, one or more problem descriptions is offered. Select the one that best describes the observable condition, or try the solutions suggested in turn until the trouble has been corrected.

WHEN	THEN
You are directed to type an AT command to correct the problem and the 7400A Data Module is in the **command** mode	• Type the directed command. • Return to the data mode by typing ato [Enter].
You are directed to type an AT command to correct the problem and the 7400A Data module is in the **data** mode	• Escape the data mode by rapidly pressing the plus sign three times (+++). You are now in command mode and the module responds with *OK* or *0* (unless the *Q1* option has been set to disable result codes). • Type the directed command line. • If directed to disconnect the call, type ath [Enter]

PROBLEMS AND SOLUTIONS

Symptom	Problem	Solution
POWER/TEST and *DATA* indicators are off.	Power is off.	Verify that the AC outlet is live and that the power unit is connected to the 7400A.
POWER/TEST and *DATA* indicators flash together.	7400A has lost communication with the PBX.	Verify that the line cord is connected to the 7400A line jack. Also verify that the PBX is working and that the 7400A has been correctly administered or has not been busied out of service.
DATA indicator flashes, but the 7400A does not answer the call.	Modem is not in the idle mode; the TM, DSR or DCD lead is ON.	Modem is optioned to hold DSR and/or the RL SD leads on. To correct this, return the modem to the idle mode. Enter the `at&s1` and/or the `at&c1` command to option the modem to provide the normal EIA lead functionality.
Call disconnects immediately after the 7400A answers the call.	Option incompatibility: there is a speed mismatch between the calling data module and the 7400A, or the calling data module is either a synchronous or half duplex data module.	The 7400A speed options must be set to match the modem speeds. To correct a speed mismatch, change the speed of the calling data module to match any of the 7400A speeds. Note that the 7400A cannot communicate with a synchronous or half duplex data module.
Call is disconnected immediately after the modem enters the data mode.	The calling data module does not operate at the speed selected by the modem.	Change the speed of the calling data module to match the speed selected by the modem.

Symptom	Problem	Solution
Call disconnects after 30 seconds.	Modem did not enter the data mode. AND/OR The EIA cable is defective.	Verify that the modems are compatible. Swap the EIA cable with a known working EIA cable.
Transmitted and received data have errors.	The speed of the modem and the 7400A or local data endpoint are not the same.	If the 7400A uses D-Lead control, check the speed lead options. Change terminal speed at the local data station to match the speed indicated in the CONNECT xxxx message.
	The parity settings for the local and remote data terminals are not the same.	Change terminal parity at the local data station to match the parity used at the remote data station.
The DATA indicator is ON but data is not being transmitted.	The modem did not send a connect code because the Display Result Codes option is set to OFF.	Disconnect the call or enter +++, then enter the atq0 command to enable the option. Change and store the results by entering &w0 followed by &z0.
	The modem sends Result Codes in verbose form.	Disconnect the call or enter +++, then enter the atv0 command to enable the numeric form. Change and store the results by entering &w0 followed by &z0.
	The modem sends only the basic result codes (XO).	Disconnect the call or enter +++, then enter the atx1 command to option the modem to send different CONNECT codes for each speed. Change and store the results by entering &w0 followed by &z0.

6   Chapter 6: DCE Operation —
Terminal Device Applications

Chapter 6: DCE Operation — Terminal Device Applications

This chapter discusses how to configure and operate the 7400A Data Module as a DCE device to connect a local terminal device to a far end device. Communication options for DCE operation include three interfaces: AT Command, Keyboard Dial, and Answer Only.

USER INTERFACES

AT Command Mode	Keyboard Dial Mode	Answer Only Mode
This Hayes-compatible interface is used to alert the modem of alterations to its configuration. Using the `at` prefix, the modem is alerted that a change is coming. The suffix following the `at` instructs the modem of the precise change to the configuration. This interface advises the user of the call's progress with screen messages. These messages are: • `Ring` • `Connect xxx` • `No Carrier` • `Busy` • `OK` • `Error`	Used when the 7400A module must interact with a terminal device, this interface advises the user of the call's progress with screen messages. Some of these messages are: • `Dial` • `Ringing` • `Answered` • `Incoming Call` • `Busied` • `Disconnected` • `Check Options` • `Denied` **Example:** `Check Options` advises that the call failed due to incompatibility such as mismatched speed or asynchronous calling synchronous endpoints.	This interface is designed for unattended user operation (e.g., host computer application). The 7400A can be configured to answer incoming calls manually or automatically.

(Continued)

AT Command Mode	Keyboard Dial Mode	Answer Only Mode
To set the 7400A Data Module using the AT Command Interface:	**To set the 7400A Data Module using the Keyboard Dial Interface:**	**To set the 7400A Data Module using the Answer Only Interface:**
1 From the HOME screen, press *NEXT / NO* until the system prompts with `SET INTERFACE?`	**1** From the HOME screen, press *NEXT / NO* until the system prompts with `SET INTERFACE?`	**1** From the HOME screen, press *NEXT / NO* until the system prompts with `SET INTERFACE?`
2 Press *ENTER / YES.* The system prompts with `INT = AT COMM?` or `INT --> AT COMM?`.	**2** Press *ENTER / YES.* The system prompts with `INT = AT COMM?`	**2** Press *ENTER / YES.* The system prompts with `INT = AT COMM?`
3 Press *ENTER / YES.*	**3** Press *NEXT / NO* until the system prompts with `INT --> KYBD DIAL?`	**3** Press *NEXT / NO* until the system prompts with `INT --> ANS ONLY?`
4 The system displays `INT = AT COMMAND`.	**4** Press *ENTER / YES.*	**4** Press *ENTER / YES.*
5 The 7400A performs a self test.	**5** The system displays `INT= KEYBD DIAL`.	**5** The system displays `INT= ANSWER ONLY`.
	6 The 7400A performs a self test.	**6** The 7400A performs a self test.

AT COMMAND INTERFACE
This section describes how to configure the 7400A Data Module for use with a terminal that uses the AT Command Interface and how the interface operates.

The Data Terminal

If You Are Using a PC

Review the documentation for your PC and data communications software. Be sure that you understand both well enough to get the software running and place your PC in terminal mode. (Also reference the **AT&T 7400B Data Module PC Applications Guide,** order number 555-035-203.)

Since there is such a diversity of functionality among the many packages available, refer to the user's manual of the software package for specific details of its use.

If You Are Using a Dedicated Terminal

To determine whether your terminal is communicating with the 7400A Data Module, type the following command line:

    AT [Enter]

Note: The two characters of the "AT" command prefix must be typed as either both uppercase or both lowercase. That is, you can type either at or AT, but At or aT will not work.

If everything is operating properly, the command should appear on the screen as you type it, and the 7400A Data Module should respond with *OK.* Refer to Chapter 7, *"DCE Troubleshooting,"* for help if you are not getting these results.

Operation and Configuration

This section describes how to change, store, and recall configuration parameters, outlines how to create and save custom configuration profiles, and discusses more advanced command usage with example command lines.

Configuration Parameters

Values for configuration parameters are selected by using AT commands to change values contained in the S-registers. The S-registers are a set of 8-bit memory locations that the data module reserves for storage of configuration settings. For a description of AT commands, see Appendix A, *"AT Command Interface — AT Commands."* For a description of S-registers used by the 7400A data module, refer to Appendix B, *"AT Command Interface — S Registers."*

Parameter Storage and Retrieval

Configuration parameters include options selected by **AT** commands and option values stored in the S-registers. A complete set of configuration parameter values is called a profile. The 7400A Data Module has four configuration profiles at any given time, one active, two stored, and one that permanently contains the factory-default values.

Unsaved changes to configuration parameters remain in effect until they are changed again, or until the data module is disconnected from the AC power source. Before making or storing any changes, or to check changes that you have made, you can issue an **AT** command to view the values that are currently in the active profile and the two stored profiles.

The active profile contains the parameter values that are currently in effect. All parameter values can be changed, and most changes can be stored to one of the two profile storage locations by issuing an **AT** command. Another AT command recalls values from one of the two stored profiles into the active profile.

Factory-default parameter values are values that are appropriate for a wide number of applications. These values are stored permanently in ROM and you can issue an **AT** command to recall them into the active profile.

Commands to view, store, and recall configuration parameters are summarized in Table 6-1. The commands discussed in this section are described in greater detail in Appendix A, *"AT Command Interface — AT Commands."* To determine whether a configuration parameter that affects a particular S-register can be stored in memory, refer to Appendix B, *"AT Command Interface — S-Registers."* And for brief reference summaries, see Appendix C, *"AT Command Interface Quick Reference."*

TABLE 6-1
Commands to Store, Recall and View Configuration Parameters

Command Line:	Action:
at&v [Enter]	Displays current **AT** command settings and S-register values in the active profile and the two stored profiles (also displays the four stored telephone numbers, which are described in a section of this chapter titled "Number Storage").
at&wn [Enter]	Writes and stores the configuration parameters in the active profile to one of the two storage locations, where n represents the desired location and may be 0 or 1.
atzn [Enter]	Immediately resets the data module and recalls one of the two stored configuration profiles into active status, where n represents the desired profile and may be 0 or 1.
at&yn [Enter]	Recalls one of the two stored configuration profiles into active status when the data module is powered on, where n represents the desired profile and may be 0 or 1.
at&f [Enter]	Recalls the factory-default configuration settings into the active profile.

PC Software

Many data communications software packages for use with PCs provide the possibility of writing script or command files. These files can then be run to execute a sequence of commands that will configure your system, or even provide an automatic log on procedure for a particular remote end device.

Operating Modes

Except when a test condition has been initiated, the 7400A Data Module is always in one of two states: command mode and on-line or data mode. When power is first applied, the data module initializes to command mode.

In command mode, the 7400A Data Module looks at everything you type on your keyboard. When you type in something that the data module recognizes as a valid AT command with a parameter (if required), it will execute the action requested. A valid command with an invalid parameter will produce the *ERROR* result code, and an invalid command is simply ignored.

In on-line mode, everything you type is transmitted to the remote end point without interpretation by the 7400A Data Module, except the *escape sequence.* The escape sequence, described in later paragraphs, provides a way of switching the data module back to command mode without disconnecting a data call.

Issuing Commands

The following paragraphs describe the elements of a command line and how the 7400A Data Module responds to a command line when it is issued.

Command Line Prefix

All commands issued to the 7400A Data Module, except the escape sequence and the repeat command, must begin with the letters "AT". This is called the command line prefix and must be entered as either both uppercase or both lowercase letters (that is, *at* and *AT* will work, but *aT* or *At* will not).

The **AT** prefix (also known as the **ATtention** command) alerts the data module to expect one or more commands to follow. Each time the **AT** prefix is sent, the data module adjusts its speed and parity to match your local terminal.

Command Buffer

As you type in a command, each character is saved in a 40-character buffer. The **AT** prefix, spaces, and the [Enter] at the end of the command line are not saved and do not add to the character count. If you try to type more than 40 countable characters on one line, the result code *ERROR* will be displayed on your terminal screen, and the command line will be ignored.

Command Line Set Up

A command line begins with the **AT** prefix, includes one or more commands, and finishes with a line termination, usually issued by pressing the [Enter] key. The factory-default line termination character is an ASCII carriage return, represented by the decimal number 013 stored in S-register S03.

Note: A special application may require choosing a different line terminating character, accomplished by issuing the command:

```
ats3=ddd [Enter]
```

where ddd is a 1- to 3-digit decimal representation of the ASCII character with a range of 0 through 127.

CAUTION: Before changing this or any other default ASCII character, make certain that your terminal device will recognize the new character.

Error Correction

If you make an error while typing a command line, you can send the backspace character, usually issued by pressing the [Backspace] key, as often as needed to delete the error. However, as soon as you enter the **AT** prefix, the data module immediately reads it and sets up for a command to follow. Hence, you cannot actually delete the **AT** prefix once it is typed. A solution to this problem is to press [Backspace] to remove all letters except for the **AT,** then simply press the [RETURN] key. The system cannot understand the **AT** command you have issued and will do nothing.

The factory-default backspace character is an ASCII backspace, represented by the decimal number 008 which is stored in S-register S05.

Note: A special application may require choosing a different backspace character, accomplished by issuing the command:

```
ats5=ddd [Enter]
```

where ddd is a 1- to 3-digit decimal representation of the ASCII character with a range of 0 through 127.

CAUTION: Before changing this or any other default ASCII character, make certain that your terminal device will recognize the new character.

Once you complete a command line by pressing [Enter], the data module will try to interpret all characters on the command line as valid commands. If the data module finds a character that is not a valid command, it will ignore the erroneous character and any remaining characters on the command line; if it finds an incorrect parameter for a valid command, the data module will issue the *ERROR* result code and ignore any remaining characters.

Command Acknowledgement

Most commands are acted upon immediately and are acknowledged by the result code *OK*. This assumes that the result codes are configured in the verbose form (command V1 is in effect), and are enabled (Q0 in effect). Other options are the short or numeric form result code is set (V0), which would produce a *0* (zero) instead of the message *OK*, and no visible acknowledgement (Q1). Refer to Appendix A, *"AT Command Interface — AT Commands"* for descriptions of the V and Q commands.

Several other result codes may appear on your terminal screen while the data module is completing a call. The option selected by the X command controls which of these result codes may appear on the screen of your terminal (the X command is described in Appendix A). All result codes that may be returned by the 7400A Data Module are shown in Table 6-2 and in Appendix C, *"AT Command Interface Quick Reference."*

TABLE 6-2
Result Codes

Verbose Form	Numeric	Description
OK	0	Command accepted
CONNECT	1	Connection made at 300 bps
		Note: If command XO is in effect, the speed of the connection is not indicated (i.e., CONNECT may not mean CONNECT 300).
RING	2	Ring signal detected
NO CARRIER	3	Carrier signal not detected or lost
ERROR	4	Error in command line
CONNECT 1200	5	Connection made at 1200 bps
BUSY	7	Busy signal detected
CONNECT 2400	10	Connection made at 2400 bps
CONNECT 4800	11	Connection made at 4800 bps
CONNECT 9600	12	Connection made at 9600 bps
CONNECT 19200	14	Connection made at 19200 bps

Multiple Characters

If you type in the at prefix and it displays on your screen as aatt, you may change the echo option on your terminal or disable the command echo of the 7400A by typing the following command:

ate0 [Enter]

The command will appear as aattee00 as you type it, but the data module will send the response code *OK* to your screen. The next command that you type should appear in single characters.

From Data Mode to Command Mode and Back

In addition to the default escape sequence (+++), a special *escape sequence* can be typed at any time during a data call to return temporarily to command mode. (The S2 register 000-127 can be used to set a special escape sequence.) Your call does not disconnect, but data is not exchanged. Once you have "escaped" to command mode, the data module returns *OK* to acknowledge that it has entered command mode (see previous section titled "Command Acknowledgement").

At this point, you can issue commands to the data module. As long as the data call has not been disconnected, you can use the at0 command to return to on-line mode.

One other condition will cause the data module to switch from data mode to command mode. If the PBX senses that the remote device has disconnected, it will disconnect the call to the data module. The data module will turn off the *DATA* LED, display the *NO CARRIER* result code message on your terminal screen, and then return to command mode.

The escape sequence and all other commands discussed in this section are explained in Appendix A, *AT Command Interface — AT Commands.*

Dialing a Number

The dial command is issued to the 7400A Data Module in the form atdnnn...n, where nnn...n represents the number you wish to dial. The command line can hold up to 40 characters, so you can usually precede the D command with other commands on the same line, if you wish.

Blank spaces and hyphens may be used in the command line. However, do not include a comma in the string; the system interprets the comma as a request for a 2-second delay (used when the system must dial a single number to obtain an outside line, then must pause to await a dial tone, then may continue dialing the remaining numbers).

Note: Every character following the D command is regarded as part of the number to be dialed and is sent to the PBX; hence, the D command must be the last command in the command line.

The following is an example:

    atd74768 [Enter]

In the example, the command will cause the data module to go off hook, dial the number, and then wait the period of time specified in S-register S7 for the call to be completed.

If the call is not completed, the data module will disconnect and send the result code *NO CARRIER* to your display screen. When a call is successfully completed, the data module will send the result code *CONNECT* nnnn to your screen, where nnnn represents the speed of the 7400A Data Module, (for example, 1200).

Repeating a Command

As mentioned earlier, the command buffer contains the last completed command line. If you wish to repeat the previous command line without retyping it, type A/ without the **AT** command prefix and without pressing [Enter].

This command is most useful when you have typed a command line to have the 7400A Data Module dial a number, and the data module returns the result code *BUSY*. Use the A/ command to redial the number as often as you wish.

Storing a Telephone Number

The 7400A Data Module is capable of storing up to four telephone numbers, each of which can contain up to 25 characters. Numbers stored in this way remain available indefinitely, even after the data module has been powered off and then on again.

Table 6-3 describes the command lines used to store a telephone number, delete a number from storage, and dial a stored number.

Note: Digits 0 through 9 and all letters "a" through "z" and "A" through "Z" may be part of the stored "number." Spaces and hyphens (-) may be used in the number when typing the command line. Spaces are not stored and do not add to the total count of characters in the stored number, but all other ASCII characters are stored and counted. Any ASCII character may be used, as long as it is acceptable to the PBX.

TABLE 6-3
Commands for Using Stored Telephone Numbers

Command line:	**Action:**
at&zm=nnn...n [Enter]	Store number nnn...n in location m, which is one of four locations designated by the numbers 0 through 3. For example: at&z2=92015551212 [Enter] stores the number 92015551212 in number storage location 2.
at&zm= [Enter]	Delete any number stored in location m, which is one of four locations designated by the numbers 0 through 3. For example: at&z2= [Enter] deletes any number that may have been stored in number storage location 2.
atds=m [Enter]	Dial the number stored in location m, which is one of four locations designated by the numbers 0 through 3. For example: atds=2 [Enter] causes the data module to send whatever is contained in number storage location 2 to the PBX as a number to be dialed.

Automatic Answering

The 7400A Data Module can be set up to answer incoming data calls automatically. To initialize this option, type the command line:

```
ats0=nnn [Enter]
```

where `nnn` is a decimal number in the range of 1 through 255, representing the number of rings to wait before answering.

If `nnn` is 0 (the factory-default setting), the automatic answer feature is turned off.

Remote Site Use

The 7400A Data Module can be used at a remote site as a dedicated service device to answer incoming data calls, send data to a remote end device, and then hang up. For example, you may wish to provide access to a printer from a remote site.

The following is a typical command line you might use for setting up this operation (spaces are used here for readability, but are not required):

```
at &c1 &d2 q1 s0=1 &y0 &w0 [Enter]
```

Following the `at` prefix, the commands in the example produce the following results:

- `&c1` sets the Data Carrier Detect (DCD) circuit of the data module to operate according to the EIA standard.

- `&d2` sets the data module to go on hook when an on-to-off transition is detected on the Data Terminal Ready (DTR) input, disconnecting the call

- `q1` turns off the result codes that would be the normal responses of the data module to commands that it receives.

- `s0=1` turns on the automatic answer feature and causes the data module to answer an incoming data call on the first ring.

- `&y0` selects the configuration stored in data profile storage location 0 to become the current configuration each time the data module is powered on

- `&w0` causes the current configuration to be stored in data profile storage location 0.

Refer to Appendix A, *"AT Command Interface — AT Commands"* for a complete description of each command used in this section.

Reset and Configuration Recall

Two commands are available for recovering from various data communications problems. You can reset the 7400A Data Module and recall one of two stored data profiles as the current configuration. The form for this command is as follows:

> `atzn` [<u>Enter</u>]

where `n` is the number 0 or 1, representing the data profile to be recalled.

A second command allows you to recall the factory-default configuration if, for instance, you loose track of changes you have made and need to start over. The form for this command is as follows:

> `at&f` [<u>Enter</u>]

> System Response: `OK`

To view the factory-default configuration, type:

> `at&v` [<u>Enter</u>]

> System Response: The system displays the screen below.

```
ACTIVE PROFILE:
B1 E1 L2 M1 Q0 V1 X4 Y0 &C0 &D0 &G0 &J0 &L0 &P0 &Q0 &R0 &S0 &X0 &Y0
S00:000 S01:000 S02:043 S03:013 S04:010 S05:008 S06:002 S07:030
S08:002 S09:006 S10:014 S12:050 S14:AAH S16:00H S18:000 S21:00H
S22:76H S23:1BH S25:005 S26:001 S27:40H
```

7   Chapter 7: DCE Troubleshooting

Chapter 7: DCE Troubleshooting

This chapter describes procedures for troubleshooting most problems that may be encountered while installing, configuring, and operating the 7400A Data Module.

HOW TO USE THIS CHAPTER

Use the following guidelines to isolate and correct a problem:

1 Scan through the "Symptom" column in the chart on the following pages to find the description that best describes the problem situation you have encountered in a DCE application.

2 In the "Problem" column, one or more problem descriptions is offered. Select the one that best describes the observable conditions, or try the solutions suggested in turn until the trouble has been corrected.

WHEN	THEN
You are directed to type an AT command to correct the problem and the 7400A Data Module is in the **command** mode	• Type the directed command. • Return to the data mode by typing ato [Enter].
You are directed to type an AT command to correct the problem and the 7400A Data module is in the **data** mode	• Escape the data mode by rapidly pressing the plus sign three times (+++). You are now in command mode and the module responds with *OK* or *0* (unless the *Q1* option has been set to disable result codes). • Type the directed command line. • If directed to disconnect the call, type ath [Enter].

PROBLEMS AND SOLUTIONS

Symptom	Problem	Solution
LEDs are off and LCD display is blank.	Power is off.	Check that the AC outlet is live. Check that the power supply unit is connected to the 7400A Data Module and to the AC outlet.
POWER/TEST and *DATA* LEDs flash together.	The data module has lost communications with the PBX.	Check that the D8W cord is connected between the *LINE* connector of the data module and a PBX wall jack. Note also that the line from the PBX is properly administered for the 7400A Data Module and that the PBX has not taken the line out of service.
Characters typed on keyboard are not displayed on the screen of the terminal device.	If the *TD* and/or *RD* indicator on the LCD display does not alternate between a dash and oval when keys on the terminal are pressed, the terminal is not transmitting characters to the 7400A or the EIA-232-D cable is not connected or not properly wired.	Using an EIA test box, verify that the terminal is transmitting characters to the 7400A. If so, connect or replace the EIA-232-D cable between the data module and the local terminal device.
	If the *TD* indicator on the LCD display alternates between a dash and oval, but the *RD* indicator does not, the command echo option is turned off.	**AT Command interface only:** Press [Enter] to start a new command line, and then type ate1 [Enter] to turn on the command echo.

(Continued)

Symptom	Problem	Solution
Characters typed on keyboard are not displayed on the screen of the terminal device.	The *TD* and *RD* indicators on the LCD display alternate between a dash and an oval, but certain EIA control leads are turned off.	**AT Command interface only:** Press [Enter] to start a new command line, and then type `at&s0&c0` [Enter] to ensure that the appropriate EIA signal leads are turned on. **Keyboard or Answer-Only interfaces:** Use the 7400A's front panel to set the RLSD lead and DSR lead options to ON.
Call disconnects immediately after an attempt to connect; *NO CARRIER* or *DISCONNECTED* may be displayed on the local terminal device.	The speed of the far end device is higher than the speed of the local terminal device.	Change the speed of the local terminal device to match that of the far end device. If the speed of the far end device is not known, set the local terminal device to the highest speed available.
	The far end device is set up for half-duplex or synchronous operation.	The 7400A Data Module cannot communicate with a far end device that is operating half-duplex or synchronous. This problem can be resolved only if the far end device can be reconfigured for full-duplex, asynchronous operation.
Call disconnects immediately after an attempt to connect; *BUSY, TRY AGAIN,* or *DENIED* may be displayed on the local terminal device.	The far end device is busy with another call.	Try the call again.
	The telephone number was dialed incorrectly.	Check the number of the far end device that you wish to call and try the call again.
	The far end device is not busy, but the PBX has restricted access to the called device.	This situation can only be resolved by having the PBX readministered to remove the access restriction.

(Continued)

Symptom	Problem	Solution
The PC communications software indicates that the call has been disconnected, but the *DATA* LED remains lit.	The data module has ignored the on-to-off transition of the DTR lead.	**AT Command interface only:** `at&d2` [Enter] to set the DTR lead option to DISCONNECT on DTR lead transition from on-to-off. Alternatively, determine and use the command provided by the communications software to implement this change. **Keyboard interface only:** Use the 7400A's front panel to set the DTR lead option to FOLLOW to cause a disconnect when DTR lead transitions from on-to-off.
	The data module has ignored the *H* (hang-up) command.	Ensure that after the escape sequence (+++) has been entered to switch the data module to command mode, an adequate pause is allowed before issuing the H command. In escaping to command mode with the result codes enabled, the data module must be given time to return *OK* or *0* before it is ready to accept a command.

(Continued)

Symptom	Problem	Solution
The data module does not automatically answer an incoming call.	The automatic answer option is not enabled.	**AT Command interface only:** Type `ats0=1` [Enter] to turn on the automatic answer feature. Set the value following the equal sign (1 in the example) to the ring number on which you want the data module to answer an incoming call. The automatic answer feature is turned off by setting this value to 0. **Keyboard or Answer-only interfaces:** Use the 7400A's front panel to set ANS to AUTO.
	The automatic answer option is enabled, but the terminal device is not ready *(DTR* graphic on the LCD display indicates OFF).	**AT Command interface only:** If the local terminal is a PC, configure the communications software to turn on the DTR lead, or set the data module to ignore the DTR lead by typing `at&d0` [Enter] **Keyboard or Answer-Only interfaces:** Use the front panel to set DTR to IGNORE.
	The automatic answer option is enabled, but the *POWER/TEST* lamp is flashing indicating that the data module is in a local loopback test mode.	**AT Command interface only:** Terminate the local loopback test by typing `at&t0` [Enter] **Keyboard or Answer-Only interfaces:** Use the front panel to end test.

(Continued)

Symptom	Problem	Solution
Transmitted and/or received data contains errors.	Speed settings of the terminal device and the data module are not the same.	**AT Command interface only:** Change terminal device speed to agree with the speed that was indicated in the *CONNECT* nnnn message. **Keyboard and Answer-Only interfaces:** Users must know speed of the far end device and must change the local terminal speed to match.
	The local terminal device and the far end device are configured for different parity settings.	Change the parity setting of the local terminal device to match that of the far end device.
The *DATA* LED is lit, but a *CONNECT* xxxx message or numeric result code was not displayed.	The display result codes option is turned off.	**AT Command interface only:** Turn on the display result codes option by typing • atq0 [Enter] Response: *OK* • ato The *O* command causes the data module to return to the on-line mode and sends the *CONNECT xxxx* message, or an equivalent numeric code, to the terminal display (see "Result Codes" in Appendix C).
Numeric code returned when CONNECT *xxxx* message is preferred.	The result code format option is set to numeric form.	**AT Command interface only:** Change the result code format option to message form by typing atv1 [Enter]

(Continued)

Symptom	Problem	Solution
Commands are displayed without error as they are typed (echoed), but the data module does not respond to any command.	The local terminal device is set to a speed not supported by the 7400A Data Module.	Set the terminal device for one of the supported speeds: 300, 1200, 2400, 4800, 9600, or 19200 bps.
The *CONNECT* message is sent without a speed indication, and the far end device is not set at 300 bps.	The data module is configured to display only the basic set of result codes (option *x0).*	**AT Command interface only:** Configure the data module to send *CONNECT* nnnn messages for all speeds except 300 bps by typing atx4 [Enter]
The terminal device has its DTR lead turned on, but the *DTR* graphic on the LCD display indicates OFF.	A defective or non-standard (null-modem) EIA-232-D cable is in use.	Replace the EIA-232-D cable with one that is wired correctly.
Permanent or Dedicated Switch Connection will not set up.	The 7400A is not optioned for Auto Answer or the DTR EIA input lead is off	**AT Command interface only:** Enter the commands ats0=1 &d0 &w0 &w1 [Enter] to option the 7400A for ANS=AUTO, to ignore the DTR input and assume it is on, and to save the option in User Profiles 0 and 1. **Keyboard interface only:** Set the 7400A for automatic answer and to ignore DTR using the front panel.

**A   Appendix A: AT Command Interface —
AT Commands**

Appendix A: AT Command Interface — AT Commands

This appendix contains an explanation of each AT command accepted by the 7400A Data Module. Labels used in the descriptions are defined as follows:

Label	Description
Command:	The command is shown as it should be typed, following *at.* The letters *at* are required for all commands, unless stated otherwise. The command may be typed in uppercase or lowercase. As you type, each character is saved in a 40-character buffer. If you try to type more than the permitted 40 countable characters on one line, the result code *ERROR* is displayed on your terminal and the command line is ignored. (The AT prefix, spaces, and [Enter] at the end of the command line do not add to the character count.) Spaces may be typed between multiple commands on the same command line for readability, but the spaces are ignored by the 7400A Data Module.
Function:	A brief, functional description of the command is provided here.
Type:	Type may be *immediate* or *configuration.* An immediate command causes the data module to perform an action as soon as the command is sent (for example, go off-hook or dial a number). A configuration command modifies a configuration parameter during the current session.
Arguments:	Many commands accept or require a numerical argument. Whether an argument is required and the range of acceptable values for the argument is shown here.
S-Register:	The S-registers consist of 28 1-byte memory locations in the data module, designated as S0 through S27. The S-registers hold values for defining the current configuration of the data module. Some commands modify a specific S-register, and some commands perform an action based on the current value stored in an S-register. Whether an S-register is modified or read by the current command is explained here.

(Continued)

Label	Description
Example:	A sample command line follows this label to demonstrate how the command may be used.
Comments:	An explanation of the example and any other information about the command not provided elsewhere is provided here. Additional commands maybe typed on the same command line with the command currently under discussion, unless noted otherwise.
See Also:	Following this label are suggestions on where to look for more information about the current command and a listing of any other commands that may be used with or affect the use of the current command.

Command:	+++
Function:	Escape sequence.
Type:	immediate
Arguments:	none
S-Register:	none
Example:	+++
Comments:	This command is entered by rapidly pressing the plus sign three times. This is one of the two commands that does not require the **AT** prefix (A/ is the other one). Also, **it is never followed by pressing** [Enter]. The purpose of the +++ command is to provide a way to switch the data module from on-line or data mode to command mode without disconnecting a data call that is in progress. As long as the call is not disconnected, you can return to the on-line mode with the ato command.
	The value in S12 determines how long your keyboard should remain idle before entering the escape sequence, as well as the maximum allowable time between entering each character of the sequence. The character used in the escape sequence is determined by the value in S2 (default is ASCII 43, the plus sign).
See Also:	Chapter 6, *"DCE Operation — Connecting a Terminal Device";* the o command; Appendix B, *"AT Command Interface—S-Registers"*

Command:	A
Function:	Go off-hook in Answer mode.
Type:	immediate
Arguments:	none
S-Register:	Bit 7 of S14 is set to 0.
Example:	ata [Enter]
Comments:	The A command causes the data module to go off-hook in answer mode and attempt to answer an incoming call. The option set by the &D command and the contents of S0 and S1 are ignored when this command is issued.
See Also:	Command &D; Chapter 6, *"DCE Operation — Connecting a Terminal Device"*; Appendix B, *"AT Command Interface—S-Registers"*

Command:	A/
Function:	Re-execute the last valid command line.
Type:	immediate
Arguments:	none
S-Register:	none
Example:	a/
Comments:	This is one of the two commands that does not require the **AT** prefix (+++ is the other one). To repeat the previously executed command line exactly, type A/ without pressing the Return or Enter key. his command must be typed at the beginning of a new line and cannot be combined with any other command.
See Also:	Chapter 6, *"DCE Operation — Connecting a Terminal Device"*

Command:	D
Function:	Dial a telephone number.
Type:	immediate
Arguments:	The D command requires an ASCII character string, which is sent by the data module to the PBX. The string may include any ASCII character, with the following restrictions:

Notes: If the letters *t* or *p* (uppercase or lowercase) are typed as the first character following the *D* command, the data module will delete either character.

For example, your dial string is the mnemonic "TEXAS," and you must type the *T* twice (the first *t* may be uppercase or lowercase), producing the command line:

atdtTEXAS [Enter]

The *t* following the *D* command will be discarded and the string "TEXAS" will be sent to the PBX as a dial mnemonic (the PBX must be administered to recognize this mnemonic as the representation of a number to be dialed).

The PBX may interpret certain non-alphanumeric characters as commands and perform an unexpected action, if you did not intend to send the command to the PBX. Consult the documentation for your PBX to determine which characters may be interpreted as commands.

(Continued)

Command: D

Arguments: The string (or AT command) s=n, where n may be a number from 0 through 3, will cause the data module to send the contents of its respective telephone number storage location to the PBX as the telephone number. For details on how to use this feature, refer to "Storing a Telephone Number" in Chapter 6, *"DCE Operation — Connecting a Terminal Device."*

S-Register: Bit 7 of S14 is set to 1.

Example 1:   atd555-1212 [Enter]

Example 2:   atds=1 [Enter]

Comments: In example 1, the number 555-1212 is dialed. The hyphen (-) is optional and may be used for easier reading of the command line. In example 2, the number stored in telephone number location 1 is dialed. The maximum length of the ASCII string is 39 characters; the **AT** prefix, the carriage return, and spaces used for readability do not add to the character count for the line.

Note: Other commands should not be issued following the dial string until the call is either completed or fails. If *anything* is typed before the call is completed, the call will fail.

See Also: Chapter 6, *"DCE Operation — Connecting a Terminal Device"*

Command:	E
Function:	Turn the command echo on or off.
Type:	configuration
Arguments:	No argument or an argument of 0 disables echo and an argument of 1 enables echo. The factory-default is 1.
S-Register:	Bit 1 of S14 is set according to the argument of the command.
Example:	ate1 [Enter]
Comments:	Typically, for a display terminal operating in full-duplex mode, use the 1 argument if you wish to see the **AT** commands on the screen as you type them. If your display terminal is operating in half-duplex mode, use the 0 argument (the 1 argument would cause characters typed to appear on the screen like tthhiiss).
See Also:	Chapter 6, *"DCE Operation — Connecting a Terminal Device"*

Command:	H
Function:	Switch hook control (e.g., data hang-up/disconnect).
Type:	immediate
Arguments:	No argument or an argument of 0 causes the data module to go on-hook.
S-Register:	none
Example:	ath [Enter]
Comments:	The H command with no argument can be used during a data call to cause the 7400A Data Module to go on-hook (hang up) after using the escape sequence (+++) to return to command mode. An argument of 0 produces the same result, and an argument of 1 is accepted but causes no action.
See Also:	The escape sequence command (+++); Chapter 6, *"DCE Operation — Connecting a Terminal Device"*

Command:	I
Function:	Request product code or ROM checksum.
Type:	immediate
Arguments:	The I command accepts one of three arguments as follows:
	0 - The data module displays its product identification number.
	1 - The data module displays the ROM checksum as two four-digit hexadecimal values, followed by a carriage return and line feed.
	2 - The data module displays *OK,* followed by a carriage return and line feed.
S-Register:	none
Example:	ati0 [Enter]
Comments:	In the example, the 7400A Data Module will return its product ID code as the value *249.*
See Also:	none

Command:	O
Function:	Return to the on-line mode.
Type:	immediate
Arguments:	No argument or an argument of 0 (zero) causes the data module to return from command mode to on-line mode, if a data call is still active.
S-Register:	none
Example:	ato [Enter]
Comments:	The 7400A Data Module accepts an argument of 1 but treats it the same as no argument or an argument of 0.
See Also:	Chapter 6, *"DCE Operation — Connecting a Terminal Device";* the +++ command

Command:	Q
Function:	Turn the display of result codes on or off.
Type:	configuration
Arguments:	No argument or an argument of 0 enables the display of result codes; an argument of 1 disables the display of result codes. The factory-default is result codes enabled.
S-Register:	Bit 2 of S14 is set according to the argument used with the Q command.
Example:	atq1 [Enter]
Comments:	In the example, the result codes are disabled. Use this option only if you wish to prevent the data module from returning result codes after an **AT** command is issued.
See Also:	Chapter 6, *"DCE Operation — Connecting a Terminal Device";* result codes in Appendix C, *"AT Command Interface—Quick Reference";* the V and X commands

Command:	Sr=n
Function:	Set S-register *r* to value *n.*
Type:	configuration
Arguments:	No argument or an argument of 0 directs to the S0 register; an S? command returns the value of the S0 register. The *r=n is* a separate command which assigns a value specified by n to the register pointed to by the previous *Sr* command.
S-Register:	The register specified is the register affected.
Example:	ats1=5 [Enter]
Comments:	In the example, register 1 has been overwritten by register 5.
See Also:	Chapter 6, *"DCE Operation — Connecting a Terminal Device";* result codes in Appendix C, *"AT Command Interface—Quick Reference";* the V and X commands

Command:	Sr?
Function:	Permit the local DTE to read the contents of register *r*.
Type:	configuration
Arguments:	No argument or an argument of 0 sets the register pointer to S0 and returns the value of the S0 register.
S-Register:	The register specified is the register affected.
Example:	ats3?1 [Enter]
Comments:	In the example, the local DTE is able to read the register S3.
See Also:	Chapter 6, *"DCE Operation — Connecting a Terminal Device";* result codes in Appendix C, *"AT Command Interface—Quick Reference";* the V and X commands

Command:	V
Function:	Select format for result codes.
Type:	configuration
Arguments:	No argument or an argument of 0 causes the data module to return the short form or numeric result codes; an argument of 1 causes the data module to return the verbose form or text message result codes. The factory-default setting is the verbose form.
S-Register:	Bit 3 of S14 is set according to the argument used with the V command.
Example:	atv [Enter]
Comments:	The example would set the short form or numeric result code format.
See Also:	Chapter 6, *"DCE Operation — Connecting a Terminal Device";* result codes in Appendix C, *"AT Command Interface — Quick Reference";* the Q and X commands

Command:	X
Function:	Control the extended result code set and dialing capabilities.
Type:	configuration
Arguments:	The X command accepts one of 5 arguments as follows:

    0 - The basic result code set (0 - 4) is enabled. No speed indication with CONNECT code. No BUSY code sent. Check on BUSY message using X0-X4.

    1 - Result codes 0 - 5, 10 - 12, and 14 are enabled. Speed indication with CONNECT code. No BUSY code sent.

    2 - Result codes 0 - 5, 10 - 12, and 14 are enabled. Speed indication with CONNECT code. No BUSY code sent.

    3 - Result codes 0 - 5, 7, 10 - 12, and 14 are enabled. Busy signal detection enabled. Speed indication with CONNECT code. BUSY code sent.

    4 - Result codes 0 - 5, 7, 10 - 12, and 14 are enabled. Busy signal detection enabled. Speed indication with CONNECT code. BUSY code sent. This is the factory-default setting.

S-Register:	Bits 4, 5, and 6 of S22 are set according to the argument given with the X command.
Example:	atx2 [Enter]
Comments:	In the example, the results described under argument value 2 are implemented. Regardless of which argument is used, the data module will wait for the dial message from the PBX before dialing the number. The time set in register S7 must expire before timing out and disconnecting the call. All arguments change the appropriate bits in S22 and affect the result codes returned.
See Also:	Chapter 6, *"DCE Operation — Connecting a Terminal Device";* result codes in Appendix C, *"AT Command Interface—Quick Reference";* the Q and V commands

Command:	Z
Function:	Reset and recall a stored profile.
Type:	immediate
Arguments:	No argument or an argument of 0 recalls the configuration profile stored in location 0; an argument of 1 recalls the configuration profile stored in location 1.
S-Register:	none
Example:	atz1 [Enter]
Comments:	In the example, the Z command causes the 7400A Data Module to reset, and then loads the configuration profile stored in location 1 into the active location.
See Also:	Chapter 6, *"DCE Operation — Connecting a Terminal Device"*

Command:	&C
Function:	Data Carrier Detect (DCD) options.
Type:	configuration
Arguments:	The &C command accepts one of two arguments as follows:
	0 - (or no argument) maintain the DCD circuit *on* at all times (factory-default setting)
	1 - the DCD circuit operates according to the EIA-232-D standard
S-Register:	Bit 5 of S21 is set according to the argument used with the &C command.
Example:	at&c1 [Enter]
Comments:	In the example, the DCD circuit operates according to the EIA-232-D standard. This would be an appropriate setting for when the 7400A Data Module is used at a remote site.
	Regardless of which option is currently in effect, the DCD circuit of the 7400A Data Module is always off during self-test, and turns off for 0.5 second during a disconnect sequence.
See Also:	*Chapter 6, "DCE Operation — Connecting a Terminal Device";* Appendix B, *"AT Command Interface—S-Registers"*

Command:	&D
Function:	Data Terminal Ready (DTR) options.
Type:	configuration
Arguments:	The &D command accepts one of four arguments as follows:
	0 - ignore the DTR interchange circuit (factory-default setting).
	1 - return to the command state if an on-to-off transition is detected on the DTR input; an active data call is *not* disconnected.
	2 - go on hook when an on-to-off transition is detected on the DTR input (EIA-232-D standard); an active data call *is* disconnected.
	3 - perform a reset if an on-to-off transition is detected on the DTR input; an active data call is disconnected.
S-Register:	Bits 3 and 4 of S21 are set according to the option used with the &D command.
Example:	at&d2 [Enter]
Comments:	In the example, the DTR circuit is set according to the EIA-232-D standard. This would be an appropriate setting for when the 7400A Data Module is used at a remote site as a dedicated device to automatically answer an incoming data call.
	For the 0 option, the front panel DTR indicator (TR LED) is always on, regardless of the state of the DTR input; for all other options the indicator follows the state of the DTR input.
	If the change of state for the DTR circuit persists for a time shorter than specified in S25, the change is ignored.
See Also:	Chapter 6, *"DCE Operation — Connecting a Terminal Device"*; Appendix B, *"AT Command Interface—S-Registers"*

Command:	&F
Function:	Load the factory-default configuration.
Type:	immediate
Arguments:	none
S-Register:	none
Example:	at&f [<u>Enter</u>]
Comments:	The factory-default configuration values are permanently stored in ROM and can be recalled at any time. No reset or self-test is initiated by issuing the &F command.
See Also:	Chapter 6, *"DCE Operation — Connecting a Terminal Device"*

Command:	&S
Function:	Data Set Ready (DSR) options.
Type:	configuration
Arguments:	The &S command accepts one of two arguments as follows:
	0 - (or no argument) the DSR circuit is maintained on at all times (factory-default setting)
	1 - the DSR circuit operates according to the EIA-232-D standard.
S-Register:	Bit 6 of S21 is set according to the argument used with the &S command.
Example:	at&s1 [<u>Enter</u>]
Comments:	In the example, the DSR circuit is configured to operate according to the EIA-232-D standard. Regardless of which option is currently in effect, the DSR circuit of the 7400A Data Module is always off during self-test, and turns off for 0.5 second during a disconnect sequence.
See Also:	Chapter 6, *"DCE Operation — Connecting a Terminal Device"*

Command:	&T
Function:	Control diagnostic and test facilities.
Type:	immediate
Arguments:	The &T command accepts one of eight arguments (see comment 2) as follows:

    0 - (or no option) terminate any test in progress (see comment 3)

    1 - initiate local digital loopback test

    2 - same as 1

    3 - initiate local data loopback test

    4 - allow remote digital loopback requests from the remote system (factory-default selection)

    5 - deny remote digital loopback requests from the remote system

    6 - initiate remote digital loopback test

    7 - initiate remote digital loopback test with self-test

    8 - initiate local digital loopback test with self-test

S-Register:	Bits 0 and 2—6 of S16 are set according to the argument used with the &T command.
Example:	at&t3 [<u>Enter</u>] *(see comment 1)*

(Continued)

Command	&T

Comments:

1 In the example, a local data loopback test is initiated.

2 All argument values in the range of 0—8 are valid. All of the options selected by the command arguments described above are accepted and implemented by the 7400A Data Module, but they are *named* differently than in the EIA-232-D standard.

3 If the local digital loopback or remote digital loopback tests are in progress, it is necessary to issue the escape sequence to return to command mode before the &T0 command can be used to terminate these tests. The test timer value stored in S18 can also be set to halt automatically any locally initiated test in progress.

See Also: Chapter 6, *"DCE Operation — Connecting a Terminal Device"*; Appendix B, *"AT Command Interface—S-Registers"*

Command: &V

Function: View the active configuration and stored profiles.

Type: immediate

Arguments: The &V command does not take an argument.

S-Register: none

Example: at&v [<u>Enter</u>]

Comments: The &V command displays all active and stored configuration data as follows (see sample screen on following page):

- command and S-register settings for the active configuration profile

- command and S-register settings saved in configuration profile locations 0 and 1

- contents of the four telephone number storage locations

See Also: Chapter 6, *"DCE Operation — Connecting a Terminal Device"*

```
ACTIVE PROFILE:
B1 E1 L2 M1 Q0 V1 X4 Y0 &C0 &D0 &G0 &J0 &L0 &P0 &Q0 &R0 &S0 &X0 &Y0
S00:000 S01:000 S02:043 S03:013 S04:010 S05:008 S06:002 S07:060
S08:002 S09:006 S10:014 S12:050 S14:AAH S16:00H S18:000 S21:00H
S22:76H S23:0BH S25:005 S26:001 S27:40H

STORE PROFILE 0:
B1 E1 L2 M1 Q0 V1 X1 Y0 &C0 &D0 &G0 &J0 &L0 &P0 &Q0 &R0 &S0 &X0
S00:000 S14:AAH S18:000 S21:00H S22:76H S23:07H S25:005 S26:001
S27:40H

STORED PROFILE 1:
B1 E1 L2 M1 Q0 V1 X4 Y0 &C0 &D0 &G0 &J0 &L0 &P0 &Q0 &R0 &S0 &X0
S00:000 S14:AAH S18:000 S21:00H S22:76H S23:07H S25:005 S26:001
S27:40H

TELEPHONE NUMBERS:
&Z0- 34017
&Z1- 95551212
&Z2- 74802
&Z3- PPARIS


OK
```

Command:	&W
Function:	Store the active configuration profile.
Type:	immediate
Arguments:	No argument or an argument of 0 stores to location 0, an argument of 1 stores to location 1.
S-Register:	none
Example:	at&w0 [<u>Enter</u>]
Comments:	In the example, the currently active configuration profile is stored to memory location 0. Only a subset of the configuration parameters are actually stored.
See Also:	Chapter 6, *"DCE Operation — Connecting a Terminal Device"*; Appendix B, *"AT Command Interface — S-Registers"*

Command:	&Y
Function:	Designate the default configuration profile.
Type:	configuration
Arguments:	An argument of 0 will recall stored profile 0; an argument of 1 will recall stored profile 1. Factory default selection is stored profile 0.
S-Register:	none
Example:	at&y1 [<u>Enter</u>]
Comments:	In the example, the configuration profile stored in location 1 will be recalled the next time that the 7400A Data Module is powered on. When the &Y command is issued, the currently active profile does *not* change until the data module is powered off and then on again.
See Also:	Chapter 6, *"DCE Operation — Connecting a Terminal Device"*

Command:	&Z
Function:	Store a telephone number.
Type:	immediate
Arguments:	The &Z command accepts one of four arguments (0 through 3), which designates the memory location in which the dialing string that follows the command will be stored.
S-Register:	none
Example:	at&z2=555-1212 [Enter]
Comments:	In the example, the dial string *555-1212* is stored in memory location 2. Each of the four number storage locations can store a maximum of 25 characters.
See Also:	Chapter 6, *"DCE Operation — Connecting a Terminal Device"*

B   Appendix B: AT Command Interface — S-Registers

Appendix B: AT Command Interface — S-Registers

This appendix contains an explanation of each S-register used by AT Command Interface of the 7400A Data Module. An S-register is an 8-bit location in non-volatile memory that is used for storing the value of one or more configuration parameters. When the data module is first powered on, the values that were last stored in the S-registers are the values in effect until **AT** commands are issued to change them.

CHECKING S-REGISTERS

You can check the current value stored in all S-registers with the &V command (see description in Appendix A, "AT Command Interface — AT Commands"). To look at the contents of just one register, use the command *Smm?*, where *mm* is the number of the S-register.

CHANGING S-REGISTERS

To change the value in any one S-register directly, use the command *Smm=nnn*, where *mm* is the number of the S-register and *nnn* is the number you wish to place in the register. The following dialog illustrates the use of the S command to read and change the value contained in an S-register.

```
ats18?   [ Enter ]
055

OK
ats18=120 [ Enter ]
OK
```

The first command request the value stored in register S18. The data module returns the value *055,* followed by *OK.* The next command changes the value in register S18 to *120,* and the data responds with *OK.* You could enter the first command a second time to verify that the value was changed correctly.

S-REGISTER DESCRIPTIONS

This section begins with a table that definitions the labels used in the S-register descriptions that follow.

Label	Description
Register:	The S-register is identified following this label. Note that the names for S-registers 1 through 9 may be typed as two-digit numbers with leading zeros, if desired, for readability (e.g., S01 is equivalent to S1).
Description:	The purpose and use for the S-register is explained following this label.
Range of Values:	The range of values that may be assigned to the register is explained following this label. The units for the value may be as follows:

- *decimal* — a one- to three-digit decimal number. Decimal numbers are typically used to represent a count, seconds, or fractions of a second.

- *ASCII* — a one- to three-digit decimal number that represents the decimal equivalent for an ASCII character (see ASCII Character Table in Appendix C, "AT Command Interface—Quick-Reference").

- *hexadecimal* — a two-digit hexadecimal number used to represent the contents of a bit-mapped S-register. Bit-mapped S-registers are not usually set by entering a complete value for the register, but are set one or more bits at a time by various **AT** commands. Hexadecimal digits include the decimal digits 0 through 9, and the letters A through F.

(Continued)

Label	Description

Range of Values:

> **Notes:**
>
> **1**   A value typed as a decimal or ASCII argument to a command may be entered as a one, two, or three digit number, as required but will always be displayed as a three digit number (e.g., you type the command `ATS0=3` to set automatic answer feature to answer an incoming call on the third ring, and then type the `AT&V` command to verify the value, which is displayed as `S00:003)`.
>
> **2**   The `&V` command, which displays the contents of all S-registers, presents the contents of bit-mapped registers as two hexadecimal digits followed by an uppercase letter `H` (e.g., assuming that S-register S14 contains the value AA hexadecimal, the `AT&V` command displays `S14:AAH)`.

Storable:

A *yes* after this label indicates that the contents of this S-register will be written when the current configuration profile is saved to one of the two configuration profile storage locations. A *no* here indicates that the contents of the S-register will *not* be written to storage.

> **Note:**   Any changes to non-storable S-registers are lost when power is removed from the Data Module; however, the `&Y` command can be set to load a specific stored configuration profile at start up, and the values set by **AT** command arguments in the recalled profile will be placed into effect.

(Continued)

Label	Description
Comments:	Additional information about the S-register is presented following this label.
See Also:	Following this label are references to other parts of this manual where you will find more information, and/or a list of other S-registers or **AT** commands that are associated with this S-register.

S-REGISTER DESCRIPTIONS

A complete description of each S-Register used by the 7400B Data Module is provided on the following pages.

Register:	S0
Description:	The value in this S-register represents the ring number on which an incoming call will be automatically answered.
Range of Values:	The value may be 000 through 255 rings. The factory-default setting is 000 rings.
Storable:	yes
Comments:	Setting S-register S0 to any value from 001 through 255 enables automatic answer; a value of 000 disables automatic answering. The count of incoming rings is stored in S-register S1.
See Also:	Chapter 6, *"DCE Operation — Connecting a Terminal Device"*; S-register S1

Register:	S1
Description:	The number of incoming rings detected. Incremented each time a ring is detected. It is cleared if no rings are detected for eight seconds.
Range of Values:	The value may be 000 through 255 rings. The factory-default setting is 000 rings.
Storable:	no
Comments:	In the 7400A, incoming rings are not detected as such. The PBX notifies the 7400A of an incoming call and a ring cycle (RI lead) is generated internally. The register is incremented after each ring cycle.
See Also:	Chapter 6, *"DCE Operation — Connecting a Terminal Device";* S-register S0 .

Register:	S2
Description:	This S-register stores the ASCII value of the escape sequence character.
Range of Values:	Value may be 000 through 127 (see comments); factory-default setting is 043, the ASCII code for a plus sign (+).
Storable:	no
Comments:	Setting the value greater than 127 will disable escape sequence detection, in which case the escape sequence cannot be used to move to command mode. The operation of the Data Terminal Ready (DTR) circuit, set by the &D command, can still be used to move to command state without disconnecting the call.
See Also:	Chapter 6, *"DCE Operation — Connecting a Terminal Device";* **AT** command &D in Appendix A, *"AT Command Interface—AT Commands"*

Register:	S3
Description:	This S-register stores the ASCII value of the carriage return character.
Range of Values:	Value may be 000 though 127; factory-default setting is 013, usually output by the [Enter] or [Return] key or the [Ctrl] **-M** key combination from a data terminal.
Storable:	no
Comments:	This character serves as the command terminator on an **AT** command line. It is also output following all result codes.
See Also:	Chapter 6, *"DCE Operation — Connecting a Terminal Device"*

Register:	S4
Description:	This S-register holds the ASCII value for the line feed character.
Range of Values:	Value may be 000 through 127; factory default setting is 010, usually output by the [Ctrl] **-J** key combination from a display terminal.
Storable:	no
Comments:	none
See Also:	Chapter 6, *"DCE Operation — Connecting a Terminal Device"*

Register:	S5
Description:	This S-register holds the ASCII value for the backspace character.
Range of Values:	Value may be 000 through 032 and 127; factory-default value is 008, usually output by the [<u>Backspace</u>] key of a data terminal.
Storable:	no
Comments:	The operation of the backspace character is to move the cursor left one character space and (on a command line) erase the character moved to. If command echo is enabled (**AT** command E1), the output of the backspace character is actually three characters: backspace, space, backspace.
See Also:	Chapter 6, *"DCE Operation — Connecting a Terminal Device"*

Register:	S6 — not used

Register:	S7
Description:	Wait time for line signal or dial tone. If line signal is not detected within this time, the call will be disconnected.
Range of Values:	Value may be 001 through 055 seconds; factory-default value is 030 seconds.
Storable:	no
Comments:	This register will affect only the wait time for line signal detection. The 7400A always waits the length of time in register S7 for the equivalent of a dial tone from the PBX.
See Also:	Chapter 6, *"DCE Operation — Connecting a Terminal Device"*

Register:	S8 — not used

Register:	S9 — not used

Register:	S10
Description:	The value in this S-register determines how long the 7400A Data Module will wait after loss of line signal is detected before disconnecting.
Range of Values:	Value may be 000 through 255 tenths (0.1) of a second; factory-default value is 014 tenths of a second (1.4 sec.).
Storable:	no
Comments:	The delay set by this S-register allows the receive line signal to disappear momentarily without causing a disconnect (hang-up). Setting this S-register to the maximum value (255) causes the Data Module to ignore receive line signal status and not disconnect the data call if line signal is lost.
See Also:	Chapter 6, *"DCE Operation — Connecting a Terminal Device"*

Register:	S11 — not used

Register:	S12
Description:	The value in this S-register determines the minimum delay required immediately before and after entering the escape sequence (guard time). It also determines the maximum interval allowed between entering each of the three consecutive characters of the sequence.
Range of Values:	Value may be 000 through *255* fiftieths (0.02) of a second; factory-default value is 050 fiftieths of a second (1 sec.).
Storable:	no
Comments:	If the value in this S-register is set to 0, timing is not a factor in escape sequence recognition.
See Also:	Chapter 6, *"DCE Operation — Connecting a Terminal Device"*

Register:	S13 — not used

Register:	S14
Description:	This S-register is used to store the status of bit-mapped options as follows:

bit 0 — not used (always set to 0)

bit 1 — 0 = command echo disabled, 1 = command echo enabled (default =1, see E command)

bit 2 — 0 = result codes enabled, 1 = result codes disabled (default = 0, see Q command)

bit 3 — 0 = short result codes, 1 = verbose result codes (default = 1, see V command)

bit 4 —not used (always set to 0)

bit 5 — 0 =not used (see comment 1)

bit 6 — not used (always set to 0)

bit 7 — 0 = originate mode, 1 = answer mode (default = 1, see A and D commands)

Range of Values:	Value may be 00 to FF hexadecimal; factory-default settings produce a value of AA (see comment 2).
Storable:	yes
Comments:	1 In the DCP operating environment of the 7400A Data Module, tone and pulse dialing have no meaning. If the T or P dial modifiers are used, bit 5 is changed accordingly, but the data module performs no other action.
	2 Refer to the explanation of hexadecimal values under the **Range of Values** label description at the beginning of this appendix.
See Also:	Chapter 6, *"DCE Operation — Connecting a Terminal Device";* refer to the indicated **AT** commands in Appendix A, *"AT Command Interface—AT Commands"*

Register:	S15 — not used

Register:	S16

Description: This S-register stores test function status in a bit-mapped format as follows:

bit 0 — local digital loop test; 0 = test disabled, 1 = test in progress (default = 0, see the &T1 and &T2 commands)

bit 1 — not used (always set to 0)

bit 2 — local data loop test; 0 = disabled, 1 = test in progress (default = 0, see &T3 command)

bit 3 — status bit for remote digital loop initiated by remote system; 0 = off, 1 = in progress (default = 0, see &T4 and &T5 commands)

bit 4 — remote digital loop; 0 = disabled, 1 = in progress (default = 0, see &T6 command)

bit 5 — remote digital loop with self-test; 0 = disabled, 1 = in progress (default = 0, see &T7 command)

bit 6 — local digital loop with self-test; 0 = disabled, 1 = in progress (default = 0, see &T8 command)

bit 7 — not used (always set to 0)

Range of Values: Value may be 00 to FF hexadecimal; factory-default settings produce a value of 00 (see comment 1).

Storable: no

Comments:

1 Only one of the tests may be in progress at any time. The T0 command terminates any locally initiated test in progress and sets S-register 16 to 00.

2 Refer to the explanation of hexadecimal values under the **Range of Values** label description at the beginning of this appendix.

See Also: Chapter 6, *"DCE Operation — Connecting a Terminal Device";* refer to the indicated **AT** command in Appendix A, *"AT Command Interface—AT Commands"*

Register:	S17 — not used

Register:	S18
Description:	The value in this S-register establishes the duration of diagnostic tests initiated by the &T command.
Range of Values:	Value may be 000 through 255 seconds. The factory-default value is 0.
Storable:	yes
Comments:	Any locally initialized test in progress is automatically terminated when the time specified in S-register 18 has elapsed. If S-register 18 is set to 0, a test initiated by the &T command must be terminated manually. Issuing the &T0 command terminates any locally initiated test immediately, regardless of the value in S-register 18.
See Also:	Chapter 6 *"DCE Operation — Connecting a Terminal Device";* Appendix A, *AT "Command Interface— AT Commands"*

Register:	S19 — not used

Register:	S20 — not used

Register:	S21

Description: This S-register is used to store the status of bit-mapped options as follows:

bit 0 — not used (default = 0, see comment 1)

bit 1 — not used (always set to 0)

bit 2 — not used (default = 0, see comment 1)

bits 3 and 4 — DTR options; value depends on argument of DTR option command (default = 00, see &D command)

bit 5 — DCD options; 0 = always on, 1 = EIA-232-D standard (default = 0, see &C command)

bit 6 — DSR options; 0 = always on, 1 = EIA-232-D standard (default = 0, see &S command)

bit 7 — not used (default = 0 see comment 1)

Range of Values: Value may be 00 to FF hexadecimal; factory-default settings produce a value of 00 (see comment 2).

Storable: yes

Comments:

1 For the 7400A Data Module, bits 0, 2, and 7 will be set by the appropriate command, however, there will be no other effect.

2 Refer to the explanation of hexadecimal values under the **Range of Values** label description at the beginning of this appendix.

See Also: Chapter 6, *"DCE Operation — Connecting a Terminal Device";* refer to the indicated **AT** command in Appendix A, *"AT Command Interface—AT Commands"*

Register:	S22

Description: This S-register is used to store the status of bit-mapped options as follows:

> *bits 0 and 1* — not used (default = 2, see comment 1)

> *bits 2 and 3* — not used (default = 1, see comment 1)

> *bits 4, 5 and 6* — result codes; value depends on argument of result code options command (default = 0, see X command)

> *bit 7* — not used (default = 0, see comment 1)

Range of Values: Value may be 00 to FF hexadecimal; factory-default settings produce a value of 76 hexadecimal (see comment 2).

Storable: yes

Comments:

1   For the 7400A Data Module, bits 0 through 3 and bit 7 will be set by the appropriate command, however, there will be no other effect.

2   Refer to the explanation of hexadecimal values under the **Range of Values** label description at the beginning of this appendix.

See Also: Chapter 6, *"DCE Operation — Connecting a Terminal Device";* refer to the indicated **AT** command in Appendix A, *"AT Command Interface—AT Commands"*

Register:	S23
Description:	This S-register is used to store the status of bit-mapped options as follows:

bit 0 — allow remote loop request from remote system; 0 = disabled, 1 = enabled (default = 1, see &T command)

bits 1, 2, and 3 — local communications speed (see comment 1)

   0 = 300 bps
   1 = not used
   2 = 1200 bps
   3 = 2400 bps (factory-set default)
   4 = 4800 bps
   5 = 9600 bps
   6 = 19200 bps
   7 = not used

bits 4 and 5 — local parity setting; 0 = even, 1 = space, 2 = odd, and 3 = mark/none (default = 0)

bit 6 and 7 — not used (see comment 2)

Range of Values:	Value may be 00 to FF hexadecimal; factory-default settings produce a value of 07 hexadecimal (see comment 3).
Storable:	yes
Comments:	

   1   Hayes compatible modems use only bits 0, 1 and 2 for speeds up to 2400 bps. The 7400A Data Module uses bit 3 to support speeds above 2400 bps.

   2   Bits 6 and 7 are set by the appropriate command, but there will be no other effect.

   3   Refer to the explanation of hexadecimal values under the **Range of Values** label description at the beginning of this appendix.

See Also:	Chapter 6, *"DCE Operation — Connecting a Terminal Device";* refer to the indicated **AT** command in Appendix A, *"AT Command Interface—AT Commands"*

Register:	S24 — not used

Register:	S25
Description:	The value in this S-Register determines how long a change of state (OFF to ON or ON to OFF) on the Data Terminal Ready (DTR) lead must persist before it is acknowledged. If the change of state persists for a shorter time than is specified in S-register 25 it is ignored.
Range of Values:	Values may be 000 through 255 hundreds of a second (0.01 sec.). The factory-default setting is 5 (0.05 sec.).
Storable:	yes
Comments:	none
See Also:	Chapter 6, *"DCE Operation — Connecting a Terminal Device"*

Register:	S26 — not used

Register:	S27 — not used

**C   Appendix C: AT Command Interface
      Quick Reference**

Appendix C: AT Command Interface Quick Reference

This appendix contains quick-reference summaries for the following data:

Table C-1: AT Command Set

Table C-2: S-Register Summary

Table C-3: Result Codes

Table C-4: Factory-Default Configuration

Table C-5: ASCII Character Set

TABLE C-1
AT COMMAND SET

Command	Description
AT	Command prefix—precedes most commands.
A	Go off hook and remain in command state.
A/	Repeat the last command line.
D	Enter originate mode and dial number that follows.
E0	Inhibit command state echo.
E1	Enable command state echo.
H0	Go on-hook (hang up).
H1	Accepted but causes no action.
I0	Returns decimal number 249 to data terminal.
I1	Returns ROM checksum as two 4-digit hexadecimal numbers.
I2	Returns *OK*.
O	Return to on-line mode.
Q0	Enable display of result codes.
Q1	Disable display of result codes.
Sr	Set pointer to S-register *r*.
Sr=n	Set S-register *r* to value *n*.
Sr?	Display value stored in S-register *r*.
V0	Display short form (numeric) result codes.
V1	Display verbose form (text) result codes.
X1	Enables features of result codes 0-4.
X2	Enables features of result codes 0-5, 10-12, 14.
X3	Enables features of result codes 0-5, 7, 10-12, 14.
X4	Enables features of result codes 0-5, 7, 10-12, 14.
Z0	Reset and recall stored configuration profile 0.
Z1	Reset and recall stored configuration profile 1.

(Continued)

TABLE C-1
AT COMMAND SET

Command	Description
&C0	Maintain DCD circuit in ON state.
&C1	DCD circuit operates according to EIA-232-D specification.
&D0	Ignore DTR signal.
&D1	Return to command mode if ON/OFF transition of DTR is detected; active call is *not* disconnected.
&D2	Return to command mode if ON/OFF transition of DTR is detected; active call is disconnected.
&D3	Perform reset if ON/OFF transition of DTR is detected.
&F	Recall factory-default configuration profile.
&S0	Maintain DSR circuit in on state.
&S1	DSR circuit operates according to EIA-232-D specification.
&T0	Terminate any test in progress.
&T1	Initiate local digital loopback test.
&T2	Same as &T1.
&T3	Initiate local data loopback test.
&T4	Allow remote digital loopback request from remote endpoint.
&T5	Deny remote digital loopback requests from remote endpoint.
&T6	Initiate remote digital loopback test.
&T7	Initiate remote digital loopback test with self-test.
&T8	Initiate local digital loopback test with self-test.
&V	Display active and stored configuration profiles.
&W0	Store active configuration profile in location 0.
&W1	Store active configuration profile in location 1.
&Y0	Recall configuration profile stored in location 0 at start-up.
&Y1	Recall configuration profile stored in location 1 at start-up.
&Z0	Store the following telephone number in location 0.
&Z1	Store the following telephone number in location 1.
&Z2	Store the following telephone number in location 2.
&Z3	Store the following telephone number in location 3.

TABLE C-2
S-REGISTER SUMMARY

Register	Description	Range/Unit
S 0	Ring to answer on.	000-255 count
S 1	Incoming ring count.	000-255 count
S 2	Escape sequence character.	000-127 ASCII
S 3	Carriage return character.	000-127 ASCII
S 4	Line feed character.	000-127 ASCII
S 5	Back space character.	000-032, 127 ASCII
S 6	Not used.	—
S 7	Wait time for call completion.	001-055 sec.
S 8	Not used.	—
S 9	Not used.	—
S10	Delay between lost line signal and hang up.	000-255 0.1 sec.
S11	Not used.	—
S12	Escape sequence guard time.	000-255 0.02 sec.
S13	Not used.	—
S14	Bit mapped options (see Appendix B).	00-FF hex.
S15	Not used.	—
S16	Test function status (see Appendix B).	00-FF hex.
S17	Not used.	—
S18	Diagnostic test duration timer.	000-255 sec.
S19	Not used.	—
S20	Not used.	—
S21	Bit mapped options (see Appendix B).	00-FF hex.
S22	Bit mapped options (see Appendix B).	00-FF hex.
S23	Bit mapped options (see Appendix B).	00-FF hex.
S24	Not used.	—
S25	DTR change detect time.	000-255 0.01 sec.
S26	Not used.	—
S27	Not used.	—

TABLE C-3
RESULT CODES

Verbose Form	Numeric	Description
OK	0	Command accepted
CONNECTED	1	Connection made at 300 bps
		Note: If command X0 is in effect, CONNECT means connection made at whatever speed both ends of the call agreed upon.
RING	2	Ring signal detected
NO CARRIER	3	Carrier signal not detected or lost
ERROR	4	Error in command line
CONNECT 1200	5	Connection made at 1200 bps
BUSY	7	Busy signal detected
CONNECT 2400	10	Connection made at 2400 bps
CONNECT 4800	11	Connection made at 4800 bps
CONNECT 9600	12	Connection made at 9600 bps
CONNECT 19200	14	Connection made at 19200 bps

TABLE C-4
FACTORY-DEFAULT CONFIGURATION

Parameter	Value	AT Command
Command state echo	enabled	E1
Communication mode	asynchronous	&M0/&Q0
Default user profile	profile 0	&Y0
DCD circuit option	always on	&C0
DSR circuit option	always on	&S0
DTR circuit option	DTR ignored	&D0
Not used by 7400A Data Module	—	&G0
Not used by 7400A Data Module	—	Y0
Not used by 7400A Data Module	—	&P0
RDL request	granted	&T4
Result codes	enabled	Q0
Result code format	text	V1
Result code subset	0-5,7,10-12,14	X4
Not used by 7400A Data Module	—	&R0
Not used by 7400A Data Module	—	M1
Not used by 7400A Data Module	—	L2
Not used by 7400A Data Module	—	B1
Not used by 7400A Data Module	—	&J0

(Continued)

TABLE C-4
FACTORY-DEFAULT CONFIGURATION

Parameter	Value	S-Register
Auto-answer on ring	disabled	S0=0
Backspace character	ASCII 8	S5=8
Carriage return character	ASCII 13	S3=13
Not used by 7400A Data Module	—	S9=6
Not used by 7400A Data Module	—	S8=2
Not used by 7400A Data Module	—	S11=95
DTR detection	0.05 sec.	S25=5
Escape sequence character	ASCII 43	S2=43
Escape sequence guard time	1 sec.	S12=50
Hang up after lost carrier	1.4 sec.	S10=14
Line feed character	ASCII 10	S4=10
Ring count	0 rings	S18=0
Not used by 7400A Data Module	—	S26=1
Test timer duration	0 sec.	S18=0
Wait for call completion	30 sec.	S7=30
Not used by 7400A Data Module	—	S6=2

TABLE C-5
ASCII CHARACTER SET

ASCII VALUE	CONTROL CHARACTER	KEY	ASCII VALUE	CONTROL CHARACTER	KEY
	032		spacebar		
001	SOH	Ctrl-A	033		!
002	STX	Ctrl-B	034		"
003	ETX	Ctrl-C	035		#
004	EOT	Ctrl-D	036		$
005	ENQ	Ctrl-E	037		%
006	ACK	Ctrl-F	038		&
007	BEL	Ctrl-G	039		'
008	BS	Ctrl-H	040		(
009	HT	Ctrl-I	041		)
010	LF	Ctrl-J	042		*
011	VT	Ctrl-K	043		+
012	FF	Ctrl-L	044		'
013	CR	Ctrl-M	045		–
014	SO	Ctrl-N	046		.
015	SI	Ctrl-O	047		/
016	DLE	Ctrl-P	048		0
017	DC1	Ctrl-Q	049		1
018	DC2	Ctrl-R	050		2
019	DC3	Ctrl-S	051		3
020	DC4	Ctrl-T	052		4
021	NAK	Ctrl-U	053		5
022	SYN	Ctrl-V	054		6
023	ETB	Ctrl-W	055		7
024	CAN	Ctrl-X	056		8
025	EM	Ctrl-Y	057		9
026	SUB	Ctrl-Z	058		:
027	ESC	Ctrl-[	059		;
028	FS	Ctrl-\	060		<
029	GS	Ctrl-]	061		=
030	RS	Ctrl-^	062		>
031	US	Ctrl-_	063		?

(Continued)

TABLE C-5
ASCII CHARACTER SET

ASCII VALUE	CONTROL CHARACTER	KEY	ASCII VALUE	CONTROL CHARACTER	KEY
064		@	096		'
065		A	097		a
066		B	098		b
067		C	099		c
068		D	100		d
069		E	101		e
070		F	102		f
071		G	103		g
072		H	104		h
073		I	105		i
074		J	106		j
075		K	107		k
076		L	108		l
077		M	109		m
078		N	110		n
079		O	111		o
080		P	112		p
081		Q	113		q
082		R	114		r
083		S	115		s
084		T	116		t
085		U	117		u
086		V	118		v
087		W	119		w
088		X	120		x
089		Y	121		y
090		Z	122		z
091		[	123		{
092		\	124			
093		]	125		}
094		^	126		~
095		-	127	DEL	Delete

D   Appendix D: Hardware Wiring Configurations

Appendix D: Hardware Wiring Configurations

This appendix contains basic wiring configurations for 7400A cabling and circuitry. Specifically, this chapter contains:

Table D-1: L2 Adapter Cable Pin Assignments

Table D-2: 7400A-L1 Data Service Unit EIA-232-D Interface Circuits

Table D-3: Wiring for OR-6316 Bridging Adapter

TABLE D-1

L2 Adapter Cable Pin Assignments*

77A Data Mounting Position	Modular Plug Pin Numbering	Signal Direction**	B25 Connector Pin Numbering
1	1	S ← M	27
	2	S ← M	2
	3	S → M	28
	6	S → M	3
	4	TDG	4
	5	D1	29
2	1	S ← M	30
	2	S ← M	5
	3	S → M	31
	6	S → M	6
	4	TDG	7
	5	D1	32
3	1	S ← M	33
	2	S ← M	8
	3	S → M	34
	6	S → M	9
	4	TDG	10
	5	D1	35
4	1	S ← M	36
	2	S ← M	11
	3	S → M	37
	6	S → M	12
	4	TDG	13
	5	D1	38

(Continued)

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*   Refer to Figures 2-9 or 2-17.

** S=Switch, M=Data Module, TDG and D1=Modem Control

Table D-1
L2 Adapter Cable Pin Assignments*

77A Data Mounting Position	Modular Plug Pin Numbering	Signal Direction**	B25 Connector Pin Numbering
5	1	S ← M	39
	2	S ← M	14
	3	S → M	40
	6	S → M	15
	4	TDG	16
	5	D1	41
6	1	S ← M	42
	2	S ← M	17
	3	S → M	43
	6	S → M	18
	4	TDG	19
	5	D1	44
7	1	S ← M	45
	2	S ← M	20
	3	S → M	46
	6	S → M	21
	4	TDG	22
	5	D1	47
8	1	S ← M	48
	2	S ← M	23
	3	S → M	49
	6	S → M	24
	4	TDG	25
	5	D1	50

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*   Refer to Figures 2-9 or 2-17.

** S=Switch, M=Data Module, TDG and D1=Modem Control

TABLE D-2
7400A-L1 Data Service Unit EIA-232-D Interface Circuits

Pin	Name	Function	DCE	DTE
1	—	Not used	NC	NC
2	BA (TD)	Transmitted Data	Input	Output
3	BB (RD)	Received Data	Output	Input
4	CA (RTS)	Request to Send	Input	Output
5	CB (CTS)	Clear to Send	Output	Input
6	CC (DSR)	Data Communication Equipment Ready	Output	Input
7	AB (SG)	Signal Ground	Common	Common
8	CF (RLSD)	Received Line Signal Detector	Output	Input
9	—	Reserved for Testing	+12 volts	NC
10	—	Reserved for Testing	-12 volts	NC
11	—	Not used	NC	NC
12	CI	Data Signal Rate Select (DCE Source)	Output	Input
13	CI2	Data Signal Rate Select 2 (DCE Source)	NC	Input
14	—	Not used	NC	NC
15	DB*	Transmitter Signal Element Timing (DCE Source)	Output	Input
16	—	Not used	NC	NC
17	DD*	Receiver Signal Element Timing (DCE Source)	Output	Input
18	LL	Local Loopback	Input	Output
19	CH2	Data Signal Rate Select 2 (DTE Source)	NC	Output
20	CD (DTR)	Data Terminal Equipment Ready	Input	Output
21	RL	Remove Loopback	Input	Output
22	CE (RI)	Ring Indicator	Output	Input
23	CH	Data Signal Rate Select (DTE Source)	Input	Output
24	DA*	Transmit Signal Element Timing (DTE Source)	Input	Output
25	TM	Test Mode	Output	Input

---

* Circuits are not used for asynchronous operation.
Outputs are clamped OFF and inputs are ignored.

TABLE D-3

Wiring for the OR-6316 Bridging Adapter*

MALE P1 Connector	25 PR. FEMALE J1 Connector	25 PR. FEMALE J2 Connector
26 N/C		
1 N/C		
27 <--------------------------< 27		
2 <--------------------------< 2		
28 <--------------------------< 28		
3 <--------------------------< 3		
29 <--< 28		
4 <--< 3		
30 <--------------------------< 30		
3 <--------------------------< 5		
31 <--------------------------< 31		
6 <--------------------------< 6		
32 <--< 29		
7 <--< 4		
33 <--------------------------< 33		
8 <--------------------------< 8		
34 <--------------------------< 34		
9 <--------------------------< 9		
35 <--< 30		
10 <--< 5		
36 <--------------------------< 36		
11 <--------------------------< 11		
37 <--------------------------< 37		
12 <--------------------------< 12		
38 <--< 31		
13 <--< 6		
39 <--------------------------< 39		
14 <--------------------------< 14		
40 <--------------------------< 40		
15 <--------------------------< 15		
41 <--< 32		
16 <--< 7		
42 <--------------------------< 42		
17 <--------------------------< 17		
43 <--------------------------< 43		
18 <--------------------------< 18		
44 <--< 33		
19 <--< 8		
45 <--------------------------< 45		
20 <--------------------------< 20		
46 <--------------------------< 46		
21 <--------------------------< 21		
47 <--< 34		
22 <--< 9		
48 <--------------------------< 48		
23 <--------------------------< 23		
49 <--------------------------< 49		
24 <--------------------------< 24		
50 <--< 35		
25 <--< 10		

* Refer to Figures 2-10 and 2-11.

Glossary

ANSI display protocol. A standard set of escape sequences, established by ANSI (the American National Standards Institute), used by many display terminal devices to transmit or receive display control functions, such as cursor movement and color or graphics configuration parameters.

Asynchronous data communications. A standard type of data transfer in which each "character" (a 7 or 8 bit data word) is sent or received separately at a selectable data transfer rate, and is framed by extra bits preceding and following the character. Various error-checking methods are used to determine whether the character received at one end of the data path is the same as the one sent at the other end. Also called asynchronous mode, as opposed to synchronous mode, this method does not use a clock signal to meter data. *(Note:* Since the 7400A Data Module operates only in asynchronous mode, synchronous mode is not defined in this glossary.) *See also* data options.

AT command set. A de facto industry-standard set of commands used for configuration and operation of DCE devices or modems. The AT (ATtention) command set originated with Hayes Microcomputer Products, Inc. The AT&T 7400A Data Module uses a subset of the full AT command set.

Command files. Files created for or by data communications software running on a PC that can be used to execute a sequence of commands to complete a task, such as performing an automatic log in to a specific remote device. Also called script files.

Command line. A string of one or more valid and compatible AT commands typed on one line with any applicable arguments. Most command lines begin with the *AT* prefix and end with a carriage return (issued by pressing [<u>Enter</u>]).

Command mode. An operating mode in which the 7400A Data Module looks at all characters coming from its associated terminal device and attempts to interpret them as commands.
See also on-line mode.

Communications parameters. *See* data options.

Configuration profiles. *See* option profiles.

Data Communications Equipment (DCE). (Also known as Data Circuit-terminating Equipment.) The equipment that provides the functions required to establish, maintain and terminate a data communications connection. Additionally, the DCE provides any required signal conversion for communication between the DTE device *(see also* Data Terminal Equipment) and the telephone line or data circuit.

Data mode. *See* on-line mode.

Data options. For asynchronous data communications, these parameters include data transfer speed (expressed in bits/second or bps, and sometimes called baud rate), parity, data word size (or data bits), and stop bits. Generally, these parameters must be set to match at both ends of the communication line. Except when the data metering option is enabled, the 7400A data module attempts to adjust to match the speed of the remote device. Also called communications parameters. *See also* asynchronous data communications *and* data metering.

Data Terminal Equipment (DTE). A device that sends and/or receives data over a communication line via a DCE device *(see also* Data Communications Equipment). Examples of DTE devices are a data display terminal, a PC running appropriate data communications software, or a printer or plotter.

DCE. *See* Data Communications Equipment.

DCP. *See* Digital Communications Protocol.

Dial modifier. Any character that may be inserted in a command line following the *D* (dial) command. *See* D command *in* Appendix A, "AT Command Set," *for a description of valid dial modifiers.*

Digital Communications Protocol (DCP). A proprietary digital protocol used by AT&T PBX equipment to communicate with AT&T voice terminals and data modules. DCP supports simultaneous voice and data services over the same line.

DTE. *See* Data Terminal Equipment.

D8W. A standard modular telephone cord used to connect DCP devices to a PBX wall jack.

EIA-232-D. A US industry standard interface for digital data communications equipment, established by EIA (the Electronics Institute of America). The standard defines the cabling, connectors, and lead signal assignments used in the interface. Formerly referred to as the EIA Recommended Standard RS-232-C.

Hayes compatible. Of a DCE device, using the *AT command set* and performing in close compliance with the configuration and operating standards established by Hayes Microcomputer Products, Inc. *See also* AT command set.

Idle mode. An operational mode in which the 7400A Data Module is on-hook waiting either for an incoming call or to originate a call.

On-line mode. An operating mode in which the 7400A Data Module transmits all characters coming from its associated terminal device and does not attempt to interpret them as commands. Also called data mode. *See also* command mode.

Option profiles. *See* configuration profiles.

Script files. *See* command files.

Terminal mode. A type of data communications software, the operating mode of the software in which your PC is emulating a data terminal. In this operating mode, you may be communicating with either the data module or a remote device, such as a host computer. *See also* stand alone mode *and* on-line mode.

Index