

UTA220/UTA220k Terminal Adapter

User Guide

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STATEMENT OF APPLICATION

This manual is written for users of the Motorola UTA220/UTA220k terminal adapter. Please read the appropriate chapters before installing, changing any option, or operating the unit.

FCC REQUIREMENTS

WARNING

This equipment uses, generates, and can radiate radio frequency energy interfering with radio communications if not installed and used according to the instruction manual. It has been tested and complies with the limits for a Class A computing device according to FCC Rules, Part 15. Operation of this equipment in a residential area may cause interference. If it does, you must correct the cause of the interference.

Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

SHIELDED CABLES

Shielded DTE cables should be used with this unit to ensure compliance with Class A limits.

SPECIAL REQUIREMENTS FOR CANADA

Certain requirements exist for data communication products manufactured for use in Canada. Principle among these requirements is the application of the IC stamp as described below. However, certain data communication products do not require the IC stamp nor adherence to IC requirements. If this is the case the IC stamp will not be affixed to the rear panel of standalone units nor packaged with units designed for insertion in user equipment.

Industry Canada (IC) Requirements

IC stamps are affixed to the rear of each standalone unit sold in Canada. Card units which are installed in the user's equipment are shipped with a stamp included. The user should place the stamp on the outside of his equipment as close as possible to the telephone line connector. This stamp has the certification number for that particular unit. The numbers are different for each model.

The Industry Canada label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational, and safety requirements. IC does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment. For their own protection users should ensure that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

CAUTION

Users should not attempt to make installation connections themselves, but should contact the appropriate electric inspection authority or electrician.

Load Number

The Load Number (LN) assigned to each terminal device denotes the percentage of the total load to be connected to a telephone loop which is used by the device, to prevent overloading. The termination on a loop may consist of any combination of devices subject only to the requirement that the total of the Load Numbers of all the devices does not exceed 100.

Canadian Emission Requirements

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Industry Canada (IC).

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la class A prescrites dans le Règlement sur le brouillage radioélectrique édicté par Industrie et Canada.

PREFACE AND STATEMENT OF APPLICATION

This manual is written for users of the UDS UTA220/UTA220k terminal adapter. Please read the appropriate chapters before installing, changing any option, or operating the unit.

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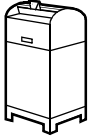
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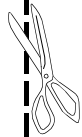
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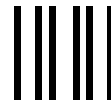


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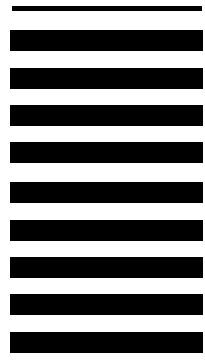
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Chapter 1 Introduction

The Motorola UTA220 terminal adapter connects existing Data Terminal Equipment (DTE) to the Integrated Services Digital Network (ISDN). The UTA220 uses the ISDN Basic Rate Interface which consists of two bearer (B) channels for data and one delta (D) channel for signaling.

The UTA220 has two DTE port connectors. In addition, the UTA220 can be ordered with two additional DTE port connectors for EIA-232 asynchronous use or EIA-366 dialing. Each DTE has access to the 56 kbps/64 kbps ISDN B channels. The UTA220 functions similarly to two standard modems in this mode.

FEATURES

The UTA220 allows maximum freedom in designing a communications network. The UTA220 includes the following features:

Compatibility

- Compatible with Northern Telecom DMS100 ISDN central office switches running software versions BCS-29 and above
- Compatible with AT&T 5ESS ISDN central office switches running generic programs 5E4.2 or above for TYPE A terminals
- Compatible with central office switches running the signaling standard National ISDN 1 (NI1)

Note: The UTA220 does not support electronic key telephone service (EKTS) or supplementary data services.

Other Features

- LCD option selection and operation control
- Nonvolatile storage of 10 dial strings per port
- Two sets of operating configurations saved in nonvolatile memory
- 56 kbps/64 kbps synchronous operation
- 112 kbps/128 kbps synchronous operation using the BONDING protocol
- V.25 bis HDLC or BISYNC call control
- EIA-366 call control on the optional upper ports
- Optional front panel UTA220 numeric keypad for dialing and entering options
- Integral autodialing with AT command set

OPERATION

Nonvolatile memory holds two sets of user defined operating configurations. Options and functions are selected from the front panel or by AT commands. A menu driven 32-character liquid crystal display (LCD) provides command feedback as well as real time displays. UTA220 operation is monitored by six light emitting diodes (LEDs) on the front panel.

The UTA220 and UTA220k have four methods of operation.

- The UTA220 is programmed from the front panel using three push buttons, YES, NO, and HOME. The UTA220k has a numeric keypad that includes the additional function keys; CALL / HANGUP and ENTER;
- V.25 bis dialer functions and AT commands are performed on the EIA-232 or V.35 interfaces.
- EIA-366 dialer functions are performed on the optional upper ports.

PHYSICAL DESCRIPTION

The UTA220 is manufactured as a stand-alone desktop unit and as a rack-mount insert card. This manual applies to either unit. Figure 1-1 shows the front panel controls and indicators.



Figure 1-1. Front Panel UTA220

The standard UTA220 rear panel (Figure 1-2) houses two 25-pin D-type connectors for the DTE interface, an 8-pin ISDN U modular connector (U interface), the ON/OFF toggle switch, line fuse, and power control. The UTA220 can be ordered with a V.35 interface, in which case adapters should be connected to the 25-pin D-type connectors (Figure 1-3).

Caution: Connecting a V.35 DTE to a non-V.35 port may damage the DTE.

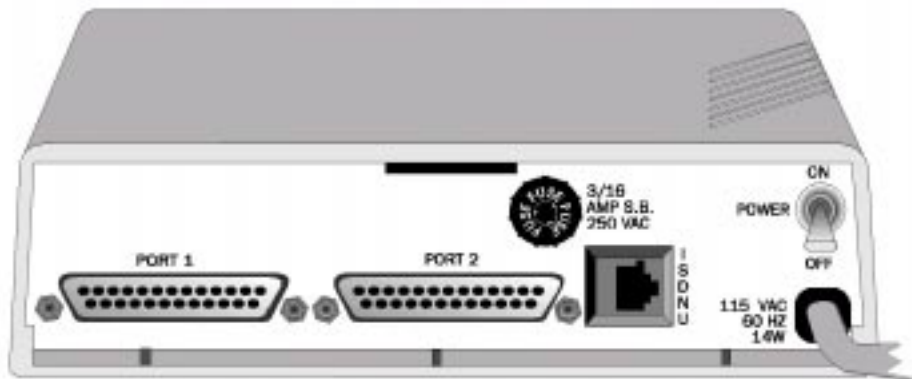


Figure 1-2. Rear Panel EIA-232 Configuration



Figure 1-3. V.35 Adaptor

If the UTA220 is ordered with the additional upper ports, then the rear panel will also contain two additional 25-pin D-type connectors above the two lower DTE interface connectors (Figure 1-4).

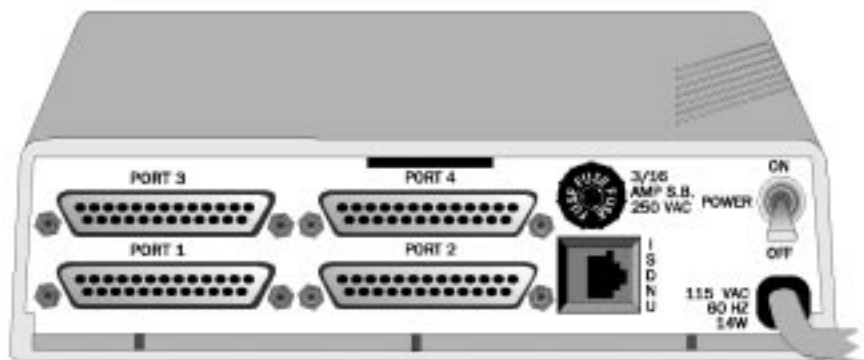


Figure 1-4. Four Port Rear Panel Configuration

LED Description

The UTA220 has six LED indicators: B1, B2, D, DP, T, PW. The functions of these LEDs are as follows:

B1 - On when the B1 channel has a call.

B2 - On when the B2 channel has a call.

D - This LED is for the D-Channel.

- It is off when the U connection is not established.
- It single blinks when the U connection is established. (This may take up to 15 seconds after connection is made.)
- It double blinks when communications are established with the switch.
- It is on when all B channels are available.

DP - On when the D-Channel is available for packet calls.

T (Test) - On during the following global tests:

- 2B+D loopback
- Switch initiated tests--quiet mode and insertion loss measurement

PW - On when the UTA220 has power.

FUNCTIONAL

The UTA220 operates on the ISDN Basic Rate Interface (BRI) (2B+D). This interface provides two 64-kbps full-duplex bearer (B) channels for circuit switched lines. The Basic Rate Interface also provides a 16 kbps delta (D) channel for signaling messages. The UTA220 adapts any data terminal to the ISDN Basic Rate Interface for circuit-switched data.

Chapter 2 Installation

Installation of the UTA220/UTA220k is simple and straight forward. Prior to installation, refer to Chapter 3 to either verify or change strap options.

RECEIPT INSPECTION

After unpacking the equipment, check the contents against the packing list. Inspect the equipment carefully for damage that may have occurred in shipment. If there is damage or material shortage, contact the shipping agent and Motorola for advice and assistance. Motorola suggests that the shipping container and packing material be retained for future shipment.

SITE PREPARATION

The installation area should be clean and free from extremes of temperature, humidity, appreciable shock, and vibration.

Allow ample space at the rear of the UTA220 for cable clearance and air flow. Install the UTA220 within 6 feet of a 115 or 230 VAC grounded outlet as required for the specific model and no farther than 50 feet from the DTE.

INSTALLATION

A typical installation is shown in Figure 2-1.

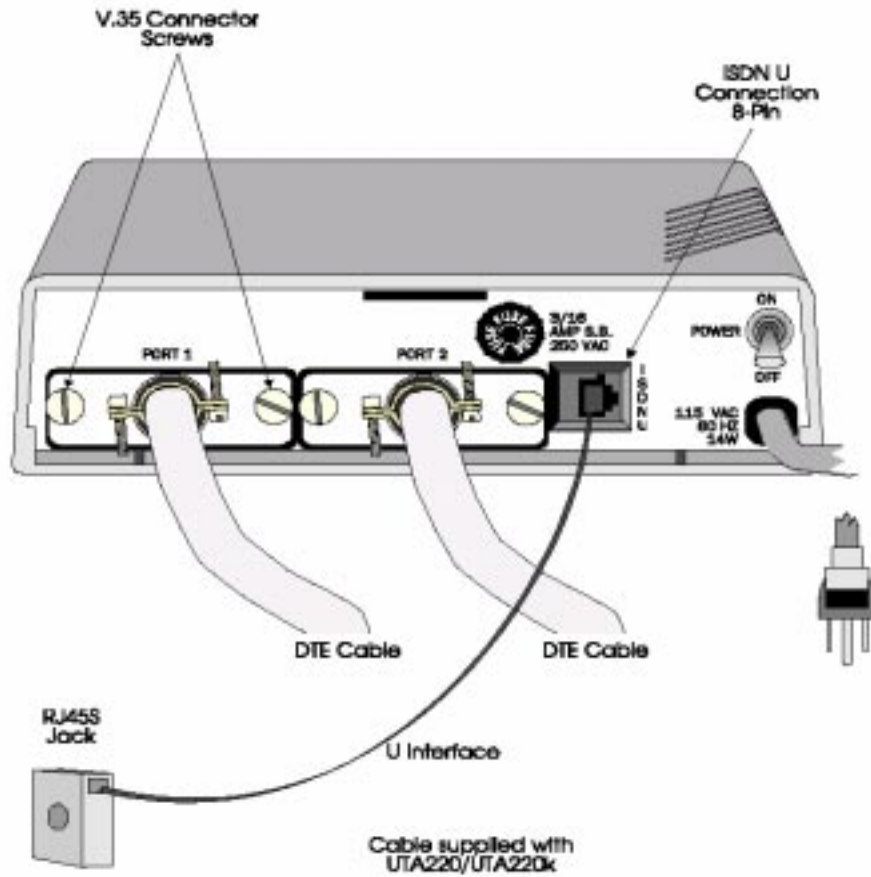


Figure 2-1. Typical Installation

Power Connection

Insert the power plug into a grounded 115 or 220 VAC outlet as required for the specific model. The UTA220 is now ready to be turned on and programmed.

Caution: Do not connect the UTA220 to the ISDN line until the UTA220 has been programmed with the correct switch settings. Refer to Central Office Switch in Chapter 3 for details.

ISDN Connection

To connect the UTA220 to the ISDN line, insert one end of the supplied cable into the UTA220 ISDN U jack. Insert the other end into the ISDN (RJ45) jack.

Note: An NT1 device is not required.

DTE Connection

Insert each DTE cable into a DTE connector. Insert the opposite end into the DTE. Secure the connect screws to complete the connection.

DTE INTERFACE SPECIFICATIONS

The DTE interface to the UTA220 is through an EIA-232 D/E 25-pin D-type connector. The UTA220 can also be configured for V.35 operation. It is also available with V.35 interfaces and with two additional ports for EIA-366 dialing, or EIA-232C operation.

Installation

Chapter 3 Getting Started

This chapter provides instructions for setting switches and straps plus a quick programming setup for the DMS100 or the 5ESS central office switch or switches running National ISDN 1 (NI1).

Caution: Do not connect the UTA220 to the ISDN line until the UTA220 has been programmed for the correct switch, switch version, Terminal Endpoint Identifier (TEI) numbers, and Service Profile Identifiers (SPIDs). These are provided by the telephone company at subscription time. Use of numbers other than those assigned or failure to program these numbers in the UTA220 can result in error conditions between the central office switch and the terminal adapter.

SWITCHES AND STRAPS

The unit is factory configured to current industry standards. Because of different environments, some terminal adapters may require strap or switch changes. This section describes the strap and switch options and how to use them.

Caution: Electrostatic discharge (ESD) can damage electronic components.

Cover Removal

To select or inspect the strap option, first remove the unit's cover.

Warning: Do not remove the cover unless both the power cord and ISDN line are unplugged.

Place the UTA220 on its side on a flat surface. Insert a medium size flat screwdriver blade in one of the bottom rear latch slots. DO NOT PUSH the screwdriver. Lightly pry the handle away to disengage the lock prong from the lock clip as shown in Figure 3-1. Assist by pushing the cover from the chassis with your fingers on the unit rear edges. Repeat this procedure with the remaining three latch slots.

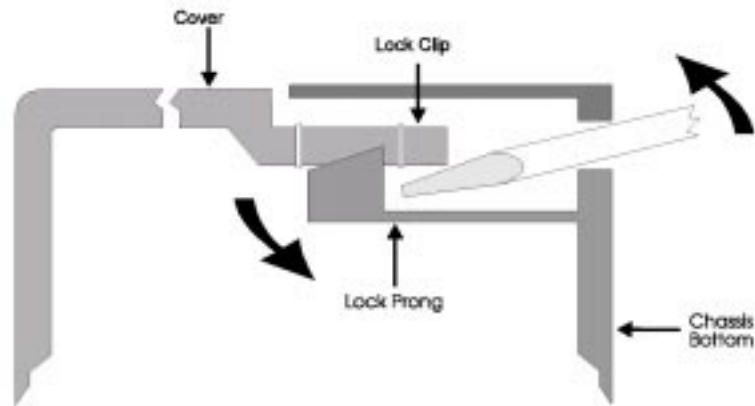


Figure 3-1. Cover Removal

To replace the cover, align the lock clips, rear guide grooves, and front lock tabs. Press the cover in place until the lock prongs engage the lock clip.

SWITCH AND STRAP SETTINGS

The following options are selected by switches or straps located on the PC boards inside the UTA220 housing. To change the strap setting, lift the jumper strap connector off and reinsert it in the new position. Figure 3-2 shows a typical strap application.

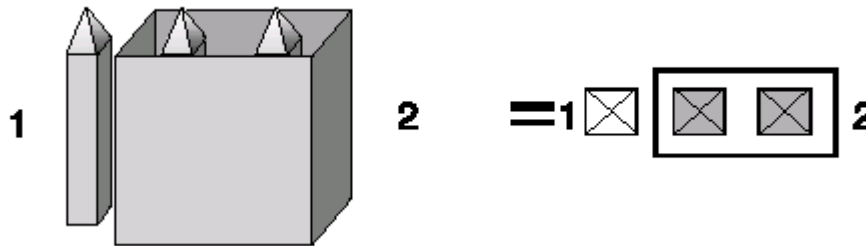


Figure 3-2. Typical Strap Application

Caution: Only personnel familiar with DIP switch selection should change switch positions or the ground strap from factory settings. Changes should be made only during setup.

Signal Ground

Signal ground is normally isolated from frame ground (factory). If interference exists, connect signal ground to frame ground by moving the strap.

(Figure 3-3).

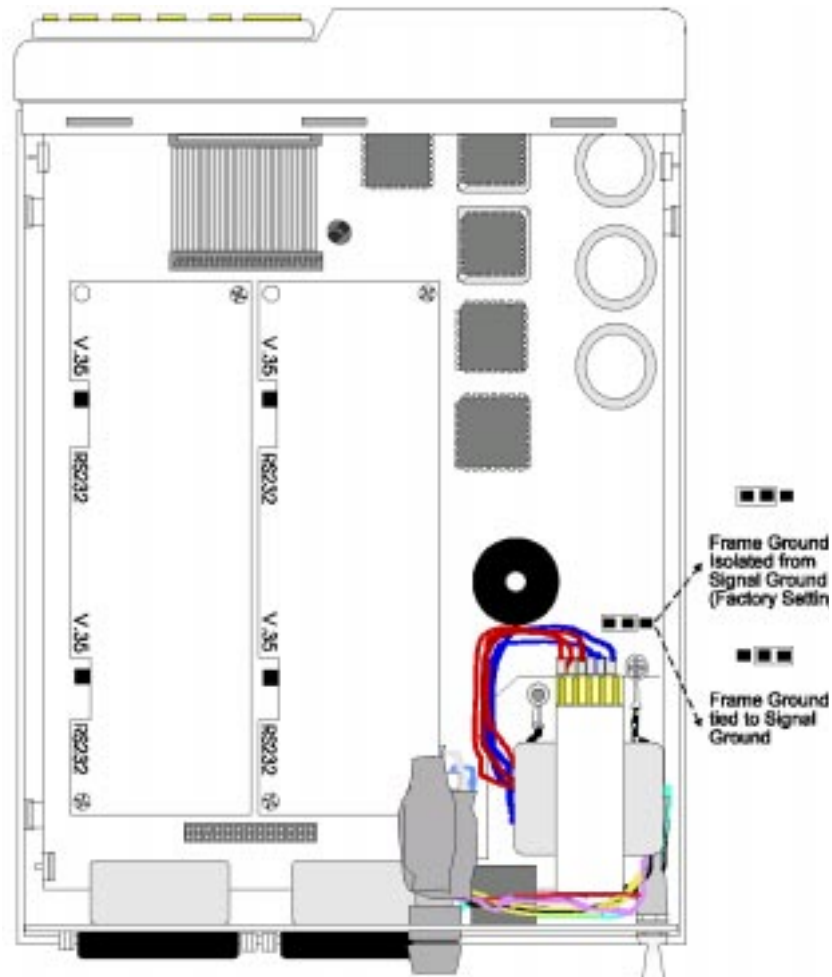


Figure 3-3. Strap and Switch Locations

V.35/EIA-232 Interface

The V.35/EIA-232 interface cards can conform to V.35 (factory) or EIA-232 D/E by means of two slide switches and a DIP switch. Slide the switches toward the front of the UTA220 to select V.35 and toward the rear of the UTA220 to select EIA-232 D/E (Figure 3-4).

To complete the selection of EIA-232 D/E, set the DIP switch as indicated in Table 3-1. The following sections describe how to change DIP switch settings.

**Table 3-1:
DIP Switch Settings for EIA232 D/E Operation**

<i>DIP Switch Position</i>			
1	2	3	4
OFF	OFF	ON	ON

Note: Ensure that both slide switches on the interface card are in the same position.

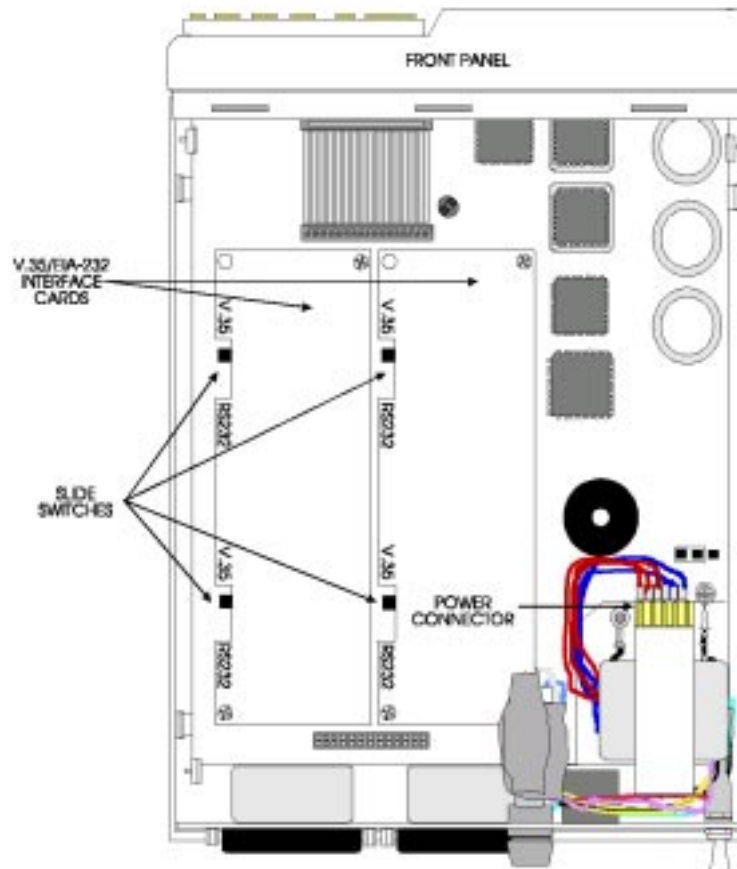


Figure 3-4. V.35 EIA-232 interface Card

Interface Card Removal

The port 1 V.35/EIA-232 interface card must be removed from the UTA220 to change the DIP switch settings.

Note: Do not remove the port 2 interface card. The port 2 DIP switch can be accessed without removing the card.

Remove the two screws from the port 1 interface card and pull it straight up (Figure 3-5). To re-assemble, align the interface card to the UTA220 PC board, press down, and insert the two screws.

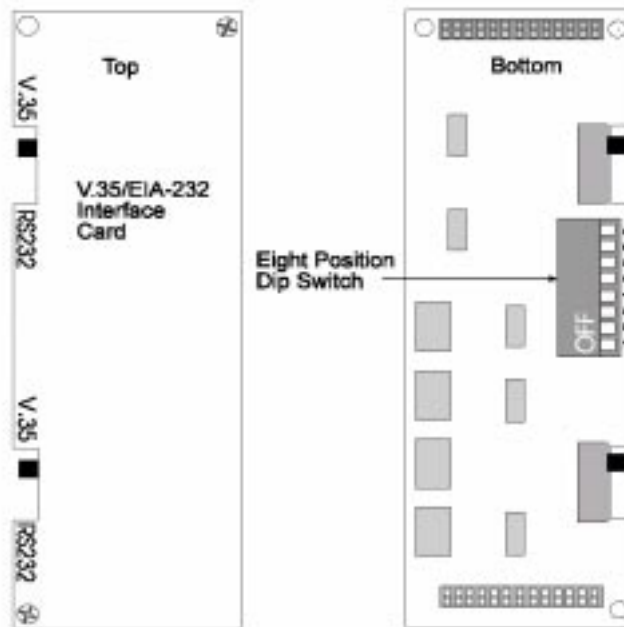


Figure 3-5. V.35 Switch Location

DIP Switch Options

The V.35/EIA-232 interface card has an eight-position DIP switch on the bottom (Figure 3-5). The port 2 DIP switch settings can be changed without removing the port 2 interface card. Note the orientation of the switch when changing the settings on port 2. The DIP switch allows you to transpose the Ring Indicate (RI) and Local Loopback pins (LL). Normally, RI is found on pin J and LL is found on pin L. However, these can be transposed (Table 3-2).

**Table 3-2:
V.35 Ring Indicate Local Loopback Pinouts**

<i>DIP Switch Position</i>				<i>Pin Function & Location</i>	
1	2	3	4	RI	LL
ON*	ON*	OFF*	J*	L*	ON

*default

Getting Started

Transmit clock B can be disconnected from pin AA/2 by turning switch position 6 to OFF. Switch positions 5, 7, 8 should be left in their factory settings (Table 3-3).

Table 3-3: V.35 Transmit Clock Pinout

<i>DIP Switch Position</i>				<i>Pin Function & Location</i>
5	6	7	8	TC
OFF*	ON*	OFF*	ON*	AA/2*
	OFF			---

Note: Extreme care should be taken to re-align the interface card when inserting it in the UTA220.

CENTRAL OFFICE SWITCH

The UTA220 is designed for easy programming and operation. Using the front panel LCD display and push-button, the UTA220 can be set up for one of the following central-office switches:

- National ISDN-1
- NTI DMS100, BCS-30, BCS-31/32 or
- AT&T 5ESS, 5E4.2, 5E5, 5E6

Programming the UTA220 requires the following information, which is provided by the telephone company:

- Switch type and version
- Terminal Endpoint Identifiers (TEI)
- Service Profile Identifiers (SPID)
- Directory Number (DN) strings (only supplied with National ISDN and NTI DMS100 lines)

This information identifies the UTA220 to the telephone company. Until the UTA220 has been programmed with this information, the telephone company will not recognize the terminal adapter, and calls cannot be placed.

SETUP

Caution: For proper operation of the UTA220, enter the following options exactly as given by the telephone company.

Setup Step 1

Plug the UTA220 into the power outlet. Turn the power switch on the rear panel ON.

Note: Do not connect the UTA220 to the ISDN line until the UTA220 has been properly programmed.

The LCD displays the banner:
ISDN TERMINAL ADAPTER

Setup Step 2

To program the UTA220, perform the steps in Table 3-4. Use the HOME key any time to back up to correct a mistake.

Table 3-4: Programming Steps

<i>STEP</i>	<i>LCD SCREEN DISPLAY</i>	<i>ACTION</i>		
1	ISDN TERMINAL ADAPTER	Press YES or NO key to advance to the next display.		
2	DIAL/HANGUP OPTIONS?	Press NO.		
3	STATUS DISPLAYS?	Press NO.		
4	CONFIGURATION OPTIONS?	Press YES.		
5	SWITCH CONFIG OPTIONS?	Press YES.		
6	SWITCH TYPE OPTION?	Press YES.		
7	NATIONAL ISDN CHANGE?	National ISDN	NTI DMS100	AT&T 5ESS
		Press NO. Continue programming with STEP 9.	Press YES until "NTI DMS100" is displayed, then press NO.	Press YES until "AT&T 5ESS" is displayed, then press NO.
8	WILL DESTROY ALL NET OPTS, CONT?	Press YES. The display momentarily shows 'RESETTING SWITCH OPTIONS' while it changes the switch options to the default values for the selected switch type.		
9	SWITCH TYPE OPTION?	Press NO.		
10	SWITCH VERSION OPTION?	National ISDN	NTI DMS100	AT&T 5ESS
		Press No. Continue programming with STEP 13.	Press YES.	Press YES.
11	<default version> VERSION. CHANGE?	This screen displays the default version for the switch type you selected above. Press YES until the correct version is displayed. Press NO to select the switch version choice. (refer to Chapter 4, ISDN Switches section.)		
12	SWITCH VERSION OPTION?	Press NO.		
13	D-CHANNEL OPTIONS?	Press YES.		

Table 3-4: Programming Steps (Continued)

<i>STEP</i>	<i>LCD SCREEN DISPLAY</i>	<i>ACTION</i>	
14	D-CHANNEL PROV OPTIONS?	Press NO.	
15	D-CHANNEL LAPD OPTIONS?	Press YES.	
16	CURRENT PORT = 1 CHANGE?	Press NO.	
17	P1:X.25 TEI=DIS CHANGE?	If D-channel X.25 is desired, follow the selections described in Step 18 for entering a TEI value. For AT&T 5ESS switches, this setting is normally "AUTO". For NT DMS-100 and NT-1 switches, a manual TEI (0-63) value is normally required. If D-Channel X.25 is not desired, press NO.	
18	P1: DATA TEI = AUTO. CHANGE?	There are three classes of possible DATA TEI value settings: "AUTO", "DIS", and 0-63. Use one of the setup cases below that matches your TEI value.	
		"AUTO" TEI:	Press NO to advance to the next menu. The "AUTO" value is used to select a dynamically assigned TEI. "AUTO" is the factory default and should be correct in most situations.
		"DIS" TEI:	Press YES to scroll through the supported TEI values until "DIS" is displayed. Press NO to advance to the next menu.
		0-63 (UTA220k):	Press YES twice "00" is displayed. Press the keypad number keys until the entire number has been keyed in. If the number is one digit long, press the appropriate number key, then press ENTER.
		0-63 (UTA220):	Press YES until the first digit of the value is displayed then press NO to accept the digit and advance to the next digit. Continue to do this until the entire number has been keyed in. If the number is one digit long, enter the first digit, then press YES until the character "_" is displayed to the right of the digit. Press NO to enter the TEI number.
		Note: If only one circuit-switched call at a time is necessary and the call will always be placed to or from the same Directory Number, then only one of the TEIs should be enabled and the other disabled.	
19	P1: _____ SPID. CHANGE?	- The SPID only needs to be configured if the TEI is not disabled. - Enter the SPID string in the same manner as the TEI. The SPID value can be up to 20 digits in length.	
20	P1: _____ DN. CHANGE?	- The Directory Number (DN) only needs to be configured if the TEI is not disabled. The DN is optional for AT&T 5ESS switch types. - Enter the DN string in the same manner as the TEIs and SPIDs. Like the SPID strings, the DN strings can be up to 20 digits in length.	
21	CURRENT PORT = 1 CHANGE?	Press 2.	
22	P2: X.25 TEI=DIS CHANGE?	Press NO	
23	P2: DATA TEI = AUTO CHANGE?	Same as Step 18.	
24	P2: _____ SPID. CHANGE?	- The SPID only needs to be configured if the TEI is not disabled. - Enter the SPID string in the same manner as the TEI. The SPID value can be up to 20 digits in length.	
25	P2: _____ DN. CHANGE?	- The Directory Number (DN) only needs to be configured if the TEI is not disabled. The DN is optional for AT&T 5ESS switch types. - Enter the DN string in the same manner as the TEIs and SPIDs. Like the SPID strings, the DN strings can be up to 20 digits in length.	
26		If you have a two-port unit, then continue with STEP 37.	

Table 3-4: Programming Steps (Continued)

<i>STEP</i>	<i>LCD SCREEN DISPLAY</i>	<i>ACTION</i>
27	CURRENT PORT = 2 CHANGE?	Press 3.
28	P3: X.25 TEI=DIS CHANGE?	Press NO
29	P3: DATA TEI = DIS. CHANGE?	Same as Step 18.
30	P3: _____ SPID. CHANGE?	- The SPID only needs to be configured if the TEI is not disabled. - Enter the SPID string in the same manner as the TEI. The SPID value can be up to 20 digits in length.
31	P3: _____ DN. CHANGE?	- The Directory Number (DN) only needs to be configured if the TEI is not disabled. The DN is optional for AT&T 5ESS switch types. - Enter the DN string in the same manner as the TEIs and SPIDs. Like the SPID strings, the DN strings can be up to 20 digits in length.
32	CURRENT PORT = 3 CHANGE?	Press 4.
33	P4: X.25 TEI=DIS CHANGE?	Press NO
34	P4: TEI = DIS. CHANGE?	Same as Step 18.
35	P4: _____ SPID. CHANGE?	- The SPID only needs to be configured if the TEI is not disabled. - Enter the SPID string in the same manner as the TEI. The SPID value can be up to 20 digits in length.
36	P4: _____ DN. CHANGE?	- The Directory Number (DN) only needs to be configured if the TEI is not disabled. The DN is optional for AT&T 5ESS switch types. - Enter the DN string in the same manner as the TEIs and SPIDs. Like the SPID strings, the DN strings can be up to 20 digits in length.
37	CURRENT PORT = 4 CHANGE?	Press HOME.
38	D-CHANNEL LAPD OPTIONS?	Press NO.
39	D-CHANNEL PROVISION X.25 OPTIONS?	Press NO.
40	D-CHANNEL OPTIONS?	Press NO.
41	MULTIFRAME SYNC = _____ CHANGE?	Press NO.
42	FRONT PANEL LOCK OPTION?	Press NO.
43	SAVE SWITCH AND GLOBL TO NONVOL?	Press YES to save the switch configuration. The display momentarily shows "SAVING" while it is saving the options to nonvolatile memory.
44	RESTART NETWORK LINK?	Plug telephone cable into ISDN U jack on rear of unit, then press YES.

Note: Some LCD screen displays require different actions depending on the telephone company's switch type.

Setup Step 3

Insert the ISDN line into the ISDN U jack located on the rear panel.

Chapter 4

ISDN

This chapter provides information to help you set up and use your Terminal Adaptor (TA). For users unfamiliar with TAs, some fundamental Integrated Services Digital Network (ISDN) concepts are presented first. If you are already familiar with ISDN you may skip over this section, but the ISDN Switches and the ISDN Addresses and Identifiers sections contain information pertinent to the switch configuration of the TA and should be reviewed.

ISDN BASICS

ISDN is a global system that provides a variety of high-speed digital telecommunication services including voice, data, images, and video, integrated on one network. As ISDN evolves it will provide the same types of services as the existing analog networks (voice and low-speed data), plus new services made possible by recent advances in computers and digital data communications.

ISDN is based on standards that define the interfaces between the network and the equipment connected to it. This standardization permits communication between ISDN systems and equipment manufactured by different vendors world wide.

ISDN Standards

ISDN standards are set by the International Consultative Committee for Telegraph and Telephone (CCITT), an organization that establishes communications recommendations under the auspices of the United Nations.

Because ISDN technology advances faster than the CCITT can establish standards, a number of de-facto standards have been developed by manufacturers of telephone equipment. While these set the precedence for CCITT standards eventually agreed to, there are enough differences that those who set up ISDN equipment (such as TAs) must be aware of them.

National ISDN

The U.S.A. and Canada have an ISDN standard for North America called National ISDN. The first version of this standard, National ISDN One (NI-1), is being adopted by equipment manufacturers and network providers. When fully deployed, NI-1 will make understanding and configuring ISDN equipment easier and more efficient.

Basic Rate Interface

Several types of ISDN network services are available. The most common is Basic Rate Interface (BRI). BRI provides two B-channels (bearer channels) and one D-channel (used to place and release calls on the network).

B-channels, which operate at 64 kbps full-duplex, carry end-to-end data between network terminals. B-channels can be either circuit-switched (dial-up), allowing each call to be placed to different endpoints, or permanently connected (nailed) to a single endpoint. In some applications, B-channels can also be used to carry packet-switched data, where each frame of data can dynamically be sent to different network users. The TA does not support packet-switching on a B-channel.

The D-channel is primarily a control channel between the network and the terminal device (such as a TA).

Terminal Adapters

Terminal adapters attach standard data terminals and voice telephones to the ISDN, allowing them to send and receive calls and data via the ISDN. Some terminal adapters (but *not* the UTA220) support voice service, allowing a standard (analog) telephone set to be connected to the ISDN.

The UTA220 operates on the ISDN BRI. It provides circuit-switched data communications using circuit-switched B-channels for data, and uses the D-channel for signaling only.

ISDN Basic Rate Interface Points

BRI points and the associated devices found on customer premises are shown in Figure 4-1. The boxes in the diagram represent devices, and the vertical lines represent defined interface points. There are two types of DTEs represented in the diagram:

- **TE1** devices have a built in ISDN interface.
- **TE2** devices do not have a built in ISDN interface, and require a TA to interface with the ISDN.

The data terminal devices (DTEs) are located in the left of the diagram. The TA is connected to the ISDN at the U interface. An NT1 device is not required; the NT1 function is built into the UTA220.

ISDN Service

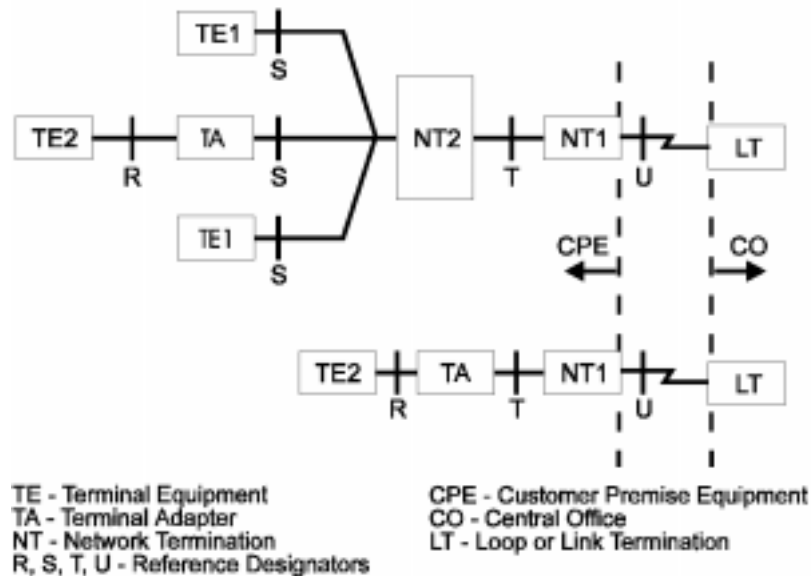


Figure 4-1. ISDN Devices and Reference Points

To use the ISDN, you must subscribe to a network service. The available options depend on the carrier (telephone company), but some generally available options are:

- Types of calls supported (voice, data, packetized data)
- Circuit-switched (dial-up) or permanent (nailed) lines
- One or two B-channels
- A telephone number for each B-channel, or one number for both channels

ISDN SWITCHES

The device controlling the ISDN line is the central office switch. It is usually owned by the network provider (e.g., the telephone company). Each switch has its own format and procedures for the D-channel protocols used to establish and control calls. (More on D-channel protocols later.) There are three main ISDN switch standards used in North America: AT&T, Northern Telecom (NTI), and NI-1. Their basic functions are similar, but each has its own set of special features and parameters.

Before using the TA, you must configure the unit for a switch type. The TA will operate with AT&T, Northern Telecom (NT), or any switch running National ISDN-1. Central Office (CO) switches can be loaded with different software versions. The TA supports AT&T switches running versions 5E4.2 and later, and NT switches running versions BCS29 and later.

AT&T switches define Single Term and Multiple Term modes of operation for the TA. AT&T switches support Point-to-Point, Multi-Point services and NI operation depending on the software version loaded in the switch. The switch can also operate in custom mode to support modes other than the default. Table 4-1 shows AT&T switch versions, supported modes, and default modes.

Table 4-1: AT&T Switch Modes

<i>Switch Version</i>	<i>Default Mode</i>	<i>Custom Mode</i>
5E4.2	Point-to-Point	None
5E5	Multi-Point	Point-to-Point
5E6	Multi-Point	Point-to-Point
5E7	Multi-Point	Point-to-Point
5E8	NI1	Point-to-Point and Multi-Point
5E9	NI1	Point-to-Point and Multi-Point

When you set the TA for Point-To-Point switch operation, it runs in the single term mode and only one TA may be attached. Because only one TA is attached, Service Profile Identifiers (SPIDs) and Directory Numbers (DNs) are not needed to identify the TA. This is called non-initializing mode. This mode functions on a multi-point switch; however, the switch requires the TA to present its DN when it makes calls to distinguish it from other TAs on the line. Thus the DN must be properly configured in the TA in this instance.

Normally on a multi-point line, you configure the TA for multi-point operation. This causes the TA to run in the multi-terminal-initializing mode; SPID numbers are required. To configure the TA for NI1 operation, select NI1 as the switch type.

Note: *If you are using BONDING with the secondary call port, the DN must be entered so that it can be provided to the remote TA.*

NT switches support three Protocol Version Control Issue Codes (PVCICs), depending on the software version loaded in the switch. Refer to Table 4-2.

Table 4-2: Northern Telecom Switch Modes

Switch Version	Default Mode	Other Modes
BCS29	PVCIC=0	None
BCS30	PVCIC=0	None
BCS31	PVCIC=1	PVCIC=0
BCS32	PVCIC=1	PVCIC=0
BCS33	PVCIC=1	PVCIC=0
BCS34	PVCIC=2	PVCIC=0, 1
BCS35	PVCIC=2	PVCIC=0, 1
BCS36	PVCIC=2	PVCIC=0, 1

Set the Switch Version option on the TA according to Table 4-3.

Table 4-3: UTA220 Switch Settings

PVCIC	TA Switch Type	TA Switch Version
0	NTI DMS100	DMS100 PVC-IC0
1	NTI DMS100	DMS100 PVC-IC1
2	National ISDN	N/A

ISDN ADDRESSES AND IDENTIFIERS

The TA contains several stored numbers—SPID, DN, and TEI (Terminal Endpoint Identifier)—used by the network to identify the TA.

Each logical ISDN link has an SPID that defines the profile of services and parameters used by the terminal. The SPID is selected by the network carrier and must be configured into the TA before it can be used. The SPID is a string of characters or digits, depending on the switch.

The DN is part of the service profile and is analogous to the telephone number on the standard telephone network. The DN identifies incoming calls. On some switches (NTI and NI-1), the DN must also be configured into the TA; on other switches (AT&T), the DN is not required.

ISDN

The TEI is used to identify the terminal device. In most applications, the network switch automatically assigns a TEI to the TA when the connection is established; otherwise, you must enter the TEI before connecting to the network.

If your switch permits it, the UTA220 allows you to use one SPID and one TEI on simultaneous calls. AT&T switches allow two calls per SPID. With this support you can configure two or more ports to share a DN.

Note: To use this feature, configure each port with the same SPID and DN, enable one port's TEI, and disable the TEI on the remaining port(s).

The UTA220 also allows you to use multiple DNs on the same SPID if your switch supports it. NT switches support up to four DNs per SPID.

Note: To use this feature, configure both ports with the same SPID and different DNs, then enable one port's TEI and disable the other's.

ISDN CHANNELS

As previously mentioned, there are three channels available on the ISDN Basic Rate Interface: two 64 Kbps B-channels and one 16 Kbps D-channel. The B-channels are the primary means of carrying user information, whether voice or data. Voice data must be sent on a B-channel. The B-channel also provides the most efficient path for data communications, since it has four times the data capacity of the D-channel.

The D-channel is the control channel between the TA and the network switch. It is used mainly for exchanging signaling messages with the switch, to perform functions like setting up and releasing calls.

Note: The UTA220 supports only data calls.

B-Channel Data Service

When a B-channel data call is placed, the switch allocates a free B-channel between the TA and the remote DCE (e.g., the TA at the other end of the ISDN link). This B-channel acts like a bit-pipe between two network users, operating synchronously at 64 Kbps. In most cases, the ISDN network does not know about the format of the data sent on the B-channels.

There are several ways to use the B-channel to pass data. In the "clear channel" mode, data from the DTE goes directly onto the B-channel. However, to use this mode, your DTE must also operate synchronously at 56 or 64 kbps.

B-Channel Data Protocols

To allow greater flexibility for your DTE, there are three rate adaption protocols available for use on the B-channel: TLink, V.120, and Bonding. These protocols allow your DTE to operate both synchronously and asynchronously, and at a different speed than the B-channel.

- **TLink** is a Northern Telecom proprietary rate adaption protocol. It supports synchronous and asynchronous rate adaption at a variety of speeds.
- **V.120** is a CCITT protocol that supports synchronous and asynchronous rate adaption, and also provides link-layer error control. Although errors on a digital network are more rare than on an analog telephone line, they are possible. V.120 provides an end-to-end protocol for detecting and correcting any such errors. V.120 also performs buffering and can thus support flow control to and from the DTE.
- **BONDING** is a new protocol standard from the Bandwidth ON Demand INteroperability Group. It combines the bandwidth of several 56 kbps or 64 kbps channels, and can bond from 2 to 31 channels at once, if the channels are available. The high speed data, which must be a multiple of 56 kbps or 64 kbps, comes in on the DTE interface and is split to the various channels. On the opposite end the data is recombined into the original data stream and sent to the DTE interface.

To use a rate adaption protocol, the DCEs (e.g., TAs) at both ends of the link must support it and must be configured to use it. In general, since it is more flexible and supports error control, V.120 should be used for most applications, and thus it is the default protocol in the UTA220.

D-Channel Signaling Protocols

The D-channel conveys signaling information and, optionally, packet-switched data, to the network switch. This data is passed in message blocks defined by the ISDN signaling protocols. These protocols vary somewhat depending on the network switch installed at the telephone company's central office. As mentioned earlier, several de-facto protocol standards, are used for the D-channel signaling between the TA and the switch.

The TA signaling protocols function on three protocol layers. Each of these layers is described below.

Layer One

The **physical** layer includes components and interfaces needed to provide a physical communications path. All ISDN switches use the same physical layer protocols for the Basic Rate Interface, which are based on CCITT Recommendation I.430.

Layer Two

The **data link** layer ensures error-free transmission of D-channel messages between the terminal and the network switch. The link layer in effect provides a virtual error-free connection for the next higher protocol layer to use. The LAPD protocol is the error detection and correction mechanism for layer two. Layer two protocols are based on CCITT recommendation Q.921, and are almost identical. Minor differences do exist, however, primarily in how the protocols respond to certain very unlikely error conditions.

Layer Three

The **network** layer consists of signaling messages passed between the terminal and the network, using the data link layer. These messages communicate call setup (dialing) and release messages from the TA, call progress information from the network, and messages concerning special call-related features. Layer three of the D-channel can also be used to exchange packetized data using X.25, if the TA and the switch are set up to allow it.

All layer three protocols are based on CCITT Recommendation Q.931. However, the protocol used depends on the brand and version of the network switch. There are differences in the exact procedures used by each switch to set up and release calls. In addition, because switches are manufactured by competing companies, each switch offers a different set of extra features. These features are called supplementary services.

Unfortunately, each vendor implements these features differently. Also, there are different versions of each of the switches, each of which implements a different set of features. As a result, you must configure your TA for the particular switch type and version so that the TA can use the correct signaling protocol for that switch. *The switch type and version are two of the most important network parameters in the TA.*

Chapter 5 LCD Operation

The UTA220 has an easy-to-use front panel with a Liquid Crystal Display (LCD). You can monitor TA status, perform operations, and program the TA without using a terminal or computer.

LCD MENUS

The LCD menus are arranged in multiple levels. Menu headers may lead to more menu headers, options screens or action screens. When the NO key is pressed while a menu header is displayed, the LCD advances to the next menu header. When the YES key is pressed, the menu descends one level in the menus.

Main Menus

The Main Menu headers are:

- DIAL/HANGUP OPTIONS? - to dial manually or to dial previously stored telephone numbers and to hang up.
- STATUS DISPLAYS? - to view the status of each data port call.
- CONFIGURATIONS OPTIONS? - to program switch and port options.
- CONFIGURATION LOAD/SAVE OPTIONS? - to save the switch and port configuration settings or to retrieve the factory settings or stored settings.
- DIAGNOSTIC OPTIONS? - to run tests, restart the network and view product information.

Submenus

A menu includes menu headers, action screens, or option screens. Action screens let you perform an action, such as dialing. Option screens show settings and allow changes. Options may be set from multiple choice lists or by entering data.

LCD OPERATION

Menu Traversal

After power-up, the LCD displays the sign-on banner: ISDN TERMINAL ADAPTER. To enter the Main Menu level, press the YES or NO key. Whenever the LCD is on the Main Menu level, the sign-on banner can be displayed by pressing HOME.

In general, pressing NO moves the display vertically down a column (Table 5-1) and pressing YES moves the display horizontally across the columns (one level deeper).

LCD Operation

At the last Main Menu screen, pressing NO displays the first Main Menu screen. At the last screen at any other level, pressing NO moves the display up one level.

The deepest screen (rightmost, in the table) typically changes an option or performs an action. Pressing YES at this screen begins the change process on the option, or performs an action.

Table 5-1. Menu Option Summary

Main Level	Level 1	Level 2	Level 3	Level 4	Description
ISDN TERMINAL ADAPTER					
DIAL/HANGUP OPTIONS?	Current Port: n				
	Pn: ENTER NUMBER TO DIAL?	Pn:----- ENTER#. CHANGE			n=current port. Note 2 Pressing Call/Hangup from anywhere in menu advances to ENTER NUMBER screen
	Pn:REDIAL? x				n=current port x=last number dialed. Note 2
	Pn:DIAL STORED NUM- BER?	Pn:DIAL TEL #t? s			n=current port s =stored number t=0-9 storage index. Note 2
	Pn:VIEW/ CHANGE STORED TEL NUM?	Pn:x. Tel #t. CHANGE?			n=current port x= 13 digits of the phone num- ber. Phone number can contain 40 digits, scrolled 1 digit / sec. t=0-9 storage index. Note 3
	Pn: HANGUP?				n=current port. Note 2
STATUS DISPLAYS?	Current Port= n. Change?				n=current port CALL STATUS SCREEN s =IDLE, SETTING UP, DIALING, PROCEEDING, RINGING, ECHO CANCELING ONLINE, INCOMING CALL, ANSWERING, DISCONNECTING, BUSY, DISCONNECTED
	OR Pn:ONLINE prmd				p=CLEAR, BOND, T-LINK, V.120 m=SYNC-1, SYNC-2, ASYNC r=300, 1200, 2400, 4800, 9600, 1k, 38k, 48k, 56k, 57k, 64k, 112k, 128k d=8E, 8O, 8N, 7E, 7O, 7N, 7M This screen appears once a call is connected. Note 4
CONFIGURA- TION OPTIONS?	SWITCH CONFIG OPTIONS?	SWITCH TYPE OPTION?	x.CHANGE?		x=NATIONAL ISDN, NT DMS100, AT&T 5ESS SELECTED
			WILL DESTROY NET OPTS, CONT?	RESETTING SWITCH OP- TIONS	The query appears only if the network type has changed.
		SWITCH VERSION OPTION?	x VERSION. CHANGE?		x=5ESS MULTIPPOINT, 5ESS PT TO PT, (if switch type=ATT) x=DMS100 PVC IC-0, DMS100 PVC IC-1 (if switch type = NT)
Navigation button directions: ➔ YES ↓ NO ← HOME					

Table 5-1. Menu Option Summary (Continued)

Main Level	Level 1	Level 2	Level 3	Level 4	Description	
	SWITCH CONFIG OPTIONS? (cont.)	B-CHANNEL OPTIONS?	B-CHANNEL PROV OPTIONS?	B1 = x CHANGE?	x= NONE, PERMANENT	
				B2 = x CHANGE?	x= NONE, PERMANENT	
		D-CHANNEL OPTIONS?	D-CHANNEL PROV OPTIONS?	D-CHAN PROVISION x. CHANGE?	x= NONE, X.25	
			D-CHANNEL LAPD OPTIONS?	CURRENT PORT = n. CHANGE?	n=1 or 2	
				Pn:X.25 TEI = x. CHANGE?	n=CURRENT PORT x= 0-63, DIS, AUTO	
				Pn:DATA TEI =x CHANGE?	n=CURRENT PORT x= 0-63, DIS, AUTO	
				Pn:x SPID. CHANGE?	n=CURRENT PORT x=SPID, up to 20 digits	
				Pn: x DN. CHANGE?	n=CURRENT PORT x=DN, up to 20 digits	
			D-CHAN PROVISION X.25 OPTIONS?	RX WINDOW SIZE=x. CHANGE?	x=1 - 7	
				TX WINDOW SIZE=x. CHANGE?	x=1 - 7	
				RX PACKET SIZE=x. CHANGE?	x=128, 256	
				TX PACKET SIZE=x. CHANGE?	x=128, 256	
				PVC NUMBER =x CHANGE?	x=0 - 255	
				INC LOGICAL CHAN NUM=x. CHANGE?	x=0 - 255	
				2-WAY LOG CHAN NUM=x. CHANGE?	x=0 - 255	
				OUT LOGICAL CHAN NUM=x. CHANGE?	x=0 - 255	
				SEQUENCE NUMBER MOD=x. CHANGE?	x=8, 128	
		FRONT PANEL LOCK OPTION?	ENTER PASSWORD ----- CHANGE?			Enter password to gain access to lock option screen.
			FRONT PANEL LCK = x CHANGE?			x= UNLOCKED, OPTIONS, OPT/ACT
		SAVE SWITCH AND GLOBL TO NONVOL?	SAVING			

Navigation button directions: ➡ YES ⬇ NO ⬅ HOME

LCD Operation

Table 5-1. Menu Option Summary (Continued)

Main Level	Level 1	Level 2	Level 3	Level 4	Description
	PORT CONFIG OPTIONS?	CURRENT PORT=n CHANGE?			n=1 - 2
		Pn:LOAD FROM NONVOL?	Pn:LOAD FROM NONVOL x. CHANGE?	LOADING	n=current port x= 0, 1
		Pn:LOAD FROM FACTORY PROFILE?	Pn:LOAD FACTORY PROF CHANGE? x.	LOADING	n=current port x= 0, 1
		Pn: ANSWER OPTIONS?	Pn:AUTO ANSWER=x CHANGE?		n=current port x= ON, OFF
			Pn: RINGS UNTIL ANS =x. CHANGE?		n=current port x= 0 - 255
		Pn:DTE OPTIONS?	Pn:xxx. CHANGE?		n=current port x= SYNCHRONOUS 1, SYNCHRONOUS 2, ASYNCHRONOUS
			Pn:DTE SPEED =xxx CHANGE?		n=current port n=300, 1200, 2400, 4800, 9600, 19.2k, 38.4k, 48k, 56k, 57.6k, 64k, 112k, 128k
			Pn:WORD LENGTH= x CHANGE?		n=current port x= 7, 8
			Pn:PARITY=x. CHANGE?		n=current port x= NONE, EVEN, ODD, MARK
			Pn: CHARACTER ECHO = xxx. CHANGE?		n=current port x= OFF, ON
			Pn: X25XPAR=x. CHANGE?		n=current port x=YES, NO
			Pn: DTE GUARD= x. CHANGE?		n=current port x= OFF, ON
		Pn: DTE CMD AND MESSAGE OPTIONS?	Pn:DIALER CMDs = x. CHANGE?		n=current port. for ports 1-2: x=NONE, AT, PAD, PAD D, V25 BCS, V25 HDLC for ports 3-4: x=NONE, AT, PAD, PAD D, EIA-366
			Pn: AT OPTIONS?	Pn: STATUS DISPLAY CHANGE? x.	n=current port x=ON, OFF, ANS OFF
				Pn:MSG FORMAT= x. CHANGE?	n=current port x=VERBOSE, NUMERIC
				Pn:RESULT CODES OPT=x. CHANGE?	n=current port x= OFF, ON
				Pn:CONNECT MSGS = x. CHANGE?	n=current port x= BASIC, ALL, BUSY
Navigation button directions: ➔ YES ↓ NO ← HOME					

Table 5-1. Menu Option Summary (Continued)

Main Level	Level 1	Level 2	Level 3	Level 4	Description	
CONFIGURATION OPTIONS? (cont.)	PORT CONFIG OPTIONS? ? (cont.)	Pn: DTE CMD AND MESSAGE OPTIONS? (cont.)	Pn: AT OPTIONS? (cont.)	Pn: ESCAPE CHAR=x. CHANGE?	n=current port x= 0 - 127; 128-255 disabled	
				Pn:CR CHAR=x. CHANGE?	n=current port x= 0 - 127	
				Pn:LF CHAR=x. CHANGE?	n=current port x= 0 - 127	
				Pn:BS CHAR=x. CHANGE?	n=current port x= 0 - 127	
				Pn: GUARD TIME=x. CHANGE?	n=current port x= 0 - 255	
				Pn: X.3 PARMS?	Pn:SESSION = s. CHANGE?	n=current port s = 1 - 4
					PnSsR1:PAD RECAL CHAR=x. CHANGE?	n=current port s = current session x= 000 - 126
					PnSsR2:ECHO=x. CHANGE?	n=current port s = current session x= ENABLE, DISABLE
					PnSsR3: DATA FWD CHAR = x. CHANGE?	n=current port s = current session x= 0, 2, 126
					PnSsR4:IDLE TIME DELAY = x. CHG?	n=current port s = current session x= 0-127
					PnSsR5:ANCIL DEV CTL= x. CHANGE?	n=current port s = current session x =NONE, DATA, DATA CMD
					PnSsR6:PAD SERV SIG=x. CHANGE?	n=current port s = current session x= SUPRESS, ALL-PRM, PROMPT, ALL
					PnSsR7:BREAK SIG ACT= x. CHANGE?	n=current port s = current session x= 00 - 37
					PnSsR8: DISCARD = x. CHANGE?	n=current port s = current session x= NORMAL, DISCARD
					PnSsR9:PAD AFTER CR=x. CHANGE?	n=current port s = current session x= 000 - 255
	PnSsR10:LINE FOLDING=x. CHG?	n=current port s = current session x= 000 - 255				
	PnSsR11:PAD DTE SPEED=x.CHG?	n=current port s = current session x= 300, 600, 1200, 2400, 4800, 9600, 19200, 38400				
	PnSsR12:PAD FLOW CTL=x. CHG?	n=current port s = current session x= OFF, ON				
	PnSsR13:LF INS AFTER CR=x. CHG?	n=current port s = current session x= 0 - 7				
Navigation button directions: ➔ YES ⬇ NO ⬅ HOME						

LCD Operation

Table 5-1. Menu Option Summary (Continued)




Main Level	Level 1	Level 2	Level 3	Level 4	Description
				PnSsR14:PAD AFTR LF=x. CHANGE?	n=current port s = current session x= 000 - 255
				PnSsR15: EDITING=x. CHANGE?	n=current port s = current session x= ENABLE, DISABLE
Navigation button directions:  YES  NO  HOME					

Table 5-1. Menu Option Summary (Continued)

Main Level	Level 1	Level 2	Level 3	Level 4	Description	
CONFIGURATION OPTIONS? (cont.)	PORT CONFIG OPTIONS? ? (cont.)	Pn: DTE CMD AND MESSAGE OPTIONS? (cont.)	Pn: X.3 PARMS? (cont.)	PnSsR16:CHAR DEL CHAR=x. CHANGE?	n=current port s = current session x= 000 - 127	
				PnSsR17:LINE DEL CHAR=x. CHANGE?	n=current port s = current session x= 000 - 127	
				PnSsR18:LINE DIS CHAR=x. CHANGE?	n=current port s = current session x= 000 - 127	
				PnSsR19:EDIT SRV SIG =x.CHG?	n=current port s = current session x= NONE, PRINTER, DISPLAY	
				PnSsR20:ECHO MASK=x. CHANGE?	n=current port s = current session x= 000 - 255	
				PnSsR21:PARITY CHECK=x. CHANGE?	n=current port s = current session x= YES, NO	
				PnSsR22:PAGE WAIT = x. CHANGE?	n=current port s = current session x= 000 -255	
			Pn:DTE PIN OPTIONS?	Pn:DTR PIN OPT= x. CHANGE?		n=current port x= IGNORE, RCAL ACU, HANG UP, RELOAD, DIAL
				Pn:DSR PIN OPT= x. CHANGE?		n=current port x= ON, NORMAL
				Pn:DCD PIN OPT= x. CHANGE?		n=current port x= ON, NORMAL, DISC OFF
			Pn:CTS PIN OPT= x. CHANGE?		n=current port x= RTS, ON	
			Pn:DCD DROP TIME=x. CHANGE?		n=current port x= 000 -255	
			Pn:DTR DE-TECT TIME=x. CHANGE?		n=current port x= 000 -255	
			Pn:RTS TO CTS TIME=x. CHANGE?		n=current port x= 000 -255	
		Pn: ISDN PROTOCOL OPTIONS?	Pn:PROTO-COL=a. CHANGE?		n=current port a = V.120, X.25, Clear, TLink, Bond	
			Pn:RATE MULTIPLR=a. CHANGE?		n=current port a = 1,2	
			Pn:FLOW CONTROL OPTIONS?	PN:x.FLOW CTL. CHANGE?	n=current port x= NO, UNI CTS, BI RTS/CTS, BI XON/XOFF	
				Pn:RESET FLOW CTL = x. CHANGE?	n=current port x= EN, DIS	
	Navigation button directions: ➔ YES ⬇ NO ⬅ HOME					

LCD Operation

Table 5-1. Menu Option Summary (Continued)

Main Level	Level 1	Level 2	Level 3	Level 4	Description		
CONFIGURATION OPTIONS? (cont.)	PORT CONFIG OPTIONS? ? (cont.)	Pn: ISDN PROTOCOL OPTIONS? (cont.)	Pn:V.120 OPTIONS?	Pn:MAX TX FRAME SIZE=x. CHANGE?	n=current port x= 1-260		
				Pn:MAX RX FRAME SIZE=x. CHANGE?	n=current port x= 1-260		
					Pn:WINDOW SIZE = x. CHANGE?	n=current port x= 1-127	
					Pn:T200 TIMER=x. CHANGE?	n=current port x= 1-255	
					Pn:INFO FRM SLCT=x. CHANGE?	n=current port x= I Frame, UI Frame	
					Pn:TLINK OPTIONS?	Pn:x. CHANGE?	n=current port x= ADAPTIVE MODE, FIXED MODE
						Pn:DTR=x. CHANGE?	n=current port x= ASSERT, NORMAL
						Pn:RTS=x. CHANGE?	n=current port x= ASSERT, NORMAL
				Pn:SESSION OPTIONS?	Pn:SESSION =s. CHANGE?		n=current port s = 1 - 4
					PnSs:X.25 OPTIONS?	PnSs:RX WINDOW SIZE=x. CHANGE?	n=current port s = current session x= 0 - 8
						PnSs:TX WINDOW SIZE=x. CHANGE?	n=current port s = current session x= 0 - 8
						PnSs:RX PKT SIZE = x. CHANGE?	n=current port s = current session x= 0, 128, 256, 512, 1024
						PnSs:TX PKT SIZE = x. CHANGE?	n=current port s = current session x= 0, 128, 256, 512, 1024
						PnSs:PVC OPTION=x. CHANGE?	n=current port s = current session x= PVC, NON-PVC
						PnSs: LOGICAL CHN NUM=x. CHANGE?	n=current port s = current session x= 000 - 255
						PnSs:D BIT CONF = x. CHANGE?	n=current port s = current session x= ON, OFF
						PnSs:CUG OPTION=x. CHANGE?	n=current port s = current session x= NONE, BASIC, OUTGOING, BILAT
						PnSs:CUG NAME=x. CHANGE?	n=current port s = current session x= Closed User Group Name
						PnSs:REVERS CHRG OPT=x. CHANGE?	n=current port s = current session x= DIS, EN
			Navigation button directions: ➡ YES ▼ NO ◀ HOME				

Table 5-1. Menu Option Summary (Continued)

Main Level	Level 1	Level 2	Level 3	Level 4	Description	
CONFIGURATION OPTIONS? (cont.)	PORT CONFIG OPTIONS? ? (cont.)	Pn:SESSION OPTIONS? (cont.)	PnSs:X.25 OPTIONS? (cont.)	PnSs:RX THRUPUT=x CHANGE?	n=current port s = current session x= 0, 75, 110, 300, 600, 1200, 2400, 4800, 9600, 19200, 48000, 64000	
				PnSs:TX THRUPUT=x CHANGE?	n=current port s = current session x= 0, 75, 110, 300, 600, 1200, 2400, 4800, 9600, 19200, 48000, 64000	
				x PnSs:NUI. CHANGE?	n=current port s = current session x= NUI, up to 16 digits	
				x PnSs:RPOA. CHANGE?	n=current port s = current session x= RPOA, up to 16 digits	
				Pn Ssx: USER DAT. CHANGE?	n=current port s = current session x= User Data, up to 12 digits	
				PnSs:TRANST DELY=x. CHANGE?	n=current port s = current session x= 00000-65535	
				PnSs:PKT RST/CLR TMR=x. CHANGE?	n=current port s = current session x= 000 - 600	
				PnSs:PKT CALL TMR=x. CHANGE?	n=current port s = current session x= 000 - 600	
				PnSs:AUTO ACCEPT VC=x. CHANGE?	n=current port s = current session x= EN, DIS	
				Pn:CALL SETUP OPTIONS?	Pn: ISDN SPEED=x BPS. CHANGE?	n=current port x=64K, 56K
					Pn: PERSIST DIAL=x. CHANGE?	n=current port x=ENABLED, DISABLED
					Pn: ORIGINATE AS x. CHANGE?	n=current port x= DATA, AUDIO, SPEECH
					Pn:ANS DATA x. CHANGE?	n=current port x= ENABLED, DISABLED
					Pn:ANS AUDIO CHANGE? x.	n=current port x= ENABLED, DISABLED
					Pn:ANS SPEECH CHANGE? x.	n=current port x= ENABLED, DISABLED
					Pn:DIAL CHANGE? x	n=current port x=ENBLOC, OVERLAP
					Pn:ECHO DISABLE TONE= CHANGE? x.	n=current port x= OFF, ON
					Pn:WAIT FOR CONN= x. CHANGE?	n=current port x= 0-255

Navigation button directions: ➡ YES ↓ NO ← HOME

LCD Operation

Table 5-1. Menu Option Summary (Continued)

Main Level	Level 1	Level 2	Level 3	Level 4	Description
		Pn: SAVE TO NONVOL?	Pn:SAVE TO NONVOL x. CHANGE?	SAVING	n=current port x= 0, 1
CONFIGURATION OPTIONS? (cont.)	PORT CONFIG OPTIONS? ? (cont.)	Pn:PWR-UP USER PROF = x. CHANGE?			n=current port x= 0, 1
CONFIG LOAD/SAVE OPTIONS?	LOAD/SAVE SETUP?	SAVE COMPLETE SETUP TO NONVOL?	SAVE SETUP TO NONVOL x. CHANGE?	SAVING	x= 0, 1
		LOAD ALL PORTS FROM NONVOL?	LOAD PORTS FROM NONVOL x. CHANGE?	LOADING	x= 0, 1
		LOAD PORTS FROM FACTORY PROFILE?	LOAD FACTORY PROF x. CHANGE?	LOADING	x= 0, 1
	LOAD/SAVE PORT CONFIG OPTIONS?	CURRENT PORT=n CHANGE?			n=1 - 2
		Pn:SAVE PORT TO NONVOL?	Pn:SAVE TO NONVOL x. CHANGE?	SAVING	n=current port x= 0, 1
		Pn:LOAD PORT FROM NONVOL?	Pn:LOAD FROM NONVOL x. CHANGE?	LOADING	n= current port x= 0, 1
		Pn:LOAD FROM FACTORY PROFILE?	Pn:LOAD FACTORY PROF x. CHANGE?	LOADING	n=current port x= 0, 1
	LOAD/SAVE SWITCH CONFIG OPTIONS?	SAVE SWITCH CFG TO NONVOL?	SAVING		
		LOAD SWITCH CFG FROM FACTORY?	LOADING		
		LOAD SWITCH CFG FROM NONVOL?	LOADING		
DIAGNOSTIC OPTIONS?	GLOBAL TEST?				Note 5
					Note 6
		2B+D LOOPBACK?			Note 7
		TEST IN PROGRESS s			GLOBAL TEST STATUS s = 2B+D LOOPBACK. Note 8
		END TEST?	TEST COMPLETE		
Navigation button directions: ➡ YES ↓ NO ← HOME					

Table 5-1. Menu Option Summary (Continued)

Main Level	Level 1	Level 2	Level 3	Level 4	Description
DIAGNOSTIC OPTIONS? (cont.)	PORT TEST?	CURRENT PORT = n. CHANGE?			Note 9
		Pn: LOCAL LOOPBACK?			Note 10
		Pn: LOCAL TER- MINAL LOOP- BACK?			Note 10
		Pn: DIGITAL LOOPBACK?			Note 10
		Pn: BILATERAL LOOPBACK?			Note 10
		Pn:TEST IN PROG s			n=current port PORT TEST STATUS s = LOCAL LOOPBACK, LOCAL TERMINAL LOOPBK, DIGITAL LOOPBACK, BILATERAL LOOPBACK. Note 11
		END TEST?	TEST COMPLETE		
	DISPLAY STA- TUS SOFT- LOAD?	SOFTLOAD s			s = NOT INITIATED, IN PROGRESS, COMPLETE, FAILED
	RESTART NET- WORK LINK?	RESETTING LINK			The ISDN line is restarted using the save switch setting
FRONT PANEL KEYPAD TEST?	KEYBOARD TEST * TO END OR HOME TO END			For numeric keypad: * TO END displays. For 3-button keypad: HOME TO END displays.	
Navigation button directions: ➡ YES ↓ NO ← HOME					

LCD Operation

Table 5-1. Menu Option Summary (Continued)

Main Level	Level 1	Level 2	Level 3	Level 4	Description
	VIEW PRODUCT INFORMATION	b-s c p			b = board number s = software revision c = checksum p = PASS or FAIL
	VIEW DIAGNOSTIC CODE?	DIAGNOSTIC CODE =c.			c = diagnostic code value to aid in field support.
		CLEAR DIAGNOSTIC CODE VALUE?	CLEARING DIAGNOSTIC CODE		Resets diagnostic code value to 0.
<p>Notes:</p> <ol style="list-style-type: none"> 1. The next screen will be either the ENTER NUMBER TO DIAL? screen or the HANGUP? screen, depending on the call status of the port. If the call status is IDLE, ENTER NUMBER TO DIAL? is displayed; otherwise, HANGUP? is displayed. 2. The LCD advances to the call status screen. 3. VIEW/CHANGE STORED TEL NUM? screen is the last submenu under DIAL/HANGUP OPTS. 4. Pressing YES or NO advances the LCD to the ENTER NUMBER TO DIAL? or the HANGUP? screen (depending on the current status: IDLE: the LCD advances to DIAL?; otherwise the LCD advances to HANGUP?). 5. Answering YES to DIAGNOSTIC OPTIONS? advances the LCD to the PORT TEST? screen if a port test is in progress. Otherwise, the LCD advances to the GLOBAL TEST? screen. 6. Answering YES to GLOBAL TEST?, advances the LCD to the test status screen if a global test is currently in progress. Otherwise, the LCD advances to 2B+D LOOPBACK? 7. Answering YES advances the LCD to the global test status screen. 8. Pressing YES or NO advances the LCD to the END TEST? screen. 9. Answering YES advances the LCD to the test status screen if a port test is currently in progress. Otherwise, the LCD advances to the CURRENT PORT screen. 10. Answering YES advances the LCD to the global test status screen. 11. Pressing YES or NO advances the LCD to the END TEST? screen 					
<p>Navigation button directions: ➔ YES ↓ NO ← HOME</p>					

Chapter 6

V.25 bis Dialer Operation

V.25 bis is an autodialer option used by synchronous DTEs to perform dialing and UTA220 control functions. The UTA220 supports a subset of the CCITT V.25 bis recommendation, primarily intended for the dialing and answering commands for HDLC or BISYNC modes of V.25 bis operation.

SELECTING V.25bis

The V.25 bis option can only be selected using the LCD menu or the AT@P1 command

To select V.25 bis with the LCD, scroll through the menu and select:

- CONFIGURATION OPTIONS?
- PORT CONFIG OPTIONS?
- DTE CMD AND MSG OPTIONS?
- DIALER CMDS = V.25 BSC for BISYNC mode *or*
DIALER CMDS = V.25 HDLC for HDLC mode

To select V.25 bis with the AT@P1 command, enter

- AT@P1 = VB for V.25 bis BISYNC mode *or*
AT@P1 = VH for V.25 bis HDLC mode.

The DTR pin is used to activate the V.25 bis dialer. When the DTR pin goes high, the dialer command setting is used to start the appropriate V.25 bis mode. When changing between V.25 mode settings, drop and raise DTR to activate the new V.25 bis dialer mode.

You can select the speed of the dialer by changing the DTE SPEED option. When you select V.25 bis dialer operation, the DTE SPEED is used to configure the dialer port speed.

OPERATION IN V.25 bis MODE

When the V.25 bis option is enabled, most UTA220 options still apply. Selecting V.25 bis forces the UTA220 into synchronous communications mode (regardless of the synchronous mode option). Only the DCD pin option setting applies when V.25 bis is enabled and the UTA220 is off-line.

V.25 bis MESSAGE FRAMES

The CCITT V.25 bis recommendation describes several message framing formats, including Async, BISYNC, and HDLC (bit-oriented). The UTA220 supports the HDLC and BISYNC modes. The ASCII (IA5) character set is used; the EBCDIC character set is not supported.

V.25 bis Dialer Operation

In HDLC operation mode, V.25 bis command and response messages are contained in standard HDLC Unnumbered Information (UI) frames (Figure 6-1). Each field consists of one or more eight bit octets. The eighth bit (parity bit) of each octet in the Message field is ignored by the UTA220.

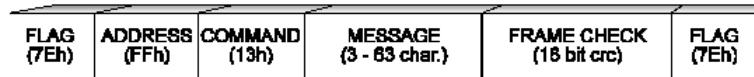


Figure 6-1. HDLC Frame for V.25 bis Messages

In BISYNC mode of operation, all V.25 bis commands and response messages are contained in frames (Figure 6-2).

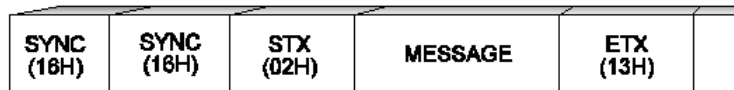


Figure 6-2. BISYNC Frame for V.25 bis Messages

The message field in the frame is composed of 7-bit IA5 characters with the eighth bit set for odd parity. If the HDLC or BISYNC frames are improperly formatted, the frames are ignored.

For more information on V.25 bis formatting and protocol procedures, refer to the CCITT V.25 bis recommendation.

DTE INTERFACE PINS

The UTA220 supports V.35 and EIA-232 interfaces to the DTE for V.25 bis dialing. The function of some pins on the EIA-232 interface is different than in other synchronous modes.

DTR Pin Operation

For the UTA220 to accept V.25 bis commands, the DTE must hold the DTR signal high. When configured for V.25 bis dialing, the DTR pin option setting does not apply because the V.25 bis specification explicitly defines how the dialer will respond to changes in DTR.

DCD Pin Operation

The default operation of the V.25 bis dialer asserts the DCD pin when DTR is high (DCD follows DTR). Some devices may require DCD to be low until the connection is established. For those devices, the UTA220 can be configured to only raise DCD upon connection by setting the DCD pin option to NORMAL. The DCD pin option setting of ON is the default for CCITT V.25 bis operation.

CTS Pin Operation

The UTA220 asserts the CTS pin when DTR is high (CTS follows DTR), except that CTS goes low during the connect sequence.

DSR Pin Operation

The UTA220 holds the DSR pin low until a connection is established.

COMMAND PROCEDURES

When the UTA220 is in V.25 bis command mode, it awaits the receipt of a V.25 bis command from the DTE. Each command must be contained in a separate frame. The UTA220 also sends indications to the DTE to advise it of call status.

Commands may be upper or lower case. Responses and indications from the UTA220 are always uppercase. Commands cannot contain leading or embedded spaces or other characters, but some commands allow clarity characters in the parameter string that follows the command.

Each command message consists of a three octet command code and a 0 to 60 octet parameter field (depending on the command). The UTA220 parses the command, returns a response message, and then executes the command.

COMMANDS

Commands are messages sent by the DTE to the UTA220 to cause it to perform a given operation. The commands are listed on the following pages.

Dial Command: CRN xx..x

The CRN (Dial) command contains a parameter field of one to 40 characters (excluding clarity characters) specifying the number to dial and any dial modifiers. Clarity characters, which are ignored by the UTA220, consist of spaces, dashes, parenthesis, and periods. Valid dial characters and modifiers are shown in Table 6-1.

Table 6-1: V.25 bis Dial Parameters

Character	Function
0-9	Dial digits
* and #	Dial digits
Space, dash, parenthesis, and period	Clarity characters

V.25 bis Dialer Operation

After dialing, the UTA220 attempts to establish a synchronous connection with the remote UTA220. As in other synchronous modes, flow control and buffering are not used when V.25 bis is enabled. When the call begins the connection sequence, the UTA220 sends a Call Connect Indication (CNX) message. Upon connection, the UTA220 raises the DSR pin and enters the on-line data mode.

Examples of valid dial commands are:

CRN 12055550123
CRN 1 (205) 555-0123
CRN 9 1-205-555-0123

Responses to the dial command are:

VAL
INVCU
INVMS
INVPS
INVPV
CFI
CFIDT
CFIET
CFIRT
CFIAB

Refer to Table 2 for a description of these response messages.

Connect Incoming Calls: CIC

This command forces the UTA220 to answer an incoming call if the port on which the call is received is configured for manual answer (the auto-answer option is set to off). No parameters are allowed. The DTE typically issues this command after receiving an INC indication from the UTA220.

Responses to the CIC command are:

VAL
INV
INVMS
INVPS

INDICATION MESSAGES

Indication messages are unsolicited messages sent by the UTA220 to indicate a special condition, such as an incoming call. These messages are described below.

Call Connect Indication: CNX

The UTA220 sends this message to the DTE to indicate that an incoming or outgoing call is physically connected end-to-end. The call connection sequence is then started. The DTE should not begin sending data until the call connection sequence is completed, which the UTA220 indicates by raising the DSR pin.

Incoming Call Indication: INC

Upon receiving an incoming call, the UTA220 sends the DTE an Incoming Call Indication (INC). Only one indication is given per call. If the auto-answer option is on, the UTA220 will answer the call after the number of rings designated by the S0 command.

Response Messages

A response message is sent by the UTA220 immediately after it receives a V.25 bis command message. Response messages are shown in Table 6-2.

Table 6-2: Response Messages

Character	Function
VAL	Valid Command.
INV	Invalid Command. Command is invalid or inappropriate.
INVCU	Command Unknown. Transmission error (parity, framing) occurred.
INVMS	Invalid Message Syntax. Command is too long; command contains invalid characters.
INVPS	Invalid Parameter Syntax. Wrong number of parameters; parameter contains invalid character or too many characters.
INVPV	Invalid Parameter Value. Parameter is out of range or is null.
CFIAB	Call Failure, Call Aborted.
CFICB	Call Failure, Local DCE busy.
CFIDT	Call Failure, No Dial Tone.
CFIET	Call Failure, Busy.
CFINT	Call Failure, No Answer Tone.
CFIRT	Call Failure, Connect Time-out.
CFI	Call Failure, Reason Unknown.

Chapter 7 EIA-366 Dialer Operation

The UTA220 implements the EIA-366 dialer in accordance with the EIA Standard RS-366 specification.

CONFIGURATION

The upper two ports of the UTA220 are configured as EIA-366 dialer ports. In this configuration, the lower two ports function as the data ports for the dialer ports. The EIA-366 dialer ports are dedicated to the data ports as follows:

- Dialer port 3 is dedicated to data port 1
- Dialer port 4 is dedicated to data port 2

OPERATION

Calls are initiated through the parallel dialer port interface (the upper two ports).

The DTE connects to the dialer port by the DB-25 connector. Connector functions are shown in Table 7-1.

Note: If an EIA-366A device is to be connected to a port, refer to EIA-366A Requirements section in Appendix D.

Table 7-1: Dial Connector Functions

Pin	Function
1	Frame Ground
2	Digit Present (DPR)
3	Abandon Call and Retry (ACR)
4	Call Request (CRQ)
5	Present Next Digit (PND)
6	Power Indication (PWI)
7	Signal Ground
13	Distant Station Connected (DSC)
14	Digit Lead 1 (NB1)
15	Digit Lead 2 (NB2)
16	Digit Lead 3 (NB4)
17	Digit Lead 4 (NB8)
22	Data Line Occupied (DLO)

INTERFACE SIGNAL DEFINITIONS

Power Indication (PWI)

PWI is supplied by the dialer to indicate the dialer has power.

Call Request (CRQ)

CRQ is supplied by the DTE to request the dialer to initiate a call. The on condition must be maintained during call origination. If CRQ is turned off before DSC is turned on, the call is aborted. CRQ should not be turned on if DLO is on. DLO indicates that the data port is in use and a call cannot be initiated.

Data Line Occupied (DLO)

DLO is sent by the dialer to indicate when the data port is in use. Off indicates the DTE can originate a call provided that PWI is on.

Distant Station Connected (DSC)

DSC is supplied by the dialer to indicate that a call has been completed and that the dialer is no longer in control of the data port. Once the dialer has relinquished control of the data port, DSC remains on until CRQ is turned off.

Digit Signal Circuits (NB1-NB8)

The DTE presents binary data to the dialer for dialing or dialer control purposes. Table 7-2 shows the dial digit character set supported by the EIA-366A dialer.

Table 7-2: Dial Digit Character Set

Digit	NB8	NB4	NB2	NB1
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0

Table 7-2: Dial Digit Character Set (Continued)

Digit	NB8	NB4	NB2	NB1
9	1	0	0	1
*	1	0	1	0
#	1	0	1	1
< (EON)	1	1	0	0

The telephone number can have up to 40 digits, including special characters. If more than 40 digits are received, the dialer turns on ACR and waits for CRQ to drop. The characters are defined as follows:

* and #:

These are used for clarity only.

EON digit:

The EON digit is used when the line is configured as a nailed-up line. The EON digit signals that the end of the number has been received. When it is received, DSC is turned on. When configured for nail-up line, it is not necessary to wait for the connection before turning on DSC.

Other characters defined by EIA-366 are not supported by the UTA220 dialer. Unsupported characters in a dial string are ignored by the dialer.

Digit Present (DPR)

DPR is sent by the DTE to indicate to the dialer that the code on the Digit Signal Circuits can be read. Circuit DPR must not be turned on before Present Next Digit (PND) comes on. When DPR is on, it must remain on until PND goes off. When DPR is off, it must be held off until PND comes on again. If DPR is not turned on within five seconds after PND is turned on, the dialer assumes it has received the last digit and dials any digits that have been received. If no digits have been received, the dialer turns on Abandon Call and Retry (ACR) and waits for Call Request (CRQ) to drop.

Present Next Digit (PND)

PND is turned on by the dialer to indicate that it is ready to accept the next digit on the digit signal circuits NB1, NB2, NB4, and NB8. Off indicates that the DTE should turn off DPR and set the states of NB1, NB2, NB4, and NB8 for the next digit.

Abandon Call and Retry (ACR)

ACR is supplied by the dialer to indicate that the call cannot be successfully established. The on condition instructs the DTE to abandon the call by dropping the call later. ACR remains on until CRQ is turned off.

EXAMPLE DIAL SEQUENCE

The following is an example of the sequence of events that occur when a call is initiated using the EIA-366A dialer port.

- Data Line Occupied (DLO) must be off for the dial sequence to begin.
- The DTE turns on Call Request (CRQ) to initiate dialing.
- When CRQ is turned on, the dialer port turns on DLO to indicate that the data port is now in use. The dialer turns on Present Next Digit (PND) to request a dial digit from the DTE.
- The DTE sets the digit signal circuit bits (NB1, NB2, NB4, and NB8) to the correct value for the first dial digit, then turns on Digit Present (DPR).
- When DPR turns on, the dialer reads the digit and responds with another PND.
- The PND/DPR sequence continues until either EON is received or five seconds expires without receiving another digit (DPR is not turned on to present another digit).
- When all the digits are received, the dialer initiates the call on the data port to which the dialer is dedicated.
- When the call is connected, Distant Station Connected (DSC) is turned on by the dialer port. If the call cannot complete successfully, Abandon Call and Retry (ACR) is turned on until CRQ is turned off.
- The call can be terminated before the call is connected by turning CRQ off.
- Once the call is completed, the call can be terminated by normal disconnect methods such as disconnect by the switch, the front panel, or DTR disconnect.

Chapter 8

AT Command Operation

This chapter provides information on how to use AT commands to operate and configure the TA via a data port. The UTA220 AT command set is shown in Appendix C.

AT COMMAND STATEMENT

The TA communicates with a DTE asynchronously whenever the corresponding DTE port is configured for AT command mode. When the TA is powered up, any DTE port configured for AT commands enters command mode. AT commands can then be used to configure and control the TA. The command statement is typed using the DTE keyboard and temporarily resides in a section of memory called a buffer.

The command statement must be written in a specific form so the TA recognizes and follows the instruction. The command statement begins with the letters AT and is followed by one or more commands, which can each consist of a sequence of keyboard symbols, such as & and %, letters, numbers, and is followed by a return or end-of-line character.

AT Command Mode

AT commands can only be issued when the DTE port is configured for AT command mode. Normally, the DTE port is in AT command mode whenever it is off-line. After the TA establishes a connection with another TA and goes into on-line data mode, characters sent to the TA by the DTE are interpreted as data (not as commands) and are transmitted to the remote TA.

If the DTE port is configured for DIALER CMDS = NONE, AT commands are not accepted in any mode.

ESCAPE SEQUENCE: + + +

If the TA is in asynchronous data mode, the escape sequence can be sent to return the TA to the command mode and remain on-line. The escape sequence consists of a pause (normally 1 second), three escape characters, and then another pause. The default escape sequence characters are: + + +.

The escape sequence character is set by the S2 command and can be changed. The escape sequence can also be disabled to prevent false escapes into command mode.

After entering the escape sequence, the TA returns to AT command mode, but does not hang up or break the connection with the remote TA. AT commands can now be entered to the TA. The ATO command returns the TA to the data mode.

CREATING A COMMAND STATEMENT: AT

To create a command statement, use the following steps:

1. Type AT, the attention code telling the unit a command statement follows.
2. Type the command.
3. Press the return key to “Enter” or send the command statement to the TA.

An example of a command statement using the dial command (D) follows.

```
ATD555-1212
```

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

Another example: Enter ATZ. This means “Attention: reset the TA and reload current configuration with stored values.”

After entering a command line the TA returns a response message indicating whether the command was accepted, or by giving the data requested by the command line.

The AT command also sets some of the TA’s DTE data parameters, such as DTE speed, parity, and bits per character to match the DTE. This process is repeated each time the AT prefix is typed.

COMMAND STATEMENT GUIDELINES

When typing command statements, the following rules apply:

- Return must be pressed to execute (Enter) a command.
- The command buffer can hold 128 characters including spaces.
- Use the backspace or delete key to erase the last character.

MONITOR DISPLAY

As commands are typed they normally appear on the DTE monitor. This is called local character echo.

DTE CHARACTER ECHO: E

To determine if echo is set properly, type AT. If the terminal displays AT, echo is set correctly. If it displays AATT, then echo should be disabled by typing ATE. If the terminal does not display the AT at all, echo should be enabled by typing ATE1. The echo option only affects command mode operation.

COMMAND STATEMENT BUFFER

The TA temporarily stores up to 128 characters in a memory buffer. If more than 128 characters are entered before the end-of-line characters, the TA ceases to echo and waits for the end of line character. To correct this condition, retype the command using 128 characters or less.

The characters the AT command interpreter uses as end-of-line, line feed, and backspace are set respectively by the S3, S4, and S5 commands and can be changed.

The punctuation used in telephone numbers takes up space in the buffer, as do blank characters used as spaces to help increase readability.

BACKSPACE KEY

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

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

REPEATING A COMMAND: A/

This command tells the TA to repeat the last command stored in its buffer. The command is automatically executed without any need to retype the command or press the return key.

Example: The ATD5551212 command has been executed, and the phone is busy. To repeat the instruction type A/, but do not use AT before this command, as AT would empty the buffer and there would be no command to repeat.

NUMBERED COMMANDS

Series of commands starting with the same letter are distinguished by a number following the letter.

For example, the E0 command selects echo off, and E1 selects echo on.

GROUP COMMANDS

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

For example, the command statement ATQ0V0D5551212 means:

- AT Attention
- Q Allow status messages to be sent
- V Select status
- D Dial 555-1212

The TA executes the AT command followed by the Q, V, and D commands. The TA returns the status message corresponding to the last command on the line. If an error is encountered in a command line, subsequent commands on the line are ignored.

AT Command Operation

Some commands use special formats or have special rules concerning their use. For example, the dial D command initiates the dial process so no other commands, only dial modifiers, can follow the D command.

COMMAND SCOPE

The scope of a command refers to the extent of its effect on the TA. AT commands have a scope of Global, Channel, or Port.

Global commands affect the operating characteristics of the TA as a whole, potentially disrupting operation on all of the ports and channels. Thus, a global command should be used with caution (or not at all) if there are currently active calls on any port.

Channel commands affect only the operation of the B1, B2, or D-Channels of the TA. These commands should be used with caution if there are active calls on any port.

Port commands affect only the operation of the particular DTE port in use. If the user is issuing a port command via DTE port 1, then only DTE port 1 characteristics are affected. This rule does not apply if the user has entered Supervisor Command Mode (explained in the next section).

Supervisor Command Mode

The UTA220 is equipped with a feature called “AT Supervisor Command Mode.” This allows AT commands issued from one DTE port to be executed as if they were coming from another DTE port. This includes call placement and call control.

To enter supervisor command mode, AT>Cn is entered, where n is the port to control. AT>C? can be entered to display which port is being controlled. To return to control of the DTE port to which you are connected, enter AT>C0 or AT>C.

For example, a user may be connected to DTE port 3 and wants to control DTE port 1. The user enters AT>C1 at the DTE console. Now the user may operate as if he or she were connected to DTE port 1. All port commands issued from here on will affect DTE port 1 until the AT>C command is entered.

In supervisor command mode, when a call is placed for another DTE port, the controlled port enters the on-line mode while the supervisor port is still off-line. The supervisory port still has full control of the controlled DTE port. Connect messages are directed to the supervisor port in addition to the port being controlled.

Caution: *There is no mechanism to prevent a DTE port from being controlled by another DTE port. A DTE port can be controlled by more than one other DTE port.*

Chapter 9 Rate Adaption

To allow greater flexibility for your DTE, three rate adaption protocols are available for use on the B-channel: T-Link, V.120, and Bonding (see Chapter 10 for a description of Bonding). These protocols allow your DTE to operate both synchronously and asynchronously, and at a different speed than the B-channel.

RATE ADAPTION

When a data call is placed, the TA tries to establish physical data connection on the ISDN B-channel. The B-channel is a digital channel that can transfer data at 56 or 64 kbps, depending on the path the network chooses when routing the call.

A rate adaption protocol is necessary if the user's DTE rate is other than 56 or 64 kbps. The protocol adapts the lower speed of the DTE to the higher speed of the ISDN B-channel. The LCD menu or the AT%A2 command can be used to select a rate adaption protocol.

This chapter discusses two rate adaption protocols: TLink and V.120.

- **T-Link** does not guarantee error free data; it only adapts the lower DTE speed to the higher ISDN speed to a maximum of 19.2 kbps asynchronous and 64 kbps synchronous.
- **V.120** is an error-controlling protocol that guarantees error free data transfer at speeds up to 128 kbps. (Throughput is limited by the B-Channel to about 70 kbps.)

T-LINK

T-Link is a Northern Telecom proprietary rate adaption protocol. It supports synchronous and asynchronous rate adaption at a variety of speeds.

To select T-Link with the LCD, scroll through the menu and select:

- CONFIGURATION OPTIONS?
- PORT CONFIG OPTIONS?
- PROTOCOL OPTIONS?
- PROTOCOL = T-LINK

To select T-Link with the AT%A2 command, enter AT%A2=1.

Rate Adaption

When using a rate adaption protocol, both the calling and called units must use the same protocol. Also, unless the TA is configured for T-Link “adaptive mode,” the DTEs on both ends must be set to the same DTE speed before data can be transferred. In the adaptive mode, the TA can adjust its speed automatically to match the remote unit. To use this mode, however, the DTE must also be able to change its speed according to the connect speed of the TA, as indicated by the rate in the connect message.

Flow Control and Pin Options

When using T-Link the flow control option for the DTE port is overridden. In addition the RTS, CTS, and DTR pin options are overridden. The T-Link protocol itself defines the way these pins are handled.

T-Link transmits the state of the RTS pin to the remote TA where it is transmitted back as the CTS state. DTR is mapped to the remote end as DSR, but it is not looped back.

T-Link Options

Fixed/Adaptive:

- In fixed mode, the TA will not negotiate setup. If the other TA is not set to the same speed the negotiation will fail.
- In adaptive mode, the called TA will be asked to adapt to the originator’s parameters. If the called TA is set for fixed mode and its parameters don't match the originator’s, the called TA will request that the originator adapt to it.

RTS Assert/Normal:

- In RTS assert mode, T-Link operates as if RTS is always asserted
- In RTS normal mode, T-Link passes the state of the RTS pin to the remote TA

DTR Assert/Normal:

- In DTR assert mode, T-Link operates as if DTR is always asserted
- In DTR normal mode, T-Link passes the state of the DTR pin to the remote TA

V.120

V.120 is a CCITT protocol that supports synchronous and asynchronous rate adaption, and also provides link-layer error control. Although errors on a digital network are rarer than on an analog telephone line, they are possible. V.120 provides an end-to-end protocol for detecting and correcting any such errors. V.120 also performs buffering and can thus support flow control to and from the DTE.

To select V.120 with the LCD, scroll through the menu and select:

- CONFIGURATION OPTIONS?
- PORT CONFIG OPTIONS?
- PROTOCOL OPTIONS?
- PROTOCOL = V.120

To select V.120 with the AT%A2 command, enter AT%A2=2.

V.120 Options

Maximum Transmit Frame Size is the maximum size a frame can be for transmitting. The transmit frame size affects the store-and-forward delay.

Maximum Receive Frame Size is the maximum size frame that is accepted by the TA. Larger frames are rejected.

Window Size is the number of frames that can be sent before an acknowledgment is received. This parameter is normally not changed.

T200 Timer is the length of time to wait for acknowledgment of a sent frame. If this timer expires, V.120 attempts to send the frame again.

Chapter 10 BONDING

BONDING is a new protocol standard from the Bandwidth ON Demand INTERoperability Group for combining the bandwidth of several 56 kbps or 64 kbps channels. BONDING can 'bond' from 2 to 31 channels at once. The high speed data, which must be a multiple of 56 kbps or 64 kbps, is split after arrival at the DTE interface into the various channels. On the opposite end the data is recombined into the original data stream and sent to the DTE interface.

BONDING ON THE UTA220

Because the UTA220 supports one ISDN basic rate interface (2B+D), two simultaneous calls can be made, allowing an effective bandwidth of 112 kbps or 128 kbps. The BONDING call can be made from port 1 or port 2. Table 10-1 lists BONDING call options.

Table 10-1: BONDING Options

Option	Select
CONFIGURATION / PORT / PROTOCOL	Bond
CONFIGURATION / PORT / BONDING OPTIONS / RATE MULTIPLR	Set to 2 in order to request a 112 kbps or 128 kbps call. Set to 1 in order to request a 56 kbps or 64 kbps call. Note: To run 56 kbps or 64 kbps, it is simpler to use clear channel transfer (select PROTOCOL: NONE). If you request a rate multiplier of one, it will negotiate parameters according to the BONDING specification at the start of the call and then switch to a 56 kbps or 64 kbps clear channel call.
CONFIGURATION / PORT / BONDING OPTIONS / SEC CALL PORT	This option is needed only for AT&T 5E5/5E6 lines. If configured for multiple call references, set port 1 to 1 and port 2 to 2. This will cause the second call to use the same directory number as the first. If the line is not configured for multiple call references and the BONDING call is being placed on port 1, set both port 1 and port 2 to 2 (this is the default). If placing the BONDING call on port 2, set both port 1 and port 2 to 1. This will cause both directory numbers to be used for the two channel BONDING call.

BONDING

PLACING A BONDING CALL

You can place a call from port 1 or port 2 using any normal means. The answering party must be set to run BONDING or the call will disconnect shortly after connection. If you specify a rate multiplier of 2 and the answering party indicates it will support 2 or more channels for BONDING, the answering side will pass the directory number for the second call in the negotiation. The second call is made automatically. You can tell this call is being made by the flashing LED on the second B-channel. If delay equalization between the channels is obtained, data mode is entered. The front panel indicates the BONDING connection, the B-channel line speed (56 or 64 kbps), and the DTE speed (56, 64, 112, or 128 kbps). The B-channel LEDs remain on when data mode has been entered.

Note: When a rate multiple of 2 is negotiated, both B-channels are used. The remaining ports are prevented from making circuit switched calls for the duration of the BONDING call.

If the rate multiple is set to 1 on either the originator or answerer, the second call will not be made and data mode will be entered immediately after negotiation. The second call will not be made and data mode will be entered immediately after negotiation. The screen will indicate the speed the call connected at.

The Directory Numbers configured in the D-channel setup tell the origination side what the second Directory Number is. If you are using a point-to-point line with only one Directory Number, on answering a BONDING call that is requesting two channels, this directory number will be sent to the origination side, which is the same number as the first one dialed. This is because a point-to-point line can receive two calls using the same Directory Number. AT&T 5E5/5E6 can also be configured to receive two calls using the same Directory Number. To use this capability, change port 1's SEC CALL PORT (located under BONDING OPTIONS in CONFIGURATION / PORT) to 1 and set port 2's SEC CALL PORT to 2.

DISCONNECTING A BONDING CALL

Disconnecting by any normal means disconnects all BONDING channels. If either channel is disconnected by the switch, the entire call is disconnected by the UTA220. The disconnection can be validated by the LCD screen indicating DISCONNECTED and the B1 and B2 LEDs being off.

Chapter 11

Synchronous Operation

SYNCHRONOUS MODES

The UTA220 supports two synchronous modes. Operation in each of these modes is described below.

Synchronous Mode 1: Sync Pause Mode

When a telephone connection is made, the UTA220 delays for 5 seconds (configurable with the S25 command '0') before monitoring DTR.

This delay serves two purposes. If separate dialing and communication terminals are used, this allows the terminal operator to switch the EIA-232 cable between the two. If separate dialing and communications software is being used on the same terminal, the delay allows time for the dialing software to complete and the communications software to initialize and turn DTR on.

After the UTA220 connects, the DSR, CD, and CTS pins will be high. This can be used by the DTE as an indication that it can begin sending synchronous data to the UTA220.

The UTA220 disconnects if it detects an on-to-off transition of the DTR pin when &D0 is not in effect, or it receives a disconnect message from the switch. After a disconnect, the UTA220 returns to the off-line state. If the UTA220 is set to auto answer, it will only answer when DTR is on or &D0 is in effect. If you do not want the UTA220 to answer, DTR must remain low for at least 8 seconds after the ringing ends.

Synchronous Mode 2: Dial Stored Number Mode

The UTA220 will automatically dial the telephone number stored in directory entry number 0 when it detects an off-to-on transition of the DTR pin.

Once the UTA220 connects, the DSR, CD, and CTS pins will be high to indicate to the DTE that it can begin sending synchronous data.

The UTA220 disconnects upon detecting an on-to-off transition of the DTR pin when &D0 is not in effect, or receiving a disconnect message from the switch. After disconnecting, the UTA220 hangs up and returns to the off-line state.

If the UTA220 is set to auto answer, it will only answer when DTR is on or &D0 is in effect. If you do not want the UTA220 to answer, DTR must remain low for at least 8 seconds after the ringing ends. After that time, DTR going high will cause the UTA220 to originate a call. If DTR goes high during the ringing process, but before the required ring count is reached, the UTA220 will not originate a call.

Synchronous Operation

Chapter 12

D-Channel X.25

The TA provides the 1984 CCITT specified X.25 protocol for the D-channel with a Packet Assembler/ Disassembler (PAD) interface for asynchronous data terminals. The X.25 protocol supports the following X.25 parameters:

- Single channel operation
- Modulo 8
- Transmit packet size maximum of 256 byte
- Receive packet size maximum of 256 bytes
- Link level window size maximum of 7
- Packet level window size maximum of 7

FUNCTIONAL DESCRIPTION

X.25

X.25 is a synchronous error-correcting protocol for data transmission over public and private networks. The X.25 protocol is subdivided into three layers: physical, data link, and packet (or network). Each layer is responsible for specific parts of the data transmission, error checking, and error correcting. Data is transmitted in packets that contain additional information to facilitate the error checking and correcting.

PAD

The PAD acts as an intermediary between the local user's asynchronous terminal and the X.25 protocol. PAD functions are specified by CCITT X.3, X.28, and X.29 recommendations. These recommendations are as follows:

- X.3 defines 22 PAD parameters that govern how the PAD operates. These parameters specify how and when the data from the asynchronous DTE is forwarded to the remote host (assembly) and how the data from the remote host displays to the asynchronous terminal (disassembly).
- X.28 defines the PAD commands and responses that permit communication with the X.25 protocol via an asynchronous terminal.
- X.29 defines supervisory packets used for communication between the local PAD and the remote host's PAD.

ESTABLISHING AN X.25 SESSION

Before using the TA for X.25 communications on the D-channel, the user must subscribe to the ISDN D-packet service. If the user is subscribed to the D-packet service, a connection is automatically established between the TA and the ISDN packet handler when the TA is first powered up. This is known as the D-channel X.25 link connection. Once the TA is connected to the ISDN packet handler, the X.25 PAD is used to make an X.25 virtual connection to a specific remote host or device. The connection is called “virtual” because it is not a direct physical connection; a transmission path is created for each call and held until communications are completed and the connection is disconnected.

The following explains how an X.25 virtual connection (session) is established and disconnected, as well as some of the activities performed during the X.25 session.

Initialize the PAD

When the TA is first powered up, the TA is in the AT command mode. There are three AT commands that the TA supports to initialize the PAD:

ATDD

AT@P1 = P

AT@P1 = D

Once the PAD is initialized, the PAD prompt character * displays and the PAD is in the PAD command mode.

ATDD Command

The **ATDD** command is valid for initializing the PAD only when the D-channel X.25 link is established. If the **ATDD** command is entered when the D-channel X.25 link is not established, the TA responds with **ERROR** and remains in the AT command mode.

AT@P1=P or AT@P1=D Command

The **AT@P1=P** or **AT@P1=D** command initializes the PAD automatically when the TA is powered up. If the D-channel X.25 link is not established when the TA is powered up, the PAD is initialized to the PAD command mode. Likewise, if the D-channel link is connected when the TA is powered up, the PAD is initialized to the PAD command mode, just as though an **ATDD** had been executed.

Note: The AT@P1=P and AT@P1=D commands do not take effect until the TA power is cycled or the TA is restarted. The AT&W command must be executed to save all port parameters.

Establishing an X.25 Virtual Connection

There are three modes of operation for the PAD:

- Command mode
- Connect-in-progress mode
- Data transfer mode

Initially, the PAD is in the PAD command mode where PAD commands can be executed and an X.25 virtual connection can be established if the D-channel X.25 link is connected.

An X.25 virtual call can be established by initiating the PAD select command containing the desired requested facilities and/or Network User Address (NUA).

Refer to the PAD COMMAND SET section for the rules governing the format of the PAD select command. The facilities permit the user to request special services from the ISDN network at call-setup time. The NUA informs the ISDN packet handler of the remote location address the user is requesting for connection through the ISDN network.

Example: R-12345678

This command requests reverse charging and directs the virtual call to the NUA 12345678.

During establishment of the X.25 virtual call connection, the PAD is in the connect-in-progress mode. When the virtual call is established, the following message displays:

COM

The PAD is now in the data transfer mode and data exchange can begin.

Note: Data is transmitted through the PAD that is packeting the data. Echo of PAD data and PAD commands is performed locally by the PAD.

Escaping to PAD Command Mode

When in data transfer mode or connect-in-progress mode, it is possible to escape to the PAD command mode to execute a PAD command. To escape to the PAD command mode issue the PAD recall character as specified by X.3 parameter 1. The default PAD recall character for the TA is DLE (Ctrl P).

Once in the PAD command mode, the PAD prompt character * displays and only one PAD command may be executed. Upon execution of the PAD command, the PAD returns either to the previous mode of the PAD (i.e., data transfer) or to the final mode required by the execution of the PAD command (i.e., after execution of the PAD clear command, the final mode is the PAD command mode).

Escaping to AT Command Mode

To escape to the AT command mode from PAD data or command mode, enter the AT escape command (+++). This temporarily suspends PAD operations and follows standard AT command function operation. To return to PAD operation enter:

ATDD

To end the call and exit the PAD enter:

ATH

To save the port and current session configuration, including the current PAD parameter configuration, to nonvolatile memory enter:

AT&W

Disconnecting the X.25 Virtual Connection

The X.25 virtual call connection is disconnected by issuing the PAD Clear command while in the PAD command mode.

Example: *CLR

This disconnects the virtual call but leaves the terminal adapter on-line and in the PAD command mode.

When the virtual call is disconnected, the PAD Clear Confirmed response and PAD prompt character are displayed:

CLR CONF

*

The PAD is now in the PAD command mode where another X.25 virtual connection can be established via the PAD Select command.

COMMON APPARENT PROBLEMS

During a session the X.25 network or remote PAD can alter the current values of the X.3 parameters resulting in common apparent problems.

Parameter 1 Changed

PAD recall using the character DLE (Ctrl P) is no longer possible.

Parameter 2 Changed

Characters are no longer echoed when in the PAD command mode.

Parameter 5 Changed

Flow control characters are sent to the DTE by the PAD during the PAD command mode.

Parameter 6 Changed

The PAD prompt no longer appears when in the PAD command mode.

Parameter 20 Changed

Editing characters are echoed.

PAD COMMAND SET

The X.25 PAD serves as an asynchronous interface through which the X.25 protocol and PAD operation can be controlled. PAD commands are specified in X.28 by CCITT which allow for communication directly with the PAD. Some of the X.28 PAD commands control the X.25 protocol operation such as call setup, call clearing, etc. The rest of the PAD commands provide access to the X.3 PAD parameters for PAD operation control (refer to the X.3 Parameters and Values section).

PAD Command Format

The format of each PAD command is described in the section below. The PAD accepts either upper or lowercase characters for the PAD command characters. Any spaces inserted in the PAD command are ignored except for spaces in the call user data of the PAD select command (see PAD select command). A PAD command line can contain up to 128 characters. Multiple PAD commands are not permitted on a command line.

Issuing PAD Commands

PAD commands are accepted by the PAD only when it is in PAD command mode (when a PAD prompt character * displays at the beginning of the command line). As each PAD command character is typed, the character is echoed to the local DTE device for display, unless echoing is disabled by X.3 parameter 2.

Each PAD command is input to the PAD by typing the PAD command delimiter character (a carriage return or + character) at the end of the command line. The PAD commands can be edited, unless editing is disabled by X.3 parameter 15, any time before the command is input to the PAD. Once the PAD has executed the command, a response, called a PAD service signal, is returned to the DTE to inform the user of the result of the command execution.

Note: An incorrect PAD format will cause an ERR response.

Status: STAT

This command requests the virtual call status of the local DTE.

Response:

ENGAGED - Indicates the local DTE is currently engaged in a virtual call.

FREE - Indicates the local DTE is not engaged in a virtual call.

Clear: CLR

The clear command disconnects the virtual call connection.

Response:

CLR CONF - Confirms that the clear command was accepted by the packet handler and the current virtual call was disconnected.

CLR ERR - Indicates that the clear command was in error because a virtual call was not established, or that the PAD is in an unknown mode and cannot accept the clear command.

CLR DER - Indicates that the remote end is no longer responding because no response to the clear or additional retransmission of the clear was received.

RESET

This command resets the current virtual call. When resetting the call, the packet sequence counters P(r) and P(s) and the packet window are reset to 0. Outstanding data or data stored from the local DTE is discarded. The reset returns the current virtual call to a known mode (the same mode the virtual call was in when it was first established). This command is only valid when a virtual call is connected.

Note: The CR LF characters indicate a carriage return and line feed response and are not actually displayed.

Response:

CR LF - Indicates the reset of the virtual call is complete.

ERR - Indicates a reset command error caused by either a virtual call not being established or the PAD being in a mode unknown to the user.

Interrupt: INT

This command initiates the transmission of an interrupt packet to the remote DTE. This command is only valid when a call is connected.

Response:

CR LF - Indicates that the interrupt packet was transmitted.

ERR - Indicates an interrupt command error caused by a virtual call not being established or the PAD being in a mode unknown to the user.

SET

This command sets or changes the value of one or more X.3 parameters.

A colon must be placed between the parameter and its corresponding value. If more than one parameter is requested to be set or changed, a comma must delimit the value and the next parameter.

SET <parameter>:<value>,<parameter>:
<value>,...

Note: Refer to Table 6 for a list of X.3 parameters and their corresponding default values.

Response:

CR LF - Indicates that the parameter specified in the set command is set to its corresponding specified value.

PAR <parameter>: INV - Indicates that the specified parameter is incorrect or cannot be changed because it is a READ ONLY parameter (i.e., parameter 11 is a READ ONLY parameter), or the value specified in the set command is an invalid value for the specified parameter.

Read: PAR?

This command requests a display of the current values of the specified X.3 parameter(s).

If more than one parameter is specified, each must be delimited by a comma. If none are specified, all parameters (1 - 22) and their corresponding values are displayed.

PAR? <parameter>,<parameter>,...

or

PAR?

Response:

PAR <parameter>:<value>,<parameter>: <value>, ... -

Lists each parameter specified by the read command and the corresponding value.

PAR <parameter>: INV - Indicates the invalid parameter specified in the read command.

Set and Read: SET?

These commands request the setting or changing of the current values of the specified X.3 parameters and display the values after the setting or changing.

A colon must be placed between the specified parameter and its corresponding specified value. If more than one parameter is requested to be set or changed, a comma must delimit the value and the next parameter reference.

SET? <parameter>:<value>, <parameter>:
<value>,...

Response:

PAR <parameter>: <value>, <parameter>: <value>... -

Lists each parameter specified by the set and read command and the corresponding value.

PAR <parameter>: INV - Indicates the specified parameter is incorrect or cannot be changed because it is a READ ONLY parameter, or the value specified in the set and read command is an invalid value for the specified parameter.

Remote Read: RPAR?

The read command requests a display of the current values of the specified X.3 parameter(s) from the remote PAD. This is only valid if an X.25 call is active.

If more than one parameter is specified, each must be delimited by a comma (.). If none are specified, all parameters (1-22) and their corresponding values are displayed.

RPAR? <parameter>,<parameter>,...

or

RPAR?

Response:

PAR <parameter>:<value>,<parameter>:<value>,... - Lists each parameter specified by the read command and the corresponding value.

PAR <parameter>: **INV** - Indicates the invalid parameter specified in the read command.

Remote Set and Read: RSET?

These commands request, from a remote PAD, the setting or changing of the current values of the specified X.3 parameters and display the values after the setting or changing from the remote PAD. This is only valid if an X.25 call is active.

A colon must be placed between the specified parameter and its corresponding specified value. If more than one parameter is requested to be set or changed, a comma must delimit the value and the next parameter reference.

RSET? <parameter>:<value>,
<parameter>:<value>,...

Response:

PAR <parameter>:<value>,<parameter>:<value>,...-- Lists each parameter specified by the set and read command and the corresponding value.

PAR <parameter>: **INV**--Indicates the specified parameter is incorrect or cannot be changed because it is a READ ONLY parameter (i.e., parameter 11 is a READ ONLY parameter), or the value specified in the set and read command is an invalid value for the specified parameter.

Profile Read/Save: PROF

These commands allow the user to load a saved, default, or standard set of X.3 parameters from non-volatile memory or save the X.3 parameters to one of two user profiles in non-volatile memory. The PROF command syntax is as follows:

PROF 90, PROF SIM: Will load the CCITT simple standard profile.

PROF 91, PROF TRA: Will load the CCITT transparent standard profile.

PROF NVM #(0,1): Will load from one of two specified non-volatile memories a profile stored by the user.

PROF SAV #(0,1): Will store the current X.3 profile into one of two non-volatile memories as specified.

PROF DEF: Will load the factory default X.3 profile.

PAD Select

This command establishes an X.25 virtual call connection through the ISDN packet handler to a remote host or device. The contents of the PAD select command determine the contents of the X.25 Call Request packet. The format can be in any of following three forms:

<facility request block> - <address block> <call user data>

<facility request block> - <call user data>

<address block> <call user data>

The facility request block permits the user to request special services from the ISDN network. If more than one facility is specified, a comma must separate each facility. The end of the facility request block must be followed by the hyphen character.

The address block specifies the called Network User Address (NUA). The address cannot exceed 15 characters in length. Abbreviated or multiple addresses are not supported.

The call user data field cannot exceed 12 characters in length (including spaces) and must be preceded by either the P or D character. Carriage returns and the + character are not considered part of the user data field because they are treated as PAD command delimiters.

Response:

COM - Indicates the virtual call is established.

ERR - Indicates the PAD is in an unknown mode that cannot allow the PAD select command, the PAD has been initialized in the off-line mode (i.e., no virtual call connection has been established), or the PAD select command is invalid due to a format error. Some PAD select format errors are as follows:

- The facilities block is not followed by the - character.
- The CUG facility is requested and two decimal digits are not specified.
- The RPOA facility is requested and four decimal digits are not specified.
- The address block length exceeded 15 characters.
- The call user data block is not preceded by the P or D character.
- The call user data block length exceeded 12 characters.
- An invalid facility is requested as the first facility in the facility request block.

CLR xxx - Indicates the attempted call has cleared. The xxx is the ASCII character cause code which specifies the reason the call attempt cleared (see PAD Clear Service Signals).

FACILITIES

The following facilities and corresponding code formats are supported by the TA.

Reverse Charging: R

Reverse Charging is a facility analogous to “collect” calls. All connect charges are charged to the remote DTE. This facility works in conjunction with the Reverse Charging Acceptance facility. If the remote DTE does not subscribe to Reverse Charging Acceptance, the local DTE's call with the reverse charging request is cleared.

Format: R

Network User Identification (NUI)

This facility provides a way for the user to be identified by the network for the purpose of billing, security, or network management.

Format: N <NUI string>

A character string of up to 16 decimal characters from 33 to 126 of the ASCII character table (see Appendix F) except for characters 43 to 45 (hyphen, comma, and plus sign). Spaces can be included in the specification of the NUI string but are discarded by the PAD.

Echo to the local DTE is turned off upon entering the N until a comma or hyphen is entered. The comma signifies the end of the NUI string and indicates that more facilities are to follow. The hyphen signifies the ending of the facility block. The P or D designator used for the beginning of the user data call does not end the NUI string because it is considered a valid NUI string character.

Closed User Group (CUG)

The Closed User Group (CUG) facility permits users to essentially establish a private network on a public network by restricting communications to only those who are designated to be in the group. Access by anyone outside the group is denied. The CUG number is assigned by the network provider at subscription time.

Format: G <xx>

<xx>: two decimal digits ranging from 00 - 99. If two decimal digits are not specified, the response ERR displays.

Recognized Private Operating Agency

The Recognized Private Operating Agency (RPOA) facility permits the user to specify the particular international gateway to be used when initiating an international virtual call.

Format: T <xxxx>

<xxxx>: four decimal digits

If four decimal digits are not specified, the response ERR displays.

Flow Control Parameter Negotiation

This facility permits the negotiation on a per-call basis of the packet and window sizes (flow control parameters) for each direction of transmission. The packet size designates the maximum data field length of the data packets. The window size designates the number of data packets that may be sent before acknowledgment of the received packets (i.e., permission to transmit more data packets) is received. Window sizes do not have to be the same at both ends of the virtual connection.

The TA cannot initiate negotiation of this facility, but will respond to negotiation from the network. The packet window size is changed by using the AT command **!X0** (receive window size), **!X1** (transmit window size) for the D-Channel or **%D0** (receive window size), **%D1** (transmit size) for an X.25 configured port (see AT commands).

If the window size is not the default value of two, the specified window size value is requested in the call request packet when the virtual call is being established. The default packet size supported by the TA is 128 bytes and can be changed using the AT commands **!X2** (receive packet size), **!X3** (transmit packet size), for the D-Channel or **%D2** (receive packet size), **%D3** (transmit packet size) for an X.25 configured port.

To allow maximum flexibility, the user may configure various parameters, such as packet size, window size, call type/LCN ranges, and packet modulus, for the D-Channel, Port, or Session (session not yet implemented) differently for each X.25 call.

The rules to determine the parameters used areas follows:

- If a session parameter (window or packet) is non-zero, the session parameter is used.
- If the session parameter is zero and the port parameter is non-zero, the port parameter is used.
- If the session and port parameters are zero, the D-Channel parameter is used.

Table 12-1: PAD Command Set Summary

Command	Description	Response
STAT	Requests virtual call status of the DTE	ENGAGED or FREE
CLR	Disconnects the current virtual call	CLR CONF, CLR ERR, or CLR DER
RESET	Resets the current virtual call	Acknowledgment PAD service signal or ERR *
INT	Transmits an interrupt packet	Acknowledgment PAD service signal or ERR *
SET	Sets or changes the value of one or more of the current parameters	Acknowledgment PAD service signal or ERR or PAR (list of specified parameters and INV) *
PAR?	Requests display of the current values of the specified parameters	PAR (list of specified parameters with their current values or INV)
SET?	Requests the setting or changing of the current values of the specified parameters and display the values after the setting or changing	PAR (list of specified parameters with their current values or INV) or ERR
RPAR?	Requests the display from the remote PAD of the current values of the specified parameters	PAR (list of specified parameters with their current values or INV)
RSET?	Requests the setting or changing from the remote PAD of the current values of the specified parameters and displays the values after the setting or changing	PAR (list of specified parameters with their current values or INV) or ERR
PROF	Loads or Stores the current X.3 profile	Acknowledgment PAD service signal or ERR*
PAD Select Command	Sets up and establishes a virtual call	COMM, ERR, or CLR xxx (see PAD Clear Service Signals)

*Acknowledgment PAD service signal is transmitted to the local DTE as a carriage return and a line feed.

PAD SERVICE SIGNALS

The local DTE may receive service signals from the PAD in response to an issued PAD command or as the result of a packet or network action. Table 12-2 shows the service signals that may be transmitted to the local DTE by the PAD.

Table 12-2: PAD Service Signals

Command	Extension	Reason
*		PAD is in the PAD command state and the user can issue a PAD command
ENGAGED		Response to PAD STATus command
FREE		Response to PAD STATus command
PAR	Parameter: value or Parameter: INV	Response to set PAD command if one of the parameters to be set is invalid or response to set and read command or read command
ERR		PAD command is in error
RESET	See PAD Reset Service Signals	Resetting by the network or remote DTE
CLR	See PAD Clear Service Signals	Clearing by the network or remote DTE
CLR	CONF	Confirmation of clearing either initiated by the CLR PAD command or by the packet
CLR	DER	Restart on the network link or response to packet virtual call request when the call cannot be established
COM		Call connected in response to a PAD Select command or the receipt of an incoming call (connection based upon acceptance of incoming call by the packet)
XXX		Line delete function performed for a printing terminal
\		Character delete function performed for a printing terminal
BS SP BS		Character delete function performed for a display terminal
CR LF		Acknowledgment of a PAD command such as RESET or INT

PAD Reset Service Signals

A reset service signal is transmitted to the local DTE when resetting is initiated by the network or remote DTE. The reset cause code issued with the reset request packet from the network or local DTE indicates the reason. The reset cause code is interpreted by the PAD and the resultant cause code service signal extension is transmitted to the local DTE with the RESET service signal. The following is a list of the possible reset service signals that may be transmitted to the local DTE by the PAD.

Table 12-3: PAD Reset Service Signals

Service Signal	Reason
RESET DTE	Reset by remote DTE
RESET ERR	Reset due to a local procedure error
RESET NC	Reset due to network congestion
RESET RPE	Reset due to a remote DTE procedure

Pad Clear Service Signals

A clear service signal is transmitted to the local DTE when clearing is initiated by the network or remote DTE. The clear cause code issued with the clear request packet from the network or local DTE indicates the reason for the clearing. The clear cause code is interpreted by the PAD and the resultant cause code service signal extension is transmitted to the local DTE with the CLR service signal. Table 12-4 shows the clear service signals that may be transmitted to the local DTE by the PAD.

Table 12-4: PAD Clear Service Signals

Service Signal	Reason
CLR OCC	DTE is engaged in another call and cannot accept the incoming call
CLR NC	Network problem exists which prevents the network from handling the call
CLR INV	DTE requested an invalid facility
CLR NA	DTE to DTE connection not allowed. For example, if the closed user group was not the same the connection would not be allowed
CLR ERR	Clearing error caused by the local DTE detected by the PAD

Table 12-4: PAD Clear Service Signals (Continued)

CLR RPE	Remote DTE procedure error detected by the remote DTE/DCE interface
CLR NP	Called DTE address not assigned to any DTE
CLR DER	Called number out of order or not responding
CLR DTE	Remote DTE cleared the call
CLR RNA	Called DTE not subscribed to reverse charging acceptance, allowing the called DTE to accept the calling DTE's request for reverse charging (the reverse charge facility in the facility request field of the call request packet)

X.3 PARAMETERS AND VALUES

Just as the AT commands control some of the operating features of the TA, the X.3 parameters control the PAD's operating features. These parameters are user configurable and remote configurable: the remote device can change the local PAD parameters to designate how the PAD handles the data.

Most X.3 parameters govern how the data displays because the data display depends on the type of local DTE or application. Other X.3 parameters govern PAD functions such as data forwarding (when to stop packeting the data received from the local DTE device and transmit the packet), editing, flow control, and service signal control.

Saving the X.3 Parameter Configuration

When the TA is first powered up, the X.3 parameters are set to the default (factory) settings (Table 12-5). PAD parameters can be modified using the set or set and read PAD commands. The PAD must be in the PAD command mode before the set or set and read commands can be executed. During a virtual call, the remote device can change the X.3 parameter configuration from the user's set configuration. To avoid the problems this may cause, the PAD saves the current settings of the X.3 parameters to RAM an X.25 virtual call is initiated. When the virtual call is disconnected, the saved X.3 parameter settings are restored. The PAD does not save the current X.3 parameter settings when the virtual call connection is established by the remote DTE.

Table 12-5: Default X.3 Parameters

Parameter	Description	Default	Remarks
1	PAD recall using a character	1	DLE character (Ctrl P) is the PAD recall character
2	Echo	1	Enabled
3	Data forwarding character selection	2	Carriage return character (0Dh) is the data forwarding character
4	Idle timer delay selection	0	Timer = 0 secs
5	Ancillary device control	2	Flow control of local DTE device by PAD allowed in data transfer
6	Control of PAD service and command signals	5	Transmit PAD command and service signals in standard form
7	Action of PAD on break from DTE	0	Do Nothing
8	Discard output	0	Normal data delivery
9	Padding after carriage return	0	No padding after carriage return
10	Line folding	0	No line folding
11	Binary speed of DTE	-	Set by current baud rate
12	Flow control of PAD by DTE	1	DTE flow control of PAD allowed
13	Line feed insertion after carriage return	5	Insert line feed after carriage return transmitted to the DTE and after echo of carriage returns
14	Padding after line feed	0	No padding
15	Editing	1	Editing is allowed during data transfer
16	Character delete	8	Ctrl H (08H of ASCII Character Table) is the delete character
17	Line delete	24	Ctrl X (18H of ASCII Character Table) is the line delete character

Table 12-5: Default X.3 Parameters (Continued)

18	Line display	18	Ctrl R (12H of ASCII Character Table) is the line display character
19	Editing PAD service signals	2	Editing PAD service signals is generated for display terminals
20	Echo mask	64	No echo of edit characters
21	Parity treatment	0	No parity check or generation
22	Page wait	0	Disabled

To save the current X.3 parameter configuration to nonvolatile memory, escape to command mode and enter AT&W (see Escaping to AT Command Mode in Establishing an X.25 Session). Entering AT&W saves the port and current session configuration as well as the X.3 parameters. The factory X.3 configuration can be restored by entering AT&F. This command also restores port and current session configuration.

CCITT specifies two standard profiles for the X.3 parameter set. The transparent profile is recommended for applications such as file transfers. The transparent profile essentially disables most of the PAD features so that the file can be transferred completely unaltered (no padding, line feed insertion, flow control characters, or service signal messages when transmitted to the DTE). The simple profile is an alternative configuration to the TA's default configuration for simple interactive terminal applications. Table 12-6 lists the X.3 parameters and the values supported by the TA.

Table 12-6: CCITT X.3 Parameter Profiles

Parameter	Description	Transparent Profile	Simple Profile
1	PAD recall using a character	0	1
2	Echo	0	1
3	Data forwarding character selection	0	126
4	Idle timer delay selection	1	0
5	Ancillary device control	0	1
6	Control of PAD service and command signals	0	1
7	Action of PAD on break from DTE	0	0
8	Discard output	0	0
9	Padding after carriage return	0	0

Table 12-6: CCITT X.3 Parameter Profiles (Continued)

10	Line folding	0	0
11	Binary speed of DTE	-	-
12	Flow control of PAD by DTE	0	1
13	Line feed insertion after carriage return	0	0
14	Padding after line feed	0	0
15	Editing	0	0
16	Character delete	127	127
17	Line delete	24	24
18	Line display	18	18
19	Editing PAD service signals	1	1
20	Echo mask	0	0

Parameter 1: Pad Recall Character

This parameter designates the PAD recall character. PAD recall allows for escape from the PAD data transfer mode or connect-in-progress mode to the PAD command mode in order to execute a PAD command. Only one PAD command can be executed after the PAD has escaped to the PAD command mode. Once executed, the PAD returns to the previous mode (i.e., data transfer or connect in progress). If parameter 5 is set to 1, when PAD recall is executed, the PAD will output an XOFF before displaying the PAD prompt.

Table 12-7: PAD Recall Character

Value	Description
0	No character will result in PAD recall in either the data transfer or connect-in-progress mode
1	PAD recall character = DLE. The character DLE (10H) can be used for PAD recall. (DLE = Ctrl P) *

* default

Parameter 2: Echo

This parameter establishes whether or not characters transmitted from the local DTE device to the PAD is echoed back to the local DTE device by the PAD. For example, if echo is enabled and the letter P is typed, the PAD transmits the letter P back to the terminal.

Table 12-8: Echo

Value	Description
0	No character echo
1	Character echo enabled (under the restraints or (parameter 20) during all modes of the PAD *

default

Parameter 3: Selection of Data Forwarding Characters

Characters received from the local DTE device are stored by the PAD until the data forwarding character is received, or some other data forwarding condition has occurred. Parameter 3 designates the character or set of characters used to initiate the forwarding of the data stored by the PAD. Before the data forwarding character is transmitted to the PAD, the data stored by the PAD can be edited if parameter 15 is enabled.

Other conditions that cause the PAD to automatically forward the data stored by the PAD are as follows:

- If editing is disabled (parameter 15 = 0) and the PAD receives enough data to fill a packet, one full packet is forwarded.
- If editing is enabled (parameter 15 = 1) and the PAD receives enough data to fill the PAD editing buffer, the PAD forwards one full packet.
- If the maximum assembly timer expires before any other data forwarding conditions occur, the data currently stored by the PAD is forwarded. The maximum assembly timer is started on receipt of the first character being packeted by the PAD from the DTE and expires after 15 minutes.
- If editing is disabled (parameter 15 = 0) and the idle timer delay expires (as set by parameter 4), the data currently stored by the PAD is forwarded.
- If the PAD receives a break and the action to be performed upon receipt of a break is nothing (parameter 7 = 0), the data currently stored by the PAD is forwarded.
- If the PAD receives the first character of a PAD command signal after escaping from the data transfer mode, the data currently stored by the PAD is forwarded.
- If the PAD receives a set, read, or set and read PAD message from the remote DTE, the data currently stored by the PAD is forwarded.

Table 12-9: Data Forwarding Character

Value	Description
0	No designated data forwarding character
2	Data forwarding on carriage return *
126	Data forwarding on all ASCII decimal characters from 0 to 31 and character DEL. (Refer to Appendix F)

**default*

If a data forwarding character's function is duplicated, the associated function for the character is according to following priority:

1. PAD recall
2. Command signal delimiter
3. XON and XOFF
4. Line display
5. Character delete
6. Line delete
7. Data forwarding

For example, if the character DLE is assigned to two functions data forwarding (parameter 3 = 126) and PAD recall (parameter 1 = 1), DLE is treated as the PAD recall character. The PAD recall function has higher priority than the data forwarding function. This also applies to: BS, CAN, DC1, DC2, DC3, and DC4 (refer to Appendix F).

Parameter 4: Selection of Idle Timer Delay

This parameter designates the amount of idle time (time in which a character is not received) allowed after the PAD has received a character from the local DTE device before the entire PAD buffer is forwarded. The idle timer is not started if parameter 15 is enabled. The decimal value stored in parameter 4 designates the timer value in 20ths of a second.

Table 12-10: Idle Timer Delay

Value	Description
0	No idle timer delay *
1 to 255	Specifies the timer value in 20ths of a second

**default*

Parameter 5: Ancillary Device Control

Parameter 5 specifies whether or not flow control of the local DTE device (ancillary device) by the PAD can occur, and if so, what modes of the PAD the PAD flow control of the local DTE are allowed. Flow control of the local DTE device is handled in conjunction with S54 (DTE flow control register). The type of flow control the PAD transmits to the local DTE device is set according to the setting of S54. For example, if S54 is set for CTS flow control, the PAD will flow control the local DTE device by turning off the CTS pin when the PAD can no longer accept any characters from the local DTE. When the PAD can resume accepting characters from the local DTE, the PAD turns the CTS pin on. If all the DTE flow control options are disabled (default), the PAD will transmit XON (Ctrl Q) and XOFF (Ctrl S) to the local DTE for flow control.

Table 12-11: Ancillary Device Control

Value	Description
0	No PAD flow control
1	PAD data transfer flow control
2	PAD data transfer and PAD command mode flow control *

*default

Note: The function of parameter 5 differs from the 1984 CCITT X.3 Specification. The specification indicates that only XON and XOFF can be transmitted to the DTE for the purpose of flow control. The TA does not restrict the type of flow control used on the local DTE. The setting of the AT command indicates the type of flow control sent to the DTE. Thus, if the DTE device only recognizes CTS flow control, the PAD can still flow control the DTE.

Parameter 6: Control of PAD Service Signals

Parameter 6 specifies whether the PAD prompt or PAD service signals are transmitted to the local DTE device by the PAD, and the format of those service signals. The PAD service signals are character messages transmitted to the local DTE device by the PAD in response to PAD commands issued by the local DTE or to inform the user of a packet or network action (i.e., call reset etc.). The PAD prompt is the character *. It is transmitted by the PAD to the local DTE device when the PAD is in PAD command mode to prompt the user to enter a PAD command.

For non-interactive applications, the service signal transmission to the local DTE may be disabled as the transmission service signals can appear to be part of the received data.

Table 12-12: PAD Service Signal Control

Value	Description
0	No PAD service signals or PAD prompt
1	PAD service signals in standard form but no PAD prompt
5	PAD service signals and PAD prompt in standard form *

*default

Parameter 7: Action of PAD on Break from DTE

Parameter 7 specifies the action taken by the PAD when the PAD receives a break signal from the local DTE. The break signal allows the DTE to signal the PAD without loss of character transparency. The PAD also relays a break signal to the DTE when the PAD receives a break from the remote DTE. The PAD responds to the break only when a packet call is established and the PAD is in the PAD data transfer mode. Upon receipt of the break, all data stored by the PAD is forwarded. The break signal consists of binary 0s for more than 135 ms.

Table 12-13: PAD Action on DTE Break

Value	Description
0	The PAD does nothing on receipt of a break in PAD data transfer, PAD command, or PAD connect-in-progress mode (while establishing a call) *
1	An expedited interrupt packet is transmitted by the PAD prior to the forwarding of the stored PAD data. If a previously transmitted interrupt is not acknowledged, the break interrupt will wait until acknowledgment of the previous interrupt is received.
2	A reset request packet is transmitted to the remote end after the forwarding of the PAD data.
5	The PAD transmits an expedited interrupt packet, any stored PAD data is forwarded, and an X.29 indication of break packet is transmitted
8	Escape from PAD data transfer. Equivalent to a PAD recall
21	Transmitted data is discarded, and expedited interrupt packet is transmitted if there is no outstanding interrupt, stored PAD data is forwarded, and an X.29 indication of break packet is transmitted. When data must be discarded, parameter 8 is set to 1. When the break actions are completed, parameter resets to 0.

Parameter 7 can be any added combination of the above values.

* default

Parameter 8: Discard Output

Parameter 8 specifies whether data received by the PAD from the remote end is transmitted to the local DTE device. The control of data delivery is only possible when the PAD is in data transfer mode (i.e., this is the mode when data is being delivered to the local DTE device).

Table 12-14: Discard Output

Value	Description
0	Normal data delivery *
1	Discard output to the DTE

* default

Parameter 9: Padding after Carriage Return

Parameter 9 specifies the number of padding (null) characters inserted after a carriage return, which is transmitted or echoed to the local DTE device. This provides the printing mechanism of the local DTE device time to physically complete the carriage return (advance the printing head to the beginning of the line). Once complete, the PAD can resume sending data to the local DTE device without losing data.

Parameter 9 also applies to the number of padding characters inserted after the format effector (carriage return and line feed). The format effector is sent in conjunction with PAD service signals to the local DTE device when the PAD is in PAD command mode.

Table 12-15: Padding After Carriage Return

Value	Description	
0	No padding after any carriage return or the line feed of the format effector. *	
	If parameter 8 is set to 0 then:	
	DTE Speed	# of Padding Characters
	110	2
	300	4
	600	4
	1200	4
>1200	0	
1 to 255	Specifies the number of padding characters	

* default

Parameter 10: Line Folding

Parameter 10 specifies the maximum number of displayable ASCII characters the PAD can send as a single line to the local DTE before a new line is begun. The displayable ASCII decimal characters (32 - 126) are shown in Appendix F. When the maximum character number is reached, the PAD inserts a PAD format effector (carriage return and line feed) into the data stream being transmitted or echoed to the local DTE device. The format effector advances the local DTE device display to the beginning of the next line to continue the display of the data. In the event the local DTE device automatically inserts line folding when the characters reach the right-most end of the device display, parameter 10 should be set to 0. This parameter applies to data, PAD command characters, and PAD service signals.

Table 12-16: Line Folding

Value	Description
0	No line folding *
1 to 255	Number of displayable ASCII characters per line

**default*

Parameter 11: Binary Speed of Local DTE

Parameter 11 reflects the current speed of the local DTE, which is set automatically when the terminal adapter receives an AT command prefix while in the AT command mode. This is a READ ONLY parameter. The speed indicated by parameter 11 is the same speed indicated by S61.

Note: The parameter 11 value for the DTE speed does not correspond to the same value for S61 for the same DTE speed (see S61).

Table 12-17: DTE Binary Speed

Value	Description
2	300 bits / sec
3	1200 bits / sec
12	2400 bits / sec
13	4800 bits / sec
14	9600 bits / sec
15	19200 bits / sec
16	38400 bits / sec

Parameter 12: Flow Control of PAD by Local DTE

Parameter 12 specifies whether the DTE is allowed to flow control the PAD. Flow control of the PAD is handled in conjunction with S-register 54 (DCE flow control). The type of flow control the PAD recognizes depends on the setting of S54. For example, if S54 is set for CTS flow control, the PAD is flow controlled when CTS is off, and resumes transmitting data when CTS is on. If all of the DCE flow control options are disabled (default), the PAD recognizes XON (Ctrl Q) and XOFF (Ctrl S) as the method of flow control. The DTE flow control of the PAD is possible if parameter 12 is set to 1 and the PAD is in the data transfer mode.

Table 12-18: PAD Flow Control by Local DTE

Value	Description
0	Disabled DTE flow control of the PAD
1	Enabled DTE flow control of the PAD *

**default*

Note: The flow control off condition is canceled when the PAD leaves the data transfer mode. The flow control off condition does not exist when the PAD enters the data transfer mode.

Parameter 13: Line Feed Insertion after Carriage Return

Parameter 13 specifies if, and under what conditions, a line feed character is inserted in the data stream by the PAD after a carriage return when the PAD is in the data transfer mode. Enabled, the line feed insertion only applies to carriage returns transmitted to and / or received from the local DTE during the PAD data transfer mode. The format effector (carriage return and line feed) of a service signal is not subject to line feed insertion after the carriage return since service signals are not transmitted in the PAD data transfer mode, but are transmitted in the PAD command mode.

Table 12-19: Line Feed Insertion

Value	Description
0	No line feed insertion.
1	Insert line feed after carriage return in the data stream received by the local DTE.
2	Insert line feed after carriage return in the data stream from the local DTE. The line feed is placed in the PAD buffer and can be edited if parameter 15 (editing) is enabled.
4	Insert line feed after echo of carriage return to the local DTE. If parameter 2 (echo) is disabled, this will not apply.

*Parameter 13 can be any added combination of the above values.
default = 5 (the added combination of values 4 and 1)*

Parameter 14: Padding after Line Feed

Parameter 14 specifies the number of padding (null) characters inserted after a line feed, which is transmitted or echoed to the local DTE. This provides the printing mechanism of the local DTE device time to physically complete the line feed (i.e., advance the printing head to the next line). Once complete, the PAD can resume sending data to the local DTE device without any data loss. When enabled, the insertion of the padding characters only applies to line feeds transmitted or echoed to the local DTE during the PAD data transfer mode.

Parameter 14 does not apply to line feeds that are part of a service signal format effector (carriage return and line feed). The format effector is transmitted as part of service signals when the PAD is in the PAD command mode. The format effector line feed transmitted to the local DTE is padded according to parameter 9.

Table 12-20: Padding After Line Feed

Value	Description
0	No padding after line feed *
1 to 255	Specifies the number of padding characters

* default

Parameter 15: Editing

Parameter 15 specifies whether editing of the currently stored PAD data characters is allowed while in the data transfer mode. Once the PAD data characters are forwarded, they can no longer be edited. Parameter 15 applies only to the data transfer mode because editing is always allowed in the PAD command mode (i.e., the PAD command can be edited before the user issues the PAD command delimiter carriage return or + character). Three editing functions are available:

- Character delete
- Line delete
- Line display

Table 12-21: Editing

0	Editing disabled in data transfer
1	Editing enabled in data transfer *

*default

Note: The editing characters are specified by parameters 16, 17, and 18. Parameter 19 specifies the response to the editing character by the PAD.

Parameter 16: Character Delete

Parameter 16 specifies the character delete character. When the PAD receives the character delete character from the local DTE device, the PAD deletes the last character contained in the PAD buffer (the last character received from the DTE). If service signals can be transmitted by the PAD (parameter 6 is not set to 0), the PAD transmits a character delete service signal to the DTE. The purpose of the character delete service signal is to delete the last character from the DTE device's display line. The format of the character delete service signal varies depending on the type of DTE device. Parameter 19 specifies the format of the character delete service signal for different DTE devices. If the PAD is in the PAD data transfer mode and editing (parameter 15) is not enabled, the character delete character is ignored by the PAD.

The function priority for duplicated characters (because of duplication of parameter assignments) follows the order of priority as specified for parameter 3.

Older DTE devices may not issue the character BS (08H) for character delete as expected. Parameter 16 must be set according to the character delete character the DTE device is transmitting to the PAD.

Table 12-22: Character Delete

Value	Description
0 to 126	One decimal character from the ASCII Character Table is used as the delete character (refer to Appendix F). If parameter 16 is set to 8, the character backspace (BS) can be used by the user to delete the last character stored in the PAD (i.e., the last character the PAD received from the local DTE).
127	Character DEL is used as the character delete character

default = ASCII decimal value 8 character BS

***Note:** Do not substitute a displayable ASCII character to initiate character delete. When used, a displayable character delete will delete both the initiating character and the object character. However, the monitor will continue to display the object character.*

Parameter 17: Line Delete

Parameter 17 specifies the line delete character. When the PAD receives the line delete character from the local DTE device, the PAD deletes the entire last line of characters contained in the PAD buffer that were transmitted to the PAD by the local DTE device. If service signals can be transmitted by the PAD (parameter 6 is not set to 0), the PAD transmits a line delete service signal to the local DTE device. This deletes the entire last line of characters from the DTE device's display. The format of the line delete service signal varies depending on the type of DTE device. Parameter 19 specifies the format of the line delete service signal for different DTE devices. Receipt of the line delete character is valid when the PAD is in the PAD data transfer mode and editing (parameter 15) is enabled, or the PAD is in the PAD command mode.

The function priority for duplicated characters (because of duplication of parameter assignments) follows the order of priority listed in the priority table provided for parameter 3.

Older DTE devices may not issue the character CAN (18H) for line delete as expected. Parameter 17 must be set according to the line delete character the DTE device is transmitting to the PAD.

Note: Do not substitute displayable ASCII characters for line delete. When used, a displayable line delete will cause the first character in the line to remain on the display even though the line buffer is indeed empty.

Table 12-23: Line Delete

Value	Description
0 to 23	One decimal character from the range 0 to 23 in the ASCII Character Table is used as the line delete character (refer to Appendix F).
24	Line delete character is CAN (18H) *
25 to 127	One decimal character from the range 25 to 127 in the ASCII Character Table is used as the line delete character (refer to Appendix F).

*default

Parameter 18: Line Display

Parameter 18 specifies the line display character. When the PAD receives the line display character from the local DTE device, the PAD sends the local DTE device the line display service signal. This transmit to the local DTE device the last entire line of characters the PAD received from the local DTE device. Receipt of the line display character is valid when the PAD is in the PAD data transfer mode and editing (parameter 15) is enabled or the PAD is in the PAD command mode.

The function priority for duplicated characters (because of duplication of parameter assignments) follows the order of priority listed in the priority table provided for parameter 3.

Table 12-24: Line Display

Value	Description
0 to 17	One decimal character from the range 0 to 17 in the ASCII Character Table is used as the line delete character (refer to Appendix F).
18	Line delete character is DC2 *
19 to 127	One decimal character from the range 19 to 127 in the ASCII Character Table is used as the line delete character.

*default

Parameter 19: Editing PAD Service Signals

Parameter 19 specifies whether editing service signals for the character delete (parameter 16) and line delete (parameter 17) are transmitted to the local DTE, and also specifies their formats. The line display (parameter 18) service signal is transmitted to the local DTE device, regardless of the parameter 19 setting.

For different local DTE devices, different editing service signals must be transmitted to the local DTE device. For example, a display terminal can display the character delete service signal as BS SP BS, which backspaces the cursor over the character to be deleted, inserts a space, and then moves the cursor back to the deleted character position. Because a printing terminal is not capable of physically removing the character to be deleted, the character delete service signal displays as a slash (/) on the printing terminal device. If parameter 6 (control of PAD service signals) is disabled, the value of parameter 19 is ignored.

Note: None of the service signals are transmitted to the local DTE display device if there are no characters stored by the PAD or parameter 6 is set to 0.

Table 12-25: Editing PAD Service Signals

Value	Description	
0	No editing PAD service signals. Line display service signals are transmitted to the DTE	
1	For edit character, the corresponding service signal is transmitted to the DTE printing device:	
	Edit Character	Service Signal
	Character Delete	/
	Line Delete	XXX CR LF
2	For edit character, the corresponding service signal is transmitted to the DTE display device: *	
	Edit Character	Service Signal
	Character Delete	BS SP BS
	Line Delete	Transmit total character number of BS SP BS
	Line Display	Display of last line of characters

*default

Parameter 20: Echo Mask

Parameter 20, in conjunction with parameter 2 set for character echo, specifies what characters are echoed by the PAD to the local DTE.

If parameter 20 bit 6 is set for echo of edit characters, but parameter 15 is set to 0 for no edit, the edit characters issued in the data transfer mode are not echoed. Also, since parameter 15 is set to 0 (no edit), no edit service signals are transmitted to the local DTE.

Table 12-26: Echo Mask

Value	Description
0	No echo mask
1	No echo of CR
2	No echo of LF
4	No echo of VT, HT, and FF
8	No echo of BEL and BS
16	No echo of ESC and ENQ
64	No echo of edit characters as designated by parameters 16, 17, and 18 *

Parameter 20 can be any added combination of the above values.

** default*

Parameter 21: Parity Treatment

Parameter 21 specifies whether the PAD should check parity in the data stream from the local DTE and/or generate parity in the data stream to the local DTE. The AT command **@P3** also allows parity checking to be enabled or disabled in the event that X.25 protocol is not in operation, and the protocol in operation is not capable of controlling parity checking. If X.25 is the active protocol, the setting of parameter 21 overrides the setting of the AT command **@P3**. The DTE word length and parity is automatically set when the terminal adapter receives an AT command prefix while in the AT command mode.

The PAD is only specified by CCITT to operate with 7 bit characters plus parity or 8 bit characters and no parity. If the user disables parity checking and generation, and the remote DTE disables parity checking and generation, be sure the remote DTE's parity is the same as the local DTE's parity. Otherwise, the incoming data transmitted to the local DTE is invalid; the remote DTE's parity will not be stripped and will not match the local DTE's parity.

Since the PAD is not specified for 8 bit characters plus parity, do not set the local DTE's parity to 8 bits plus parity. When the local DTE's parity is set to 8 bits plus parity, the data output to the DTE and the PAD service signals cannot be guaranteed to be correct.

If the remote DTE is not stripping the parity before transmitting the data to the local PAD, the local PAD may not recognize the LF and CR characters (depending on the parity) for line feed insertion and padding purposes.

Table 12-27: Parity Treatment

Value	Description
0	No parity checking or generation *
3	Parity checking and generation

*default

Parameter 22: Page Wait

Parameter 22 allows for the paging of data transmitted by the PAD to the local DTE. This parameter specifies the number of allowed line feeds to be transmitted by the PAD to the local DTE before the PAD suspends data transmission to the local DTE. When the specified line count of data has been transmitted to the local DTE, the service signal PAGE is delivered to the local DTE to notify the user that the data is being displayed in page mode. Note that no service signal is transmitted to the local DTE if parameter 6 (control of service signals) is set to 0. No more data is delivered to the DTE until the user sends the XON (Ctrl Q) character to cancel the page wait condition. Upon cancellation of the page wait condition, the PAD resumes the transmission of data to the local DTE until the specified line feed count is reached again.

The page wait condition can be canceled by issuing the XON character; however, there are certain situations that can occur that would cause the PAD to automatically cancel the page wait condition. These are:

- After the echoing of a line feed that was input by the user. If the echo parameter (parameter 2) is not enabled, the page wait will not be canceled.
- After the line deleted PAD service signal (and all its associated line feeds) have been transmitted to the local DTE.
- Upon leaving the PAD command mode after all the associated line feeds.
- Upon receipt of a data forwarding condition. For example, if parameter 3 (selection of data forwarding character) designates carriage return as the data forwarding character, when a carriage return is received from the local DTE, the page wait is canceled and the data currently stored by the PAD is forwarded.

Note: If parameter 6 (control of PAD service signals) is set to 0 (no PAD service signals) and parameter 22 (page wait) is enabled, the page wait service signal will not be transmitted to the local DTE. However, when the number of line feeds specified in parameter 22 transmitting data to the local DTE anyway. To resume the transmission of data, an XON must be transmitted to the PAD by the user, or any of the above page wait cancellation conditions must occur.

Table 12-28: Page Wait

Value	Description
0	Page wait disabled *
1 to 255	Maximum page wait line feed character count. After this specified number of line feeds, the PAD suspends transmission of data to the local DTE and the PAD transmits the PAGE service signals. For display terminals, a page wait line feed count of 23 is commonly used.

**default*

Chapter 13 Softload

The optional softload feature lets you download new software into the TA through the local DTE port. The new software is stored in nonvolatile flash-programmable read-only memory devices (PROMS) and is retained even when the unit is powered down. This allows software updates and new features to be added to the TA without physically removing the unit from service.

The new software files are downloaded into the TA from the customer's host computer using the YModem-G file transfer protocol. Password protection prevents unauthorized software changes.

Note: If the softload feature is not present, the %PI, \$Q, \$Y=x, \$Y2=x, and \$T=x commands will return an ERROR message.

The softload feature does not interfere with normal TA operation, except for the swap command. While the softload is in progress the TA remains fully operational.

TA SOFTWARE ARCHITECTURE

The concepts of sets of software and how the TA's Central Processing Unit (CPU) use them are described below.

Software Sets

The TA has two sets of operational software: the active set and the alternate set. The TA operates from the active set and performs software downloads into the alternate set.

A swap command allows the user to swap software sets at any time. The active software becomes the alternate software, and vice versa. This swap also allows the unit to return to its previous version of software. The active software set selected is stored in a separate nonvolatile memory location and is retained even after powering down the unit.

Swaps to invalid software are prevented. If a power-up occurs in an invalid set of software, the TA automatically swaps to the alternate set of software.

Software Format

Updated software for the TA is provided on a standard PC-compatible 5.25" high-density floppy diskette. The host computer can be a PC on any other system capable of reading PC-formatted floppy disks and transferring files via YModem-G.

The TA software file contains an ASCII coded "header" which can be displayed to verify the software's product and version information before initiating the softload. On DOS based PCs, this can be accomplished with the "TYPE" command. For example, to view the header information of a file called TA.SL, enter:

```
TYPE TA.SL
```

A typical header might look like this:

```
METHOD: SOFTLOAD YGMS-1
```

```
PRODUCT: ISDN TA
```

```
BOARD ID: 4563672
```

```
CPU ID: 0
```

```
VERSION: 1CPT-D
```

TA Power-Up Sequence

When the TA is powered up, it tries to execute the current active set. The active set is stored in nonvolatile memory and is determined by the last swap command.

However, if the active set indicated by the nonvolatile memory selection is invalid, the TA will display a PROM ERROR message on the LCD and then attempt to execute the alternate set of software. This could occur if a softload session is aborted or a hardware failure occurs.

If a SELECTED PROM INVALID message appears, the unit will still operate, but possibly with an incorrect software set. The error message will remain on the LCD for approximately three seconds.

To clear the error, download the correct software, and then use the swap command to activate it. If this does not resolve the problem, the unit may require factory service.

If a FATAL ERROR occurs, the unit cannot operate and must be serviced. PROM ERROR messages are shown in Table 13-1.

Table 13-1: PROM Error Messages

LCD Message	Description
SELECTED PROM INVALID	The selected PROM is invalid (blank or last softload session failed). The TA is overriding the software selection and is executing from the alternate software set.
FATAL ERROR PROM INVALID	The selected PROM is invalid, and the alternate software set is also invalid. Normal operation is not possible.

SOFTLOAD OPERATION

The softload facility in the TA supports the following functions: set/display softload password, request softload version information (on both active and alternate sets), initiate softload, and swap to alternate software.

The LCD menu supports the softload operation and remains fully operational while the softload is in progress. The status can be displayed by selecting DIAGNOSTIC OPTIONS? and DISPLAY STATUS SOFTLOAD?.

The status messages are shown in Table 13-2.

Table 13-2: LCD Status Messages

LCD Status Message	Description
SOFTLOAD NOT INITIATED	The "not initiated" message will be displayed upon power-up before any softload activity has taken place.
SOFTLOAD IN PROGRESS	This message will be displayed after the softload has been successfully started. The message will be displayed as long as no problems occur with the softload.
SOFTLOAD COMPLETE	This message will be displayed after the successful completion of a softload.
SOFTLOAD FAILED	This message will be displayed after the softload fails for any reason. The error code can be viewed using the S59 command.

Softload operations must be initiated using the AT commands listed in Table 13-3.

Table 13-3: AT Softload Commands

Command	Operation
%P1	Display or set softload password
\$Q	Request softload version information
\$Y = x	Initiate softload with password x
\$Y2=x	Copy active Flash PROM to alternate Flash PROM
\$T = x	Swap to alternate software with password x

The commands are described on the following pages.

Set/Display Softload Password: %P1

A password must be entered to perform softload and swaps. The %P1 command is used to display or change the softload password. Any password changes must be made from the local DTE.

Softload

The password, stored in nonvolatile memory, consists of zero to eight alphanumeric digits. Leading zeros are significant. The password may also be disabled, preventing any softload operations except inquiries.

By default, the softload password is set to null. It is recommended that the softload password be changed when initially configuring the unit in order to prevent accidental or unauthorized softload attempts. The softload password commands are listed in Table 13-4.

Table 13-4: Softload Password Commands

Command	Operation
%P1?	Display softload password.
%P1 = x	Set softload password to x, where x is 0-8 alphanumeric digits.
%P1 = D	Disable the softload function.

Request Softload Product Version Information: \$Q

The \$Q command returns the product code, the version number of the active software, and the version number of the alternate software. It can provide a positive verification of the success of a softload operation, and indicates which software set is currently active.

A typical response to the \$Q command might be:

PRODUCT NUMBER: 4563672

ACTIVE SOFTWARE: 1D

ALTERNATE SOFTWARE: 1B

If the alternate software set contained any software versions that were invalid, the word INVALID would appear instead of a version code. A software set that is invalid cannot become the active software set.

If the \$Q command returns the ERROR message, the TA does not support the optional softload feature.

Note: Before initiating softload, configure both the local DTE host computer and the local TA for a hardware (out-of-band) flow control method (e.g. RTS/CTS). Do not use software flow control (XON/XOFF), since the softload software files contain XON/XOFF characters that would be misinterpreted as flow control characters.

Initiate Software Download: \$Y=x

The \$Y command initiates a softload into the alternate software set. This command requires the softload password previously set by the %P1 command. If the password does not match the unit's stored password, the TA will return an ERROR message.

If the password matches, the TA begins by displaying the softload method ID. This ID code must match the softload method ID of the new software to be loaded.

After displaying the method ID, the TA begins erasing the Flash memory devices for the alternate software set. If the erasure is successful, the TA returns a READY message and enters the YModem-G receive mode.

At this point, the TA is ready to accept a softload using the YModem-G file transfer protocol. The TA sends the YModem-G initiation character (G) until the DTE begins sending YModem-G frames. If no frames are received within two minutes, the TA will time out, send an ERROR message, and return to the AT command mode.

The YModem-G transfer should send one file. During the transfer, the TA may issue flow control requests to pace the DTE's sending of data.

After the file has been transferred, the TA verifies that the file has been received and programmed correctly. The TA then sends a response code (OK or ERROR) to the DTE indicating the success or failure of the entire softload.

If an error occurs during the transfer, or if the host fails to respond to the YModem-G initiation requests, the TA returns with an ERROR message. In this case, the alternate software is marked as INVALID to prevent a swap attempt.

If an error occurs during the softload, the TA attempts to cancel the YModem-G transfer by sending a series of ASCII CAN characters (18 hex). It then returns to the AT command mode, echoing any characters received from the DTE. Depending upon when the host recognizes the cancel sequence, the host may begin to display the echoed softload characters on its screen. The DTE may also abort the transfer by sending 2 or more CAN characters between YModem-G frames.

An example of a typical softload session is provided at the end of this chapter.

Softload

Copy Active Flash: \$Y2=x

The \$Y2 command initiates a softload into the alternate software set. The source of the softload is the active software instead of a downloaded file. This command requires the softload password previously set by the %P1 command. If the password does not match the unit's stored password, the TA will return an ERROR message.

After verifying the password, the TA begins erasing the Flash memory devices for the alternate software set. If the erasure is successful, the TA begins programming the alternate Flash PROM.

After the data has been transferred, the TA verifies that the flash has been programmed correctly. The TA then sends a response code (OK or ERROR) to the DTE indicating the success or failure of the entire copy.

S59 SOFTLOAD

To help determine the cause of any problems encountered during a softload, the TA can return a result code via the S59 command to indicate the status of the latest softload. The error codes (Tables 13-5 and 13-6) indicate the success or reason for failure of softload operations. They are not retained after power off, reset, or successful swap. S59 is a read-only command, and is not stored in nonvolatile memory.

Table 13-5: General Softload Error Codes

Code	Hex	Description
0	00H	Softload not initiated or incomplete
16	10H	Done, OK
128	80H	Bad softload password
193	C1H	YModem-G initial time-out error
194	C2H	YModem-G inter frame time-out error
195	C3H	YModem-G between frame time-out error
196	C4H	YModem-G invalid frame number
197	C5H	YModem-G CRC error
198	C6H	YModem-G invalid file size error
199	C7H	YModem-G premature end of file
200	C8H	YModem-G cancel received (abort)

Table 13-6: CPU Softload Error Codes

Code	Hex	Description
81	51H	Softload file header too long (EOF char not found)
82	52H	Invalid softload file - missing or bad method ID
83	53H	Invalid softload file - no CPU ID
84	54H	Invalid softload file - bad CPU ID
85	55H	Duplicate softload file
86	56H	Missing softload file
97	61H	Bad softload file record length
98	62H	Bad softload file record type
99	63H	Bad softload file frame address
100	64H	Bad softload file frame offset
101	65H	Data before softload file begin record
102	66H	Duplicate softload file begin record
103	67H	Softload file end record before begin record
104	68H	Premature end of softload record
105	69H	Bad softload file checksum
106	6AH	Premature end of softload file
113	71H	Flash PROM erase error
114	72H	Flash PROM program error
115	73H	Flash PROM ID error
116	74H	Flash PROM checksum error
117	75H	Flash Time-out Error
118	76H	Flash Word Boundary Error
119	77H	Unknown Memory Type (Flash, EPROM, unknown)
120	78H	Unit set for EPROM
121	79H	Softload In Progress On Other Port
122	7AH	Copy Flash Failed

Swap to Alternate Software: \$T=x

The \$T command initiates a swap to the alternate set of software. If successful, the alternate software becomes the active software, and vice versa. The TA will automatically perform a reset to reinitialize the new software after the swap.

A softload password must be provided with the \$T command. If the password does not match the unit's stored password, the TA will return an ERROR message.

Before the TA attempts the swap, it first verifies that the alternate set of software is valid. An extensive set of tests must be passed during and after softloading. In order for the TA to allow a software swap the following conditions must be met:

- The previous software load was complete and successful.
- The software is loaded in the correct format.
- The software is for the correct product.
- The software version information is correct.
- The checksum of the software matches its stored checksum value.

If any of the above conditions is not met, then the alternate software is marked as invalid and the TA returns the ERROR message. If all verification checks pass, it returns OK and proceeds with the swap. The swap forces the TA to reset and reinitialize with the new software; this takes about 10 seconds. Note that the OK message is returned before the swap and reset are performed; to verify that the swap was actually successful, use the \$Q command to request the software version.

When the swap command is executed, the TA automatically stores the selection of active software in nonvolatile memory.

Note: Depending upon the changes implemented in the software, one or more parameters in the TA's stored profile may be reset following a swap command.

TYPICAL LOCAL SOFTLOAD SESSION

The following example demonstrates a typical softload session from a local host. The host computer in this example is a PC-compatible computer running a typical communications package.

The steps in performing a softload transfer and swap are:

1. Check the distribution floppy diskette that contains the file to be downloaded. There should be a file called README.TXT that describes the software contained on the floppy and gives the name of the actual softload file. Normally, softload files for the UTA220 are named UTA220.SL.

2. To be sure that the software in the file is correct, display the file on the host computer (be careful not to modify it). At the top of each file is a header (ASCII format) containing the product and version information for the softload file. If the host is a PC-compatible, the easiest way to do this is to enter:
TYPE filename
where filename is the name of the softload file to display.
3. Load the file to be downloaded to the TA onto the host computer hard disk before downloading (this significantly decreases the download time).
4. Connect the PC to any of the TA's DTE port(s). Begin executing the communications software package on the host.
5. Configure the host software for: 19200 bps full-duplex asynchronous operation, 8-bit characters with no parity, and RTS/CTS flow control of the DTE.
6. Using the terminal emulation mode on the host, send an AT command to the TA. The TA should respond with OK.
7. Configure the TA for RTS/CTS flow control, using either the keypad on the front panel or the AT&K3 command.
8. Check the version numbers of the current software on the TA to verify that it is to be downloaded into the correct alternate set. Enter AT\$Q. The TA should respond with the version codes for both the active and alternate set.
9. Initiate Softload. Enter the AT\$Y=x (where x is the softload password). The TA responds with either ERROR (if the password is invalid) or the softload method banner (SOFTLOAD YGMS-1). This banner identifies the download method and file format. The TA then begins to erase the Flash memory for the alternate set so that the new software can be downloaded.
10. When the erase is complete, the TA returns YModem-G initiation characters (G). This indicates that the TA is ready to receive the YModem-G frames containing the new software.
11. Initiate the YModem-G file upload mode on the host computer. Upload only the ".SL" file to the TA; do not attempt to send any other type of file. The transfer takes approximately 3.5 minutes at 19200 bps.
12. If any errors are encountered during the file transfer attempt, set the host back up for the terminal emulation mode and enter AT\$59? to display the softload error code.
13. After the YModem-G file transfer is complete, the TA verifies the new software. This takes about 10 seconds. If the software has been transferred and programmed correctly, the TA returns an OK message to the DTE; otherwise it returns ERROR.

Softload

14. After successful completion of the softload, the alternate memory now contains the new downloaded software. To verify this, return to the terminal emulation mode on the host and enter AT\$Q to display the software version codes. The code of the alternate software set should match the code contained in the header of the downloaded file.

15. The user can swap and operate using the new alternate software now or at a later time. To perform the swap, enter AT\$T=x where x is the softload password. The TA returns either OK (indicating a swap is imminent) or ERROR (indicating a bad password or invalid alternate software set). The TA resets and reinitializes after implementing the swap.

16. To verify that the swap has occurred, enter AT\$Q.

Chapter 14 Diagnostics

COMMUNICATION DIAGNOSTICS

Communication diagnostic tests verify that the UTA220, the DTE, the NT1, the central office switch, and the remote unit are operating correctly. These tests can help determine the source of a fault down to a particular element responsible for it.

GLOBAL TESTS

Communication tests are initiated and terminated via the front panel under the GLOBAL TEST submenu of the DIAGNOSTIC OPTIONS menu. The following sections describe each of the diagnostic tests, when to use them, and what it means if they fail.

2B+D Loopback

This test sets the UTA220 up for a data integrity test that is run from the central office switch (Figure 14-1). This test causes the unit to loop data received from the ISDN on the D-channel and each B-channel back to the ISDN.

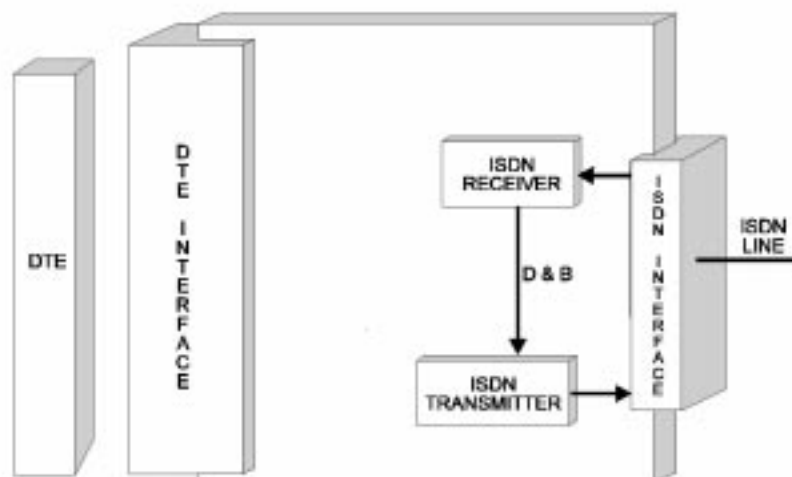


Figure 14-1. 2B+D Terminal Loopback Test

This is not a complete loopback; it is an echoing loopback where the D-channel loopback point is different from the B-channel loopback points.

PORT TESTS

Port communications tests are initiated and terminated via the front panel under the PORT TEST submenu of the DIAGNOSTIC OPTIONS. The following section describes each of the tests, when to use them and what it means if they fail.

Local Terminal Loopback

Local terminal (DTE) loopback loops data back to the DTE by connecting the TD and RD pins so that whatever the DTE sends is echoed back (Figure 14-2).

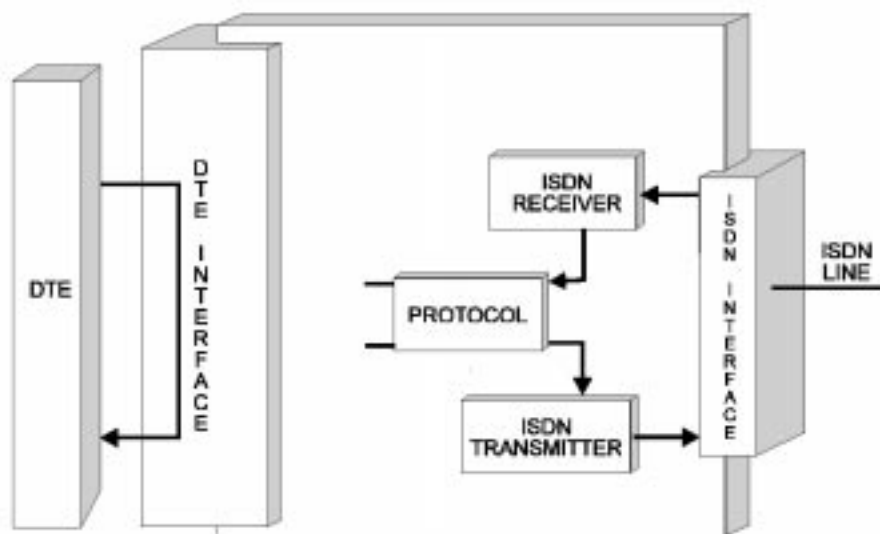


Figure 14-2. Local Terminal Loopback Test

To initiate the test, select LOCAL TERMINAL LOOPBK option from the PORT TEST submenu. The UTA220 may be on-line or off-line when the test is initiated. Any protocol, mode, and DTE rate can be used. The test is successful if the data is successfully echoed back to the DTE. A BERT device can be helpful in checking for data errors. This test verifies the operation of the DTE, the DTE cable, and the DTE interface of the UTA220.

Local Loopback Test

Local loopback loops data from the local terminal back to the terminal so that whatever the terminal sends is echoed back (Figure 14-3). Also the RTS pin is echoed on the CTS pin and the DTR pin is echoed on the DSR, DCD, and RI pins. Run this test if you are encountering data errors before and after data calls are placed. This test is useful in diagnosing the DTE and the UTA220.

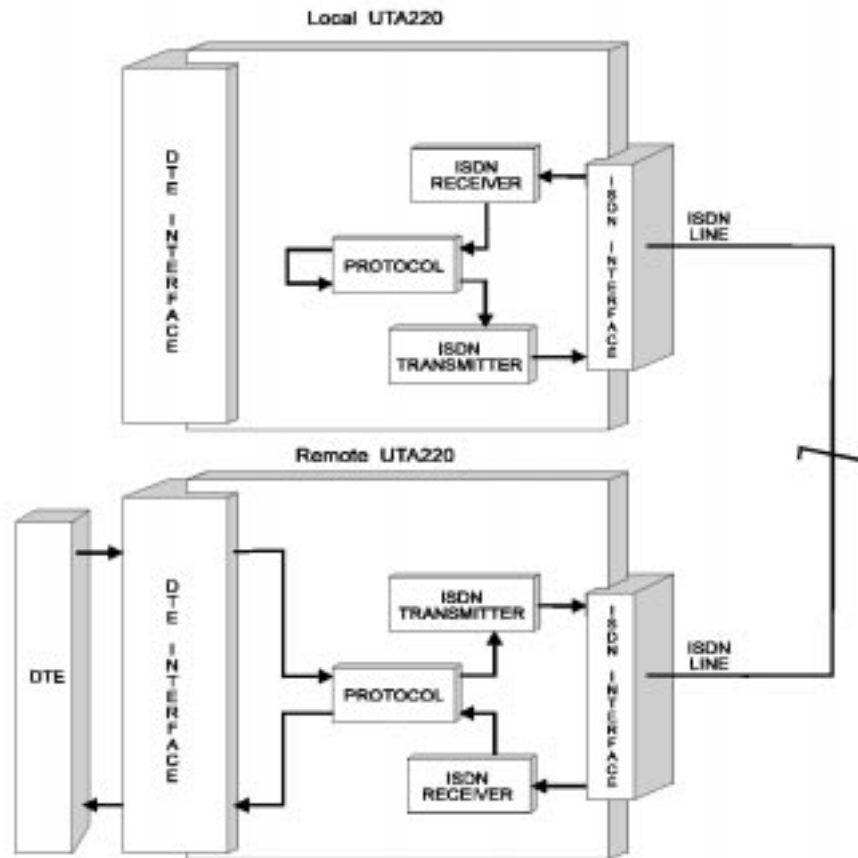


Figure 14-4. Digital Loopback Test

To initiate the test, select the DIGITAL LOOPBACK option from the PORT TEST submenu. The UTA220 must be on-line when the test is initiated (a call must be placed) before the unit can loop B-channel data. Any protocol, mode, and DTE rate may be used, although the protocol and DTE rates on the two units must be compatible. The remote unit should be set to the same rate adaptation protocol as the local UTA220, and left in normal data mode (NOT placed in Bilateral test mode). Data sent by the remote UTA220 will be received by the local UTA220, then echoed back to the remote UTA220. The test is successful if the data is correctly echoed back to the sender. A BERT device can be helpful in checking for data errors.

The test should be run in both directions if possible (i.e. use the local UTA220 as both the sending unit and as the loopback unit). If the B-channel data test is successful, it indicates that the local and remote units and network are functioning. If there are errors, the problem could be in any of those elements.

Bilateral Loopback Test

Bilateral loopback combines the functions of local loopback and digital loopback. Its loops data from the local terminal back to the terminal, so that whatever the terminal sends is echoed back (Figure 14-5). Also, it loops to where the ISDN B-Channel data normally sent to the local DTE. Any B-Channel data received by the UTA220 is processed by the rate-adaptation protocol, and then echoed back out the B-channel to the sending unit. This test is useful in diagnosing the DTE, UTA220, switch, ISDN line, and remote unit. Run this test if you are encountering data errors after a call is placed successfully.

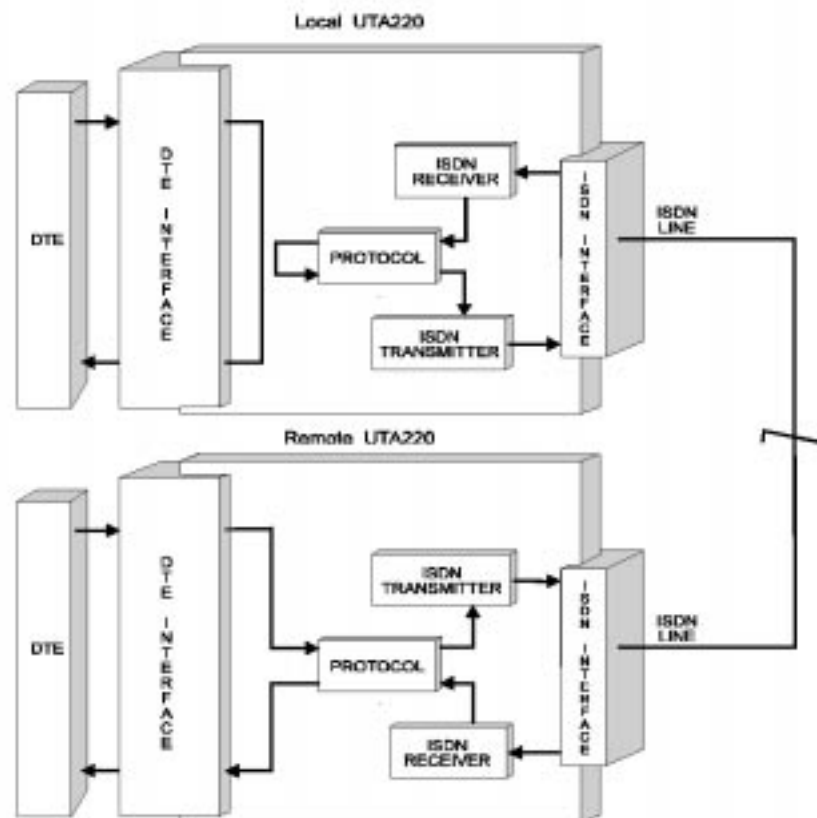


Figure 14-5. Bilateral Loopback Test

To initiate the test, select the BILATERAL LOOPBACK option from the PORT TEST submenu. The UTA220 can be on-line or off-line when the test is initiated but a call must be placed before the unit can loop B-channel data. Any protocol, mode, and DTE rate can be used, however, the protocol and DTE rates on the two units must be compatible. The remote unit should be set to the same rate adaptation protocol as the local UTA220 and left in normal data mode (NOT placed in Bilateral test mode). Data sent by the remote UTA220 will be received by the local UTA220 then echoed back to the remote UTA220. The test is successful if the data is successfully echoed back to the sender. A BERT device can be helpful in checking for data errors.

Also, data from the local DTE will be echoed back to the DTE. The DTE portion of the test verifies the operation of the DTE, the DTE cable, the DTE interface to the UTA220, and the data buffers in the UTA220.

The test should be run in both directions if possible (i.e., use the local UTA220 as both the sending unit and as the loopback unit). If the B-channel data test is successful, it indicates that the local and remote units and the network are functioning. If there are errors, the problem could be in any of those elements.

DIAGNOSTIC STATUS DISPLAY

The UTA220 LCD can display a status screen that provides diagnostic information concerning the state of the UTA220 and the link. The status displays are found under the DIAGNOSTIC OPTIONS menu and are described below.

Front Panel Keypad Test

This test allows you to verify the functioning of the front panel buttons. After this test is begun, press each key. The key legend will be displayed on the LCD when the key is pressed. The * (UTA220k) or "HOME" (UTA220) key ends the test.

View Product Information

Displays software checksum, self-check status, PC board number and the software revision code.

View Diagnostic Code

This display is for factory use.

Chapter 15 Maintenance

Warning: *Disconnect power before performing maintenance. Although dangerous voltage levels are not exposed, disconnecting power will ensure no electric shock hazard is present.*

The unit contains no internal electronic components that can be serviced or replaced by the user. Repairs should not be attempted by the user.

FUSE

If a fuse fails, replace it with one of equal rating. Repeated failure indicates a more serious problem.

MAINTENANCE

The unit provides maintenance free service. Periodically it is necessary to remove dust that has collected on internal components. Remove dust with a soft bristle brush and low pressure air or vacuum. Before attempting diagnostic tests, check that all connectors and plugs are firmly inserted. The test procedures will identify the faulty component in a bad communications link.

If the unit appears faulty, contact your Motorola representative. Do not return the unit without prior instructions.

ISDN Line Type

ISDN Basic Rate Interface

Connection Types

Circuit-switched (dial-up)

DTE Data Rates

300, 1200, 2400, 4800, 9600, 19.2k, 38.4k, 48k, 56k, 57.6k, 64k, 112k, 115.2k, 128k

DCE Data Rates

B-channel: 56 kbps or 64 kbps
D-channel: 16 kbps

Data Rate Adaption Protocols

Clear Channel
BONDING
V.120
T-Link

DTE Available Interfaces

EIA-232 (V.24), CCITT V.35, EIA-366A

Switch Compatibility

Northern Telecom DMS100 - Central office switch running software version BCS-29 or above

Layer 1 (physical): Conforms to CCITT I.430

Layer 2 (Link): Conforms to Northern Telecom specification NIS 208-4, Issue 1.1 section C, based on CCITT Recommendation Q.921

Layer 3 (Signaling): For BCS-29 and BCS-30, conforms to NIS 208-4, Issue 1.1, sections D-H. For BCS-31, -32, and -33 conforms to NIS 208-5, Issue 1.1 Section D-H. These are based on CCITT Recommendation Q.931. For BCS-34, conforms to National ISDN-1.

AT&T 5ESS - Central office switch running generic program 5E4.2, or above for type A terminal

Layer 1 (physical): Conforms to CCITT I.430

Specifications

Layer 2 (Link): Conforms to AT&T specification 5D5-900-311, December 1987, Part III, based on CCITT Recommendation Q.921

Layer 3 (Signaling): For 5E4.2, conforms to 5D5-900-301, Issue 1.04, September 1987, Parts IV - VI. For 5E5, conforms to 5D5-900-311, Issue 1.00, December 1987, Parts IV - VII. For 5E6 and 5E7, conforms to 5D5-900-321, Issue 1.02, September 1990, Parts IV - VII. These are based on CCITT Recommendation Q.931. For 5E8, conforms to National ISDN-1.

US National ISDN One - Central office switches, as described in Bellcore Special Report SR-NWT-001953, Issue 1, June 1991, and Revision 1, December 1991

Supplementary Services

The UTA220 does not support any supplementary data services, nor does it support Electronic Key Telephone Service (EKTS).

Dimensions

Width	6.95 inches	(17.65 cm)
Height	2.22 inches	(5.69 cm)
Depth	9.98 inches	(25.35 cm)

Environmental

0° to + 50° C

95% relative humidity, noncondensing

Power Requirements

115 Vac <Insert equation here> 10%, 60 Hz; or 230 Vac <Insert equation here> 10%, 50/60 Hz for applicable models

Power Consumption

6 watts nominal

Appendix B Factory Default Settings

Table B-1: UTA 220 Default Parameter Options

Global Parameters	
Front Panel Lock	Unlocked
ISDN	64 kbps
Switch Parameters	
Switch Type	National ISDN
Switch Version	National ISDN-1
B1-Channel Provision	None
B2-Channel Provision	None
D-Channel Provision	None
Port 1-4 X.25 TEI	Disabled
Port #1 Data TEI	Auto
Port #2 Data TEI	Auto
Port #3 Data TEI	Disabled
Port #4 Data TEI	Disabled
Port #1-4 SPID	NULL
Port #1-4 Directory Number	NULL
Port Parameters	
DTE Sync Mode	Asynchronous
DTE Speed	38.4 kbps
DTE Parity	Even
DTE Number of Data Bits	7
DTE Number of Stop Bits	1
DTE Dialer Option	AT
DTE Guard	Disabled
DTR Pin Option	Ignore DTR
DSR Pin Option	DSR Always On

Factory Default Settings

Table B-1: UTA 220 Default Parameter Options (Continued)

DCD Pin Option	Always On
CTS Pin Option	CTS follows RTS
Protocol Option	V.120
Auto Answer	On
S Reg #0: Rings Until Answer	1
S Reg #2: Escape Character	43
S Reg #3: Carriage Return Character	13
S Reg #4: Line Feed Character	10
S Reg #5: Backspace Character	8
S Reg #7: Wait for Connect	30, Units = seconds
S Reg #10: DCD Drop Time	0, Units = 1/10 second
S Reg #12: Guard Time	50, Units = 1/50 second
S Reg #25: DTR Detect Time	5, Units = 1/100 second
S Reg #26: RTS to CTS Time	1, Units = 1/100 second
Originate Option	Originate Normal
Answer Option	Answer Normal
Local Echo	On
Status Displays	On
Verbose Display	Verbose
Connect Message Setting	All Messages
Flow Control	No Flow Control
Reset Flow Control	Disabled
Powerup User Profile	Profile 0
Dialing Method	ENBLOC
Telephone Numbers 1-10	NULL
Echo Disable Tone	Off
V.120 Maximum Transmit Frame Size	256
V.120 Maximum Receive Frame Size	256
V.120 Window Size	8
V.120 T200 Retransmit Timer	1

Table B-1: UTA 220 Default Parameter Options (Continued)

T-Link DTR	Normal
T-Link RTS	Normal
T-Link Negotiation	Enabled
Bonding Rate Multiplier	2
Bonding Secondary Call Port	2

Factory Default Settings

Appendix C

AT Command Set

Table C-1: UTA 220 AT Command Set

Command	Description	Value
Global Commands: Action		
>Tn	Test Modes	n = 0 End Test 4 2B+D Loopback
>C	Control Mode Exit	
>Cp	Control Mode on Port p	p = 0 Control Mode Exit 1 Control Port 1 2 Control Port 2 3 Control Port 3 4 Control Port 4
>F=	Reload Global	
>Ln	Front Panel Lock Level	n = 0 Unlocked <default> 1 Option Locked 2 Option/Actions Locked
>W=	Store Global	
>V=	View Global Parameters	G View Global Parameters C View Directory Numbers, SPIDs, and TEIs
>Z=	Restart Network	
%Z1	Restart UTA	
Z9	See >Z	
&F9	See >F	
&W9	See >W	
Global Commands: Miscellaneous Configuration		
>Fn	See >Ln	
Global Commands: Switch Configuration		
!C0=	Switch Type Changing this parameter changes all !B, !C parame- ters to factory default.	0 AT&T 5ESS 1 Northern Telecom DMS-100 2 National ISDN <default>
<p>*Note: "by port" indicates that these switch parameters are associated with a particular port. However, this does not exclude ports from sharing the same SPID or TEI.+</p>		

Table C-1: UTA 220 AT Command Set (Continued)

Command	Description	Value
!C1=	Switch Software Version	!C0=0 0 AT&T Point-to-Point 1 AT&T Multi-Point !C0=1 2 DMS100 PVC IC-0 3 DMS100 PVC IC-1 !C0=2 4 National ISDN 1 <default>
!C2=	SPID (by port)*	Range: 0-20 characters default (null string)
!C3=	D-Channel Provisioning	0 None <default> 1 X.25
!C4=	B1-Channel Provisioning	0 None <default> 9 Permanent
!C5=	B2-Channel Provisioning	0 None <default> 9 Permanent
!N=	Directory Number (by port)*	Range: 0-20 characters (0-9,#,*) default (null string)
Channel Parameters: LAPD		
!D0=	SAPI-16 X.25 TEI (by port)	Range: 0-63, 255 (auto), 127 (disable) default (127)
!D1	SAPI Parameter Negotiation	0 Disable 1 Enable <default>
!D3=	SAPI-0 data TEI (by port)*	Range: 0-63, 255 (auto), 127 (disable) default (255)
Channel Parameters: X.25 Provisional D-Channel		
!X0=	Receive Window Size Default	Range: 1-7 default (2)
!X1=	Transmit Window Size Default	Range: 1-7 default (2)
!X2=	Receive Window Size Default	Range: 7-8 default (8)
!X3=	Transmit Window Size Default	Range: 7-8 default (8)
*Note: "by port" indicates that these switch parameters are associated with a particular port. However, this does not exclude ports from sharing the same SPID or TEI.+		

Table C-1: UTA 220 AT Command Set (Continued)

Command	Description	Value
!X4=	Number of Permanent Virtual Circuits	Range: 0-255 <i>default (0)</i>
!X5=	Number of Incoming Logical Channels	Range: 0-255 <i>default (0)</i>
!X6=	Number of Two-Way Logical Channels	Range: 0-255 <i>default (8)</i>
!X7=	Number of Outgoing Logical Channels	Range: 0-255 <i>default (0)</i>
!X8=	X.25 Sequence Number Modulus	Range: 8, 128 <i>default (8)</i>
Port Commands: Configuration		
En	Local Echo Off	n = 0 Echo Off 1 Echo On <i><default></i>
Qn	Status Displays	n = 0 Status On <i><default></i> 1 Status Off 2 Status Off during answer mode
Vn	Verbose	n = 0 Numeric 1 Verbose <i><default></i>
Wn	Carrier/Protocol Result Codes	n = 0 Disables <i><default></i> 1 Enables
Xn	Connect Messages	n = 0 Enable Result Code 0-4 1 Enable 0-5, 10-15, 17-19, 28, 32 2 Enable 0-5, 10-15, 17-19, 28, 32 3 Enable 0-5, 7, 10-15, 17-19, 28, 32 4 Enable 0-5, 7, 10-15, 17-19, 28, 32
S0=	Rings Until Answer	Range: 0-255 <i>default (1)</i>
S1?	Ring Count (Read Only)	Range: 0-255 <i>default (0)</i>
S2=	Escape Character	Range: 0-127 <i>default (43)</i> Range: 128-255 Disabled
S3=	Carriage Return Character	Range: 0-127 <i>default (13)</i>
<p>*Note: "by port" indicates that these switch parameters are associated with a particular port. However, this does not exclude ports from sharing the same SPID or TEI.+</p>		

AT Command Set

Table C-1: UTA 220 AT Command Set (Continued)

Command	Description	Value
S4=	Line Feed Character	Range: 0-127 <i>default (10)</i>
S5=	Back Space Character	Range: 0-32, 127 <i>default (8)</i> Range: 33-126, 128-255 Disabled
S7=	Wait for Connection	Range: 0-255 <i>default (30)</i> Units = Seconds
S10=	DCD Drop Time	Range: 0-255 <i>default (0)</i> Units = 1/10 seconds
S12=	Guard Time	Range: 0-255 <i>default (50)</i> Units = 1/50 seconds
S25=	DTR Detect Time	Range: 0-255 <i>default (5)</i> Units = 1/100 seconds
S26=	RTS to CTS Time	Range: 0-255 <i>default (1)</i> Units = 1/100 seconds
&Cn	Data Carrier Detect	n = 0 Always On < <i>default</i> > 1 Tracks Connection (async only) 2 Always except during S10 disconnect (async only)
&Dn	Data Terminal Ready (DTR)	n = 0 Ignore DTR (async/sync) < <i>default</i> > 1 Recall ACU (async only) 2 Hangup-auto answer disabled while DTR down (async only) 3 Hangup - reload parameters (async only) 9 DTR Dial (async only)
&Kn	Flow Control (parity ignored)	n = 0 None < <i>default</i> > 3 Bi-directional RTS/CTS 4 Bi-directional XON/XOFF 5 Transparent bi-directional flow control (not supported)
<p>*Note: "by port" indicates that these switch parameters are associated with a particular port. However, this does not exclude ports from sharing the same SPID or TEI.+</p>		

Table C-1: UTA 220 AT Command Set (Continued)

Command	Description	Value
&Ln	Persistent DTR Dialing	n = 0 Disabled 1 Enabled
&Qn	Sync Mode	n = 0 Async <default> 1 Sync - DTR disc delay (S25) 2 Sync - DTR dialing (auto answer disabled while DTR down)
&Rn	Clear to Send (CTS)	n = 0 CTS follows RTS <default> 1 CTS always on when on-line
&Sn	Data Set Ready (DSR)	0 DSR always on <default> 1 DSR on after protocol installed except test modes
&Yn	Select Powerup User Profile (saved to non-volatile immediately)	n = 0 Select Stored Profile 0 upon power up <default> 1 Select Stored Profile 1 upon power up
&Zn	Store Telephone Number	n = 0-9 0-40 characters (0-9,#,*)
\Qn		n = 0 Disable flow control <default> 2 Enable unidirectional CTS flow control 3 Enable bidirectional RTS/CTS flow control 4 Enable bidirectional XON/XOFF flow control 5 Transparent flow control 6 Enable unidirectional XON/XOFF flow control
%A2=	Protocol	0 None - Clear Channel 1 TLink 2 V.120 <default> 3 Bonding
<p>*Note: "by port" indicates that these switch parameters are associated with a particular port. However, this does not exclude ports from sharing the same SPID or TEI.+</p>		

AT Command Set

Table C-1: UTA 220 AT Command Set (Continued)

Command	Description	Value
%A4=	Line Channel Speed	0 64 kbps <default> 1 56 kbps
%A96=	Echo Disable Tone	0 Off <default> 1 On
%A97=	Dialing Method	O Overlap E Enbloc <default>
%A98=	Originate Mode	N Normal <default> V Voice
%A99=	Answer Mode	N Normal <default> V Voice
@G=	DTE Guard Mode	D Disabled <default> E Enabled
@P1=	Dialer Commands	N None A AT <default> VB V25bis BYSYNC VH V25bis HDLC E EIA-366
@P2=	DTE Speed	Note: Speed can be entered as a code or a bit rate. The bit rate value displays. 3 300 5 1200 6 2400 7 4800 9 9600 12 19200 13 38400 <default> 32 48000* 17 56000* 18 57600* 19 64000* 20 112000* 22 115200* 21 128000* * disables Autobaud
@P3=	Parity	N None O Odd E Even <default> M Mark
@P4=	Number of Data Bits	Range: 7-8 <default is 8>
<p>*Note: "by port" indicates that these switch parameters are associated with a particular port. However, this does not exclude ports from sharing the same SPID or TEI.+</p>		

Table C-1: UTA 220 AT Command Set (Continued)

Command	Description	Value
@P6=	Number of Stop Bits	0 One <default> 1 One and One-Half 2 Two
Port Commands: Action		
A	Answer	
D	Dial	S = n Dial stored Number n 0-9,#,* Digits ; Return to on-line command mode (ATO dial)s P,T,W Ignored
H	Hangup	
In	Information	n = 0 Product ID ("960") 1 ROM Checksum 2 Checksum Verification 3 Revision ("4563672-1NRPT3 C34A PASS") <board#>-<software> <checksum> <PASS/FAIL>
I4	Numeric Capability String	
I8	Verbose Capability String	
I9	Plug-and-Play ID	
I10	ISDN Link Status	
I11	Port Status	
I12	User-definable Device ID	
On	Return On-Line	n = 0 Return On-Line 1 Return On-Line
Zn	Reload Port from non-volatile set n	n = 0, 1
&Fp	Load Port from factory profile p	p = 0, 1
<p>*Note: "by port" indicates that these switch parameters are associated with a particular port. However, this does not exclude ports from sharing the same SPID or TEI.+</p>		

Table C-1: UTA 220 AT Command Set (Continued)

Command	Description	Value
&Tn	Test Modes	n = 0 End Test 1 Local Loop-back 3 Digital Loop-back 9 Local Terminal Loopback 8 Bilateral Loopback
&V=	View Parameters	E Port V.120 T Port TLink Z Stored Telephone Numbers
&Wn	Store port to non-volatile set n	n = 0, 1
Port Commands: V.120 (B-Channel only)		
%E0=	Maximum Transmit Frame Size	Range: 1-260 <i>default (260)</i>
%E1=	Maximum Receive Frame Size	Range: 1-260 <i>default (260)</i>
%E2=	Window Size	Range: 1-127 <i>default (8)</i>
%E3=	T200 Transmission timer	Range: 1-255 <i>default (5)</i>
%E7=	Protocol Option	0 Transparent to all bits (SYNC/ASYNC) according to &Q 1 Use protocols (SDLC) < <i>default</i> >
%E9=	Information Frame Selection	0 Use I Frames < <i>default</i> > 1 Use UI Frames
Port Commands: TLink (B-Channel Only)		
@T0=	Echo	E Enabled D Disabled < <i>default</i> >
@T1=	DTR	A Assert N Normal < <i>default</i> >
@T2=	RTS	A Assert N Normal < <i>default</i> >
@T3=	Negotiation	E Enabled < <i>default</i> > D Disabled
<p>*Note: "by port" indicates that these switch parameters are associated with a particular port. However, this does not exclude ports from sharing the same SPID or TEI.+</p>		

Table C-1: UTA 220 AT Command Set (Continued)

Command	Description	Value
	Session Parameters: X.25	
%B0=	Receive Window Size	Range: 0-8 <i>default (0)</i>
%B1=	Transmit Window Size	Range: 0-8 <i>default (0)</i>
%B2=	Receive Packet Size	Range: 0, 7-10 <i>default (0)</i>
%B3=	Transmit Packet Size	Range: 0, 7-10 <i>default (0)</i>
%B5=	Permanent Virtual Circuit (PVC)	0 Non-PVC < <i>default</i> > 1 PVC
%B6=	Logical Channel Number	Range: 0-255 <i>default (1)</i>
%B7=	D-bit Confirmation	0 Disabled < <i>default</i> > 1 Enabled
%B8=	Closed User Group (CUG) Option	0 No CUG selected < <i>default</i> > 1 Basic CUG 2 CUG with outgoing access 3 Bilateral CUG
%B9=	Closed User Group Name	Range: 0-4 digits <i>default (null string)</i>
%B10=	Reverse Charging Option	0 Normal Call Charging < <i>default</i> > 1 Reverse Call Charging
%B11=	Receive Through Input Class	0 Use network default < <i>default</i> > 1 Reserved 2 Reserved 3 75 4 110 5 300 6 600 7 1200 8 2400 9 4800 10 9600 11 19200 12 48000 13 64000 14 Reserved 15 Reserved
<p>*Note: "by port" indicates that these switch parameters are associated with a particular port. However, this does not exclude ports from sharing the same SPID or TEI.+</p>		

AT Command Set

Table C-1: UTA 220 AT Command Set (Continued)

Command	Description	Value
%B12=	Transmit Through Input Class	0 Use network default <i><default></i> 1 Reserved 2 Reserved 3 75 4 110 5 300 6 600 7 1200 8 2400 9 4800 10 9600 11 19200 12 48000 13 64000 14 Reserved 15 Reserved
%B13=	Network User ID	Range: 0-16 characters <i>default (null string)</i>
%B14=	RPOA	Range: 0-16 characters <i>default (null string)</i>
%B15=	Called Line Address Modification Code (Caller, Read Only)	0 Call not redirected <i><default></i> 1 Called station was busy 7 Call distribution within a hunt group 9 Called station was out of order 15 Systematic call redirection by called station <i>Not saved in non-volatile. Initialized to factory defaults before each virtual call.</i>
%B16=	Called Redirection Notification Code (Called, Read Only)	0 Call not redirected <i><default></i> 1 Called station was busy 9 Called station was out of order 15 Systematic call redirection by called station <i>Not saved in non-volatile. Initialized to factory defaults before each virtual call.</i>
%B17=	Intended Call Address	Range: 0-15 digits <i>default (null string)</i>
%B18=	User Data	Range: 0-12 characters <i>default (null string)</i>
<p>*Note: "by port" indicates that these switch parameters are associated with a particular port. However, this does not exclude ports from sharing the same SPID or TEI.+</p>		

Table C-1: UTA 220 AT Command Set (Continued)

Command	Description	Value
%B19=	Transmit Delay	Range: 1-65535 <i>default (0)</i> units = ms
%B20=	Reset Notice	0 Normal operation <default> (write only 0) 1 DTE originated 2 Local procedure error 3 Incompatible destination 4 Network congestion 5 Remote procedure error 6 Reset cause unknown <i>Not saved in non-volatile. User may clear. TA updates to normal at the beginning of X.25 call.</i>
%B99=	Packet Reset, Clear, Restart Timer	Range: 0-600 <i>default (180)</i>
%B98=	Packet Call Timer	Range: 0-600 <i>default (180)</i>
%B97=	Auto Accept Virtual Call	E Enabled<default> D Disabled
Session Parameters: X.3 PAD		
%L1=	PAD Recall Using a Character	0 None 1 DLE 32-126 <i>default (0,1,0)</i>
%L2=	Echo	0 No echo 1 Echo <i>default (0,1,0)</i>
%L3=	Selection of Data Forwarding Characters	0 None 1 A-Z, a-z, 0-9 2 <CR> 4 <ESC>, <BEL>, <ENQ>, <ACK> 8 , <CAN>, <DC2> 16 <ETX>, <EOT> 32 <HT>, <LF>, <VT>, <FF> 64 <NUL>, <SOH>, <STX>, <BS>, <SO>, <SI>, <DLE>, <DC1>, <DC2>, <DC3>, <DC4>, <NAK>, <SYN>, <ETB>, , <SUB>, <FS>, <GS>, <RS>, <US> <i>default (0,126,0)</i>
<p>*Note: "by port" indicates that these switch parameters are associated with a particular port. However, this does not exclude ports from sharing the same SPID or TEI.+</p>		

AT Command Set

Table C-1: UTA 220 AT Command Set (Continued)

Command	Description	Value
%L4=	Selection of Idle Timer Delay	Range: 0-255 <i>default (0,0,20)</i>
%L5=	Ancillary Device Control	0 Off 1 On in data transfer 2 On in data transfer and command <i>default (1,1,0)</i>
%L6=	Control of PAD Service Signals	0 Suppressed 1 All but prompt in standard format 5 All <i>default (0,1,0)</i>
%L7=	Action on receipt of break signal from DTE	0 None 1 Send an interrupt packet 2 Send a reset packet 5 Send interrupt and indication of break packets 8 Escape from data state 21 Send interrupt and indication of break packets and set %L8 to 1 <i>default (5,2,2)</i>
%L8=	Discard output to DTE	0 Normal Data Delivery 1 Discard output to DTE <i>default (0,0,0)</i>
%L9=	Padding after carriage return	Range: 0-255 <i>default (0,0,0)</i>
%L10=	Line Folding	Range: 0-255 <i>default (0,0,0)</i>
%L11=	DTE Speed	2 300 3 1200 4 600 12 2400 13 4800 14 9600 15 19200 16 38400 <i>default (16,16,16)</i>
%L12=	Flow Control of the PAD	0 Off 1 Use \Q <i>default (0,1,0)</i>
<p>*Note: "by port" indicates that these switch parameters are associated with a particular port. However, this does not exclude ports from sharing the same SPID or TEI.+</p>		

Table C-1: UTA 220 AT Command Set (Continued)

Command	Description	Value
%L13=	Line feed insertion after carriage return	0 None 1 after <CR> to DTE 2 after <CR> from DTE 4 after echo of <CR> default (0,0,0)
%L14=	Padding after line feed	Range: 0-255 default (0,0,0)
%L15=	Editing in Data Transfer	0 None 1 Edit
%L16=	Character Delete	Range: 0-127 default (8,127,127)
%L17=	Line Delete	Range: 0-127 default (24,24,24)
%L18=	Line Display	Range: 0-127 default (18,18,18)
%L19=	Editing PAD Service Signals	0 None 1 Printers 2 Displays default (2,1,1)
%L20=	Echo Mask	0 None 1 No echo of <CR> 2 No echo of <LF> 4 No echo of <VT>, <HT>, <FF> 8 No echo of <BEL> and <BS> 16 No echo of <ESC> and <ENQ> 32 No echo of <ACK>, <NAK>, <STX>, <SOH>, <EOT>, <ETB>, <ETX> 64 No echo of parameters 16, 17, and 18 128 No echo of <NUL>, <SO>, <SI>, <DLE>, <DC1>, <DC2>, <DC3>, <DC4>, <SYN>, <CAN>, , <SUB>, <FS>, <GS>, <RS>, <US> default (248,0,0)
%L21=	Parity	0 None 3 Use @P3 default (0,0,0)
<p>*Note: "by port" indicates that these switch parameters are associated with a particular port. However, this does not exclude ports from sharing the same SPID or TEI.+</p>		

AT Command Set

Table C-1: UTA 220 AT Command Set (Continued)

Command	Description	Value
%L22=	Page Wait	Range: 0-255 default (0,0,0)
*Note: "by port" indicates that these switch parameters are associated with a particular port. However, this does not exclude ports from sharing the same SPID or TEI.+		

ISDN INTERFACE

Figure D-1 and Table 1 show the UTA ISDN.

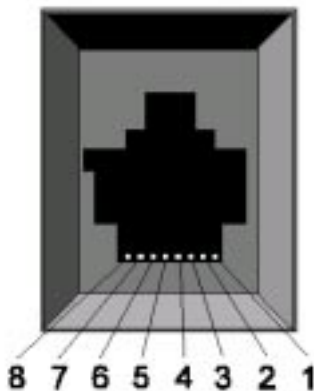


Figure D-1. U Interface RJ45 Pin Interfaces

INTERFACES

Tables 2 through 4 describe the pin functions of the DTE interfaces on the UTA. Use the table corresponding to the interface on your UTA. General descriptions of the pins follow.

Note: In the following tables, unused pins have no electrical connection.

Table D-1: U Interface RJ45 Pin Functions

Pin	Name	Function
1	Battery status	No connection
2	Battery status	No connection
3	----	No connection
4	Signal	U interface tip or ring
5	Signal	U interface tip or ring

Interfaces

Table D-1: U Interface RJ45 Pin Functions (Continued)

Pin	Name	Function
6	----	No connection
7	Powering	No connection
8	Powering	No connection

Table D-2: EIA-232C/V.24 Pin Functions

<i>DB-25 Pin</i>	<i>EIA-232C Pin</i>	<i>V.24 Pin</i>	<i>Function</i>
1	AA	101	Protective Ground (FG)
2	BA	103	Transmitted Data to UTA (TC)
3	BB	104	Received Data from UTA (RD)
4	CA	105	Request to Send (RTS)
5	CB	106	Clear to Send (CTS)
6	CC	107	Data Set Ready (DSR)
7	AB	102	Signal Ground (SG or GND)
8	CF	109	Data Carrier Detect (CD or DCD)
15	DB	114	Transmit Clock (TC)
17	DD	115	Receive Clock (RC)
18	LL	141	Local Loopback
20	CD	108	Data Terminal Ready (DTR)
21	RL	---	Remote Loopback
22	CE	125	Ring Indicator (RI)
25	TM	142	Test Mode

Table D-3: V.35 Pin Functions

<i>DB-25 Pin</i>	<i>M-34 Pin</i>	<i>V.35 Function</i>
1	A	Protective Ground
2	P	Transmitted Data A
3	R	Received Data A
4	C	Request to Send (RTS)
5	D	Clear to Send (CTS)
6	E	Data Set Ready (DSR)
7	B	Signal Ground (SG)
8	F	Received line signal detect
13	AA/a	Transmit clock B
14	S	Transmitted data B
15	Y	Transmit clock A
16	T	Received data B
17	V	Receive clock A
18	J	Ring Indicator (RI)
19	X	Receive clock B
20	H	Data Terminal Ready (DTR)
21	BB/b	Remote loopback
22	L	LL Loopback
25	K	Test Mode

Table D-4 describes the pin functions of the DTE interfaces available on ports three and four of the UTA220. Use the table corresponding to the DTE interface on ports three and four of your UTA220.

Caution: Connection to pins designated “Not Used” may cause unforeseen problems. Pins designated “Not Connected” have no electrical connection to the UTA220.

Table D-4: Ports 3 and 4 Pin Functions

DB-25 Pin	EIA-232/V.24 Mode			EIA-366 Mode	
	<i>EIA-232E Pin</i>	V.24 Pin	Function	EIA-366 Pin	Function
1	AA	101	Frame Ground (FG)	Shield	Frame Ground
2	BA	103	Transmitted Data to UTA (TC)	DPR	Digit Present
3	BB	104	Received Data from UTA (RD)	ACR	Abandon Call and Retry
4	CA/CJ	105	Request to Send (RTS)	CRQ	Call Request
5	CB	106	Clear to Send (CTS)	PND	Present Next Digit
6	CC	107	Data Set Ready (DSR)	PWI	Power Indication
7	AB	102	Signal Ground (SG or GND)	SG	Signal Ground
8	CF	109	Data Carrier Detect (CD or DCD)	-	(Not Used)
9	(Reserved)	+	(Not Connected)	-	(Not Connected)
10	(Reserved)	+	(Not Connected)	-	(Not Connected)
11	-	126	(Not Connected)	-	(Not Connected)
12	SCF/CI	122/112	(Not Connected)	-	(Not Connected)
13	SCB	121	(Not Used)	DSC	Distant Station Connected
14	SBA	118	(Not Used)	NB1	Digit Lead 1
15	DB	114	(Not Used)	NB2	Digit Lead 2
16	SBB	119	(Not Used)	NB4	Digit Lead 3
17	DD	115	(Not Used)	NB8	Digit Lead 4
18	LL	141	Local Loopback	-	DO NOT USE
19	SCA	120	(Not Connected)	-	(Not Connected)

Table D-4: Ports 3 and 4 Pin Functions (Continued)

DB-25 Pin	EIA-232/V.24 Mode			EIA-366 Mode	
	<i>EIA-232E Pin</i>	V.24 Pin	Function	EIA-366 Pin	Function
20	CD	108/1,2	Data Terminal Ready (DTR)	-	(Not Used)
21	RL/CG	140/110	Remote Loopback	-	(Not Used)
22	CE	125	Ring Indicator (RI)	DLO	Data Line Occupied
23	CH/CI	111/112	(Not Used)	-	(Not Used)
24	CE	113	(Not Connected)	-	(Not Connected)
25	TM	142	Test Mode	-	(Not Used)

EIA-366A Requirements

The EIA-366 revision changed the function of pin 18 to receive common. If an EIA-366A device will be connected to the port, a special cable with the following connections must be used:



DTE INTERFACE PIN DESCRIPTIONS

Pin functions assume that the UTA is in data mode.

Note: There are a number of interpretations of these signals that the UTA can make, depending on its mode and configuration. The descriptions reflect the most common interpretations.

Transmit Data

This pin carries data transmitted from the DTE to the UTA.

Receive Data

This pin carries data from the UTA to the DTE. If no data is present, this line will be held in the mark state.

Request to Send

In asynchronous mode, this input may be used for flow control of the UTA or ignored. In synchronous modes, the pin can be used by the DTE to indicate that it is ready to send.

Clear to Send

Generally, used within a call to indicate when it is permissible for the DTE to transmit.

Data Set Ready

Indicates that the UTA has detected the remote UTA.

Signal Ground

This pin is the common return lead for all input and output signals on the DTE interface. It is normally connected to the chassis ground but can be changed via the DIP switch.

Data Carrier Detect

This output, which is also called carrier detect (CD), is generally used within a call to indicate a connection exists to the remote UTA.

Transmit Clock

In synchronous modes this output supplies the DTE with timing information for it to use when transmitting data to the UTA. This output is not used in asynchronous mode.

Receive Clock

In synchronous modes, this output supplies the DTE with timing information for it to use when reading data from the UTA. This output is not used in asynchronous mode.

Data Terminal Ready

This signal is generally supplied by the DTE to indicate that it is ready to send data.

Ring Indicator

This output pulses high when the UTA detects an incoming data call on the ISDN.

Interfaces

Appendix E Network Option Values

For future reference, enter the values, agreed upon with the telephone company, at subscription time.

Table E-1: Network Options

ISDN OPTIONS			
Parameter	Factory Default	Range	Value
SWITCH TYPE	National ISDN	AT&T NTI DMS100 National ISDN	
SWITCH VERSION: 5ESS DMS 100	MULTI POINT PVC IC-	MULTI POINT PT TO PT	
National ISDN	National ISDN-1	PVC-IC0 PVC-IC1 National ISDN-1	
Port 1 X.25 TEI VALUE	DIS	0-63, DIS, AUTO	
Port 1 DATA TEI VALUE	AUTO	0-63, DIS, AUTO	
Port 1 SPID	Empty String	0-20 characters (7 numeric digits for NI-1)	
Port 1 DN*	Empty String	0-20 characters (0-9,#,*) (9-20 numeric digits for NI-1)	
Port 2 X.25 TEI VALUE	DIS	0-63, DIS, AUTO	
Port 2 DATA TEI VALUE	AUTO	0-63, DIS, AUTO	
*	For NTIDMS100 or NI-1 switch only.		
**	For four port UTA220 only		

Table E-1: Network Options (Continued)

ISDN OPTIONS			
Parameter	Factory Default	Range	Value
Port 2 SPID	Empty String	0-20 characters (7 numeric digits for NI-1)	
Port 2 DN*	Empty String	0-20 characters (0-9,#,*) (9-20 numeric digits for NI-1)	
Port 3 X.25 TEI VALUE	DIS	0-63, DIS, AUTO	
Port 3 DATA TEI VALUE**	DIS	0-63, DIS, AUTO	
Port 3 SPID**	Empty String	0-20 characters (7 numeric digits for NI-1)	
Port 3 DN* **	Empty String	0-20 characters (0-9,#,*) (9-20 numeric digits for NI-1)	
Port 4 X.25 TEI VALUE	DIS	0-63, DIS, AUTO	
Port 4 DATA TEI VALUE**	DIS	0-63, DIS, AUTO	
Port 4 SPID**	Empty String	0-20 characters (7 numeric digits for NI-1)	
Port 4 DN* **	Empty String	0-20 characters (0-9,#,*) (9-20 numeric digits for NI-1)	
* For NTIDMS100 or NI-1 switch only. ** For four port UTA220 only			

Appendix F

ASCII and EBCDIC Characters

Hexadecimal equivalents of binary and decimal numbers are as follows:

<i>Binary</i>	<i>Decimal</i>	<i>Hexadecimal</i>
0000	0	0
0001	1	1
0010	2	2
0011	3	3
0100	4	4
0101	5	5
0110	6	6
0111	7	7
1000	8	8
1001	9	9
1010	10	A
1011	11	B
1100	12	C
1101	13	D
1110	14	E
1111	15	F

Hexadecimal Examples:

0101	1011	=5B hex
1001	1101	=9D hex
1110	0010	=E2 hex

The following chart lists the ASCII decimal, hexadecimal, equivalent character values, and EBCDIC characters. The table only goes as high as available keyboard symbols. Control keys are shown in the right column of the first table.

<i>ASCII Symbol</i>	<i>Decimal</i>	<i>Hex</i>	<i>EBCDIC</i>	<i>Control Key</i>
(NUL)	0	00	NU (null)	@
(SOH)	1	01	SH (start of header)	A
(STX)	2	02	SX (start of text)	B
(ETX)	3	03	EX (end of text)	C
(EOT)	4	04	PF	D
(ENQ)	5	05	HT (horizontal tab)	E
(ACK)	6	06	LC (lower case)	F
(BEL)	7	07	delete	G
(BS)	8	08	--	H
(HT)	9	09	--	I

ASCII and EBCDIC Characters

ASCII Symbol	Decimal	Hex	EBCDIC	Control Key
(LF)	10	0A	(SMM)	J
(VT)	11	0B	VT (vertical tab)	K
(FF)	12	0C	FF (form feed)	L
(CR)	13	0D	CR (carriage return)	M
(SO)	14	0E	SO (shift out)	N
(SI)	15	0F	SI (shift in)	O
(DLE)	16	10	DL (data link escape)	P
(DC1)	17	11	D1 (device control 1)	Q
(DC2)	18	12	D2 (device control 2)	R
(DC3)	19	13	D3 (device control 3)	S
(DC4)	20	14	RE (restore)	T
(NAK)	21	15	NL (new line)	U
(SYN)	22	16	BS (back space)	V
(ETB)	23	17	IL (light)	W
(CAN)	24	18	CN (cancel)	X
(EM)	25	29	EM (end of message)	Y
(SUB)	26	1A	CC	Z
(ESC)	27	1B	C1 (CU1)	[
(FS)	28	1C	FS (form separator)	\
(GS)	29	1D	GS (group separator)]
(RS)	30	1E	RS (record separator)	^
(US)	31	1F	US (unit separator)	DEL
(SP)	32	20	DS	--
!	33	21	SS (SOS)	--
"	34	22	--	--
#	35	23	--	--
\$	36	24	CP (bypass)	
%	37	25	LF (line feed)	
&	38	26	EB (end of block)	
'	39	27	EC (escape)	
(40	28	--	
)	41	29	--	
*	42	2A	SM	
+	43	2B	C2 (CU2)	
,	44	2C	--	
-	45	2D	EQ (enquiry)	
.	46	2E	AK (acknowledgment)	
/	47	2F	BL (bell)	
0	48	30	--	
1	49	31	--	
2	50	32	SY (sync)	

ASCII and EBCDIC Characters

ASCII Symbol	Decimal	Hex	EBCDIC	Control Key
3	51	33	--	
4	52	34	PN	
5	53	35	--	
6	54	36	UC (uppercase)	
7	55	37	ET (end of transmission)	
8	56	38	--	
9	57	39	--	
:	58	3A	--	
;	59	3B	C3 (CU3)	
<	60	3C	D4 (device control 4)	
=	61	3D	NK (no acknowledgment)	
>	62	3E	--	
?	63	3F	SB (substitute)	
@	64	40	space	
A	65	41	--	
B	66	42	--	
C	67	43	--	
D	68	44	--	
E	69	45	--	
F	70	46	--	
G	71	47	--	
H	72	48	--	
I	73	49	¢ (cent)	
J	74	4A	. (period)	
K	75	4B	< (less than)	
L	76	4C	((open parenthesis)	
M	77	4D	+ (plus)	
D	68	44	--	
N	78	4E	--	
O	79	4F	& (ampersand)	
P	80	50	--	
Q	81	51	--	
R	82	52	--	
S	83	53	--	
T	84	54	(leading pad)	
U	85	55	--	
V	86	56	--	
W	87	57	--	
X	88	58	--	
Y	89	59	! (exclamation)	
Z	90	5A	\$ (dollar sign)	

ASCII and EBCDIC Characters

ASCII Symbol	Decimal	Hex	EBCDIC	Control Key
[91	5B	* (asterisk)	
\	92	5C) (close parenthesis)	
]	93	5D	; (semicolon)	
^	94	5E	^ (caret or ¬)	
_	95	5F	--	
'	96	60	/ (ACK1)	
a	97	61	--	
b	98	62	--	
c	99	63	--	
d	100	64	--	
e	101	65	--	
f	102	66	--	
g	103	67	--	
h	104	68	--	
i	105	69	--	
j	106	6A		
k	107	6B	,	
l	108	6C	%	
m	109	6D	_	
n	110	6E	>	
o	111	6F	?	
p	112	70	ACK0	
q	113	71	--	
r	114	72	--	
s	115	73	--	
t	116	74	--	
u	117	75	--	
v	118	76	--	
w	119	77	--	
x	120	78	--	
y	121	79	' (single quote)	
z	122	7A	: (colon)	
{	123	7B	# (pound)	
	124	7C	@ (at)	
}	125	7D	' (apostrophe)	
~	126	7E	= (equal)	
DEL	127	7F	" (double quote)	
--	128	80	--	
--	129	81	a	
--	130	82	b	
--	131	83	c	

ASCII and EBCDIC Characters

ASCII Symbol	Decimal	Hex	EBCDIC	Control Key
--	132	84	d	
--	133	85	e	
--	134	86	f	
--	135	87	g	
--	136	88	h	
--	137	89	i	
--	138	8A	--	
--	139	8B	--	
--	140	8C	≤ (less than or equal)	
--	141	8D	(
--	142	8E	+	
--	143	8F	--	
--	144	90	--	
--	145	91	j	
	146			
	147	93	l	
	148	94	m	
	149	95	n	
	150	96	o	
	151	97	p	
	152	98	q	
	153	99	r	
	154	9A	--	
	155	9B	--	
	156	9C	x	
	157	9D)	
	158	9E	±	
	159	9F	--	
	160	A0	--	
	161	A1	~	
	162	A2	s	
	163	A3	t	
	164	A4	u	
	165	A5	v	
	166	A6	w	
	167	A7	x	
	168	A8	y	
	169	A9	z	
	170	AA	--	
	171	AB	┌	
	172	AC	┐	

ASCII and EBCDIC Characters

ASCII Symbol	Decimal	Hex	EBCDIC	Control Key
	173	AD	[
	174	AE	≥	
	175	AF	•	
	176	B0	S0 (SM0)	
	177	B1	S1 (SM1)	
	178	B2	S2 (SM2)	
	179	B3	S3 (SM3)	
	180	B4	S4 (SM4)	
	181	B5	S5 (SM5)	
	182	B6	S6 (SM6)	
	183	B7	S7 (SM7)	
	184	B8		
	185	B9	S9 (SM9)	
	186	BA	--	
	187	BB]	
	188	BC]	
	189	BD] (close bracket)	
	190	BE	≠ (not equal)	
	191	BF	--	
	192	C0	{ (open brace)	
	193	C1	A	
	194	C2	B	
	195	C3	C	
	196	C4	D	
	197	C5	E	
	198	C6	F	
	199	C7	G	
	200	C8	H	
	201	C9	I	
	202	CA	--	
	203	CB	--	
	204	CC	(unprintable character)	
	205	CD	--	
	206	CE	(unprintable character)	
	207	CF	} (close bracket)	
	208	D0	J	
	209	D1	K	
	210	D2	L	
	211	D3	M	
	212	D4	N	
	213	D5	O	

ASCII and EBCDIC Characters

ASCII Symbol	Decimal	Hex	EBCDIC	Control Key
	214	D6	P	
	215	D7	Q	
	216	D8	R	
	217	D9	--	
	218	DA	--	
	219	DB	--	
	220	DC	--	
	221	DD	--	
	222	DE	--	
	223	DF	--	
	224	E0	\ (back slash)	
	225	E1	--	
	226	E2	S	
	227	E3	T	
	228	E4	U	
	229	E5	V	
	230	E6	W	
	231	E7	X	
	232	E8	Y	
	233	E9	Z	
	234	EA	--	
	235	EB	--	
	236	EC	(unprintable character)	
	237	ED	--	
	238	EE	--	
	239	EF	--	
	240	F0	0	
	241	F1	1	
	242	F2	2	
	243	F3	3	
	244	F4	4	
	245	F5	5	
	246	F6	6	
	247	F7	7	
	248	F8	8	
	249	F9	9	
	250	FA		
	251	FB	--	
	252	FC	--	

ASCII and EBCDIC Characters

ASCII Symbol	Decimal	Hex	EBCDIC	Control Key
	253	FD	--	
	254	FE	--	
	255	FF	(trailing pad)	

Appendix G

Abbreviations and Acronyms

This appendix shows terms commonly used in data communications.

A

ABT	Abort Timer OR Answer Back Tone
ac	Alternating Current
ACK	Acknowledgment, positive
ACR	Abort Call, Retry
ACU	Automatic Call Unit
A/D	Analog-to-Digital
ADD	Address Field
ADDR	Address
AGC	Automatic Gain Control
ASCII	American Standard Code for Information Interchange (7 level)
AT&T	American Telephone and Telegraph

B

BC	Bearer Capability
BCD	Binary Coded Decimal
BER	Bit Error Rate
BERT	Bit-Error-Rate-Test (set)
BIL LB	Bilateral Loopback
Bit	Binary Digit
bps	Bits Per Second
BSC	Binary Synchronous Communications
BUFF	Elastic Buffer

Abbreviations and Acronyms

C	
C	Celsius
CA	Circuit Assurance
CBX	Computerized Private Branch Exchange
CC	Carrier Control
CCITT	International Consultative Committee for Telegraph and Telephone
CCU	Communications Control Unit
CD	Carrier Detect
CFICB	Call Failure Indication - Local DCE Busy
CFIDT	Call Failure Indication - No Dial Tone
CFINT	Call Failure Indication - No Answer Back Tone
CFIRT	Call Failure Indication - Ringback Detected
Ch Gnd	Chassis Ground
CIC	Connect Incoming Call
CMOS	Complementary Metal Oxide Semiconductor
CNX	Connect Complete
COM	Computer Output Microfilm
CO	Central Office
COS	Call Originate Status
CPE	Customer Premise Equipment
CPH	Characters Per Hour
CPU	Central Processing Unit
CR	Carriage Return
CRC	Cyclic Redundancy Check
CRQ	Call Request
CSA	Canadian Standards Association
CSDC	Circuit Switched Digital Capability
CSU	Channel Service Unit
CSULL	Channel Service Unit Local Loopback
CTRL	Control Field
CTS, CS	Clear to Send

D

DAA	Data Access Arrangement (AT&T)
dB, db	Decibel
dc	Direct Current OR Digital Connection
DCE	Data Circuit Terminating Equipment OR Data Communications Equipment
DCD	Data Carrier Detect
DCPSK	Differentially Coherent Phase- Shift Keying
DDD	Direct Distance Dialing
DDS	Digital Data Service OR Dataphone Digital Service (AT&T)
DDS/MR	Digital Data Service / Multi Rate
DIC	Disregard Incoming Call
Dip	Dual In-line Package
DIS, DS	Disable
DLE	Data Link Escape
DLO	Data Line Occupied
DMS	Digital Multiplexer System
DOC	Department of Communications (Canada)
DOS	Disk Operating System
DPR	Digit Present
DRS	Data Rate Select
DSR	Data Set Ready
DSU	Data Service Unit
DTE	Data Terminal Equipment
DTMF	Dual Tone Multi Frequency
DTN	Dial Tone Detected
DTR	Data Terminal Ready

Abbreviations and Acronyms

E

EBCDIC	Extended Binary Coded Decimal Interchange Code (8 level)
EIA	Electronic Industries Association
EIA-232C EIA-232D	Interface between DTE and Data Interchange Communication Equipment employing serial binary data
EN	Enabled
ENQ	Enquiry
EOA	End of Address
EOM	End of Message
EON	End of Number
EOT	End of Text OR End of Transmission
EPROM	Erasable Programmable Read Only Memory
ER	Error
ESC	Escape (key)
ETB	End of Block
ETC	External Transmit Clock
ETX	End of Text
EXT	External
F	
FA	Feature Activator
FB	Fallback
FCC	Federal Communications Commission
FDM	Frequency Division Modulation
FDX	Full-Duplex Transmission
FF	Form Feed
FGND	Frame Ground
FL	Flag
FLL	Fixed loss loop
FM	Frequency Modulation
Fox message	Test message (The quick brown fox jumps over the lazy dog) 0123456789
FSK	Frequency-Shift Keying
FX	Foreign Exchange

H

HDLC	High Level Data Link Control
HDX	Half-Duplex Transmission
Hz	Hertz (cycles per second)

I

INC	Incoming Call
INV	Invalid
INVCU	Invalid Command - Command Unknown
INVMS	Invalid Command - Message Syntax Error
INVPS	Invalid Command - Parameter Syntax Error
INVPV	Invalid Command - Parameter Value Error
I/O	Input / Output
IS	International Standard
ISDN	Integrated Services Digital Network

K

KBD	Keyboard
kbps	Kilobits Per Second

L

LAL	Local Analog Loopback
LAPD	Link Access Protocol - D Channel
LAPM	Link Access Protocol for Modems
LB OPTS	Loopback Options
LCD	Liquid Crystal Display OR Line Current Disconnect
LDL	Local Digital Loopback
LDM	Limited-Distance Modem
LED	Light Emitting Diode
LF	Line Feed
LINK	Analog Telephone Line Connection
LL	Local Loopback
LO	Line Occupancy
LRC	Longitudinal Redundancy Check

Abbreviations and Acronyms

L (Continued)

LSD	Long Space Disconnect
LSI	Large-Scale Integrated (circuit)
LSO	List of Stored Options
LSV	List Version
LT	Loop or Link Termination

M

mA	Milliamps
MHz	MegaHertz
Modem	Modulator / Demodulator
MR	Modem Ready
MR/RI	Modem Ready / Ring Indicate
ms	Millisecond
MUX	Multiplexer

N

NAK	Negative Acknowledgment
NET STAT	Network Status
NRZ	Non Return to Zero
NRZI	Non Return to Zero Inverted
NS	No Signal
NT	Network Termination

O

OH	Off Hook
OS	Out-of-Service

P

PBX	Private Branch Exchange
PC	Personal Computer
pc	Printed circuit (board)
PIW	Power Indication
PN	Pseudo random
PND	Present Next Digit

P (Continued)

POTS	Plain Old Telephone Service
PRI	Primary
PRO	Program Option
PROG, PR	Programmable
PROM	Programmable Read Only Memory
PRP	Restored Factory Straps
PR/TM	Power / Test Mode / Error
PSK	Phase Shift Keying
PSTN	Public Service Telephone Network
PWI	Power Indication
Q	
QAM	Quadrature Amplitude Modulation
R	
R	Reference Designator
RAD	Random Access Method
RAL	Remote Analog Loopback
RAM	Random Access Memory
RC	Receive Clock
RCD	Receiver-Carrier Detector
RCV, RCVR	Receiver
RD	Receive Data
RD/ER	Receive Data / Error
RDI	Receive Data Inhibit
RDL	Remote Digital Loopback
RI	Ring Indication
RL	Remote Loopback
RLO	Request List of Stored Options
RLSD	Received Line Signal Detector
RLV	Request List of Version
rms	Root-Mean-Square

Abbreviations and Acronyms

R (Continued)

RMT LB	Remote Loopback
RNG	Ringback Detection
RO	Receive Only
ROM	Read Only Memory
RT	Remote Terminal
RTS, RS	Request to Send
RX	Receive
S	
S or S/T	Reference Designator
SCC	Serial (or Satellite) Communications Controller
SD	Send Data
SDLC	Synchronous Data Link Control (IBM)
SGND, SG	Signal Ground
SH	Switch Hook
SIM SW CR	Simulated Switched Carrier
SNR	Signal / Noise Ratio
SPID	Service Profile Identifier
SQD	Signal Quality Detector
SQM	Signal Quality Monitor
SS	Systems Status
STX	Start of Text
SYN	Synchronization Character
T	
T	Reference Designator
TA	Terminal Adapter
TC	Transmit Clock
TD	Transmit Data
TE	Terminal Equipment
TEI	Terminal Endpoint Identifier
TELCO	Telephone Company

T (Continued)

TELSET	Telephone Set
TM	Test Mode
TP	Test Pattern
TR	Terminal Ready
TST	Test
TTD	Temporary Text Delay
TTL	Transistor-to-Transistor Logic
TX	Transmit
U	
U	Reference Designator
UART	Universal Asynchronous Receiver / Transmitter
USOC	Universal Service Ordering Code
V	
V.	CCITT Code Designation
V.24	List of definitions for interchange circuits between data terminal equipment and data circuit-terminating equipment (and provisional amendments, May 1977)
Vac	Volts Alternating Current
VAC	Value Added Carrier
VAL	Valid
Vdc	Volts Direct Current
W	
WATS	Wide Area Telecommunications Access Method (AT&T)
X	
X.	CCITT Recommendation Designation
XMIT	Transmit
XOFF	Transmitter Off
XON	Transmitter On
XTC	External Transmit Clock

Abbreviations and Acronyms

Appendix H

Status and Connection Messages

If the UTA 220 is in command mode, and the DTE sends it a command, the UTA attempts to execute it and then sends a status message (if the option to do so is enabled) to the DTE. If the command was a dial command, then the message is called a connect message.

Status messages may also be sent as the result of other conditions detected by the UTA 220.

The messages sent depend on the message configuration options in effect: worded messages vs. number codes (ATV command) and normal vs. extended messages (X and W commands).

Status and connect messages, number codes, text messages, and meanings are as follows.

Number Code	Text Message	Meaning
0	OK	Command received OK
1	CONNECT	Connection made
2	RING	Incoming ring detected
3	NO CARRIER	Valid carrier not detected within period specified by register S7, or carrier lost for 300 ms or more
4	ERROR	Command not recognized or too long
5	CONNECT 1200	Connection made at 1200 bps
6	NO DIALTONE	ISDN link is not synchronized
7	BUSY	Dialed number is busy
10	CONNECT 2400	Connection made at 2400 bps
11	CONNECT 4800	Connection made at 4800 bps
12	CONNECT 19200	Connection made at 19200 bps
14	CONNECT 19200	Connection made at 19200 bps
17	CONNECT 56000	Connection made at 56000 bps
18	CONNECT 57600	Connection made at 57600 bps
19	CONNECT 64000	Connection made at 64000 bps
20	CONNECT 112000	Connection made at 112000 bps
21	CONNECT 128000	Connection made at 128000 bps
22	CONNECT 115200	Connection made at 115200 bps
28	CONNECT 38400	Connection made at 38400 bps
32	CONNECT 48000	Connection made at 48000 bps
81	PROTOCOL: ISDN	Clear Channel protocol
82	PROTOCOL: X.25	X.25 protocol
83	PROTOCOL: V.120	V.120 protocol
84	PROTOCOL: TLINK	TLINK protocol
85	PROTOCOL: BONDING	BONDING protocol
95	D CHANNEL	Using Channel D
96	B1 CHANNEL	Using Channel B1
97	B2 CHANNEL	Using Channel B2

Status and Connection Messages

Appendix I 128K Clear Channel Leased-Line Service

This appendix provides a description of commands used for configuring the UTA220k for 128K Clear Channel Leased Line (2B1Q) service.

Configuring D- and B-Channels

There are no D-channel activities in leased-line service; therefore the TEI's are disabled and DPIDs and DNs are cleared for all ports.

The AT commands in this section let you:

- Disable TEIs and clear SPIDs and DNs
- Configure B-channels

Use the AT>C*n* command, where *n* is a port number, for each port in turn, to specify which port to configure. (The AT>C command, without a number, ends control of any specified port and specifies control of the physically-connected port.)

<i>This Command...</i>	<i>Does This:</i>
AT!D3=127	Disables the TEI
AT!C2=""	Sets the SPID to an empty string
AT!N1=""	Sets the DN to an empty string
AT!C4=9	Sets the B1 channel for leased-line operation
AT!C5=9	Sets the B2 channel for leased-line operation
Example: This command string disables the D-channel and sets the B-channels for leased-line operation from Port 1. AT>C2!D3=127!C2=""!N1="">C!D3=127!C2=""!N1=""!C4=9!C5=9 [enter]	

Configuring the Port and Protocol

The AT commands in this section let you:

- Configure the port for 128K Clear Channel
- Enter a leased-line dial string in storage area zero
- Save the configuration
- Restart the network so that the leased-line switch configuration takes effect

<i>This Command...</i>	<i>Does This:</i>
AT%A2=0	Sets the port protocol to Clear Channel
AT@B0=2	Sets the rate multiplier to 2
AT&L1	Sets the port for persistent DTR dial
AT&M2	Sets the port for sync mode 2 - DTR dialing
AT&Z="B1"	Sets the stored dial string for leased line operation
AT&W	Saves the port-specific configuration
AT>W	Saves the switch configuration of SPIDs, DNs, TEIs, and B-Channel provisioning
AT>Z	Restarts the network
<p>Example: This command string configures the port for 128K Clear Channel, enters a leased-line dial string, saves the configuration, and restarts the network: AT%A2=0@B0=2&M2&Z="B1"&L1&W>W>Z [enter] Note: enter AT&L1 as one of the last commands to prevent the unit from attempting to connect immediately. Entering commands as shown in the example prevents the unit from connecting unexpectedly, before it has accepted the entire command and saved the configuration.</p>	

Introduction

The following sections apply to U.S.A. customers only. Non-U.S.A. customers with questions or concerns regarding return procedures should contact their Motorola subsidiary or distributor.

Equipment Return Procedures

If you have questions about equipment return procedures, call the Logistics Administration Group at (508) 261-4495 for advice and assistance. If you require either on-site service or unit-exchange service, call the Customer Support Center at (800)-544-0062.

In Case of Damage

If the equipment is damaged in transit, contact the shipper.

If you have additional concerns in case of failure, about missing parts, or to return equipment, contact your nearest Motorola ISG representative.

<i>For locations</i>	<i>contact...</i>
Inside the U.S.A.	Motorola ISG Customer Administration 20 Cabot Blvd. Mansfield, MA 02048-1193 Phone (508) 261-4000, Ext. 4745
Outside the U.S.A.	the nearest Motorola ISG distributor. For a listing of our Sales and Service Offices, visit our Web site at: http://www.mot.com/MIMS/ISG/ .

Expiration of Lease

To return equipment upon expiration of a lease agreement, contact your Motorola Sales Office for return authorization and instructions. A list of these offices follows. When you contact the sales office, you will be asked to provide the following information:

- Product name and description
- Serial number
- Customer order number
- Reason for return

Factory Repair

To return equipment for factory repair, call the Logistics Administration Group at (508) 261-4495, for return authorization and instructions. When you call, you will be given a Return Material Authorization (RMA) control number. Mark this number clearly on the shipping container for ease of identification and faster service. The RMA control number provides a convenient tracking reference for both parties. Please have the following information available for each piece of equipment you return:

- Product name and description
- Serial number
- Failure symptoms

Packaging Guidelines for Equipment Return

Data communications equipment or parts that are to be returned to Motorola for any reason must be properly packaged to prevent damage in shipment and handling.

If the original packing material and shipping container are available, reuse these items to return equipment. If these items are not available, it is your responsibility to package the contents in a manner that protects the equipment from damage during normal shipping and handling. Responsibility for damage to equipment during transit must be resolved between you and the carrier. The Logistics Administration group can provide you with specific packaging instructions upon request.

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