Black Box Corporation
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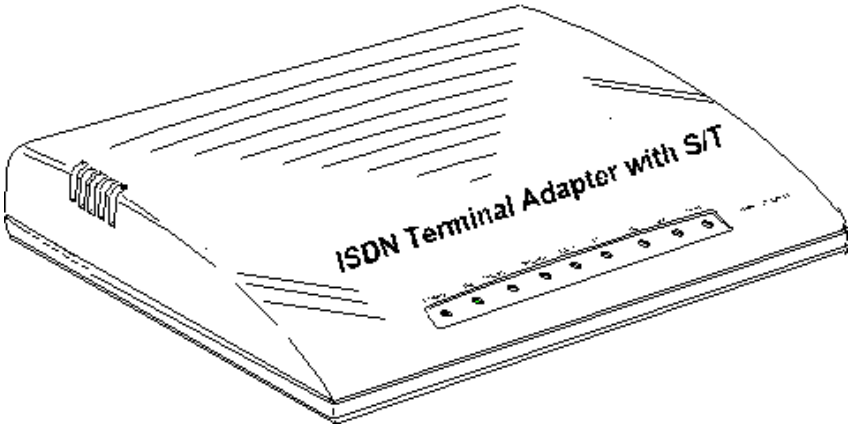
JUNE 2000

IS425A
ISDN Terminal Adapter with S/T



CUSTOMER SUPPORT INFORMATION

To order or for technical support: Call 724-745-5500 or fax: 724-746-0746
Technical support and fax orders 24 hours a day, 7 days a week
Phone orders 24 hours. 7 A.M. Monday to midnight Friday: Saturday 8 to 4 (Eastern)
Mail order: Black Box Corporation. 1000 Park Drive. Lawrence, PA 15055-1018
Web site: http://www.blackbox.com E-mail: info@blackbox.com

Version 1.0-July 30, 1996

Table of Contents

1 Introduction

1.1 Package Contents

Immediately after unpacking the unit, please inspect the contents. The following items should be enclosed:

- One BLACK BOX® IS425A
- One RJ-45 (8 pin connector) to RJ-45 (8 pin connector) Cable
- One RJ-11 (4 pin connector) to RJ-11 (4 pin connector) Cable
- One DTE Cable (DB9 female to male)
- One DB25 (female) to DB9 (male) converter
- One AC/DC Power Adapter
- Two 3.5" Installation Floppy Disk
- One BLACK BOX® ISDN IS425A Manual
- One Quick Installation Guide

If any items are missing or damaged during shipment, please contact Black Box. We recommend that the customer retain the packaging container and material.

1.2 Features

The BLACK BOX® ISDN IS425A is an Integrated Services Digital Network (ISDN) Terminal Adapter (TA) for Personal Computers (PC). It allows your PC to access the Internet and transfer files at high speeds (64Kbps to 128Kbps). You configure the IS425A using only software. There is no need for complex hardware jumper settings.

Product Features

- Network Connection: ISDN U-Interface
- One Data Port - two Analog Ports - one S/T Port
- Asynchronous data rate: up to 230.4Kbps
- V.120 asynchronous mode
- Async to sync PPP
- Multilink PPP
- Dynamic bandwidth allocation
- HDLC transparent
- Remote Configuration

1.3 System Requirements

The IS425A will perform best if your PC is equipped with the following:

- 8 Meg of RAM (minimum)
- 3 Meg of Hard Drive Space (for Windows 95 users only)
- 386 CPU or better
- Mouse
- Operating System: DOS, Windows 3.1, 3.11 or Windows 95

1.4 System Parameters

The following information is the knowledge required for installing and operating the IS425A.

Switch Type

Contact your local telephone company to find out the correct switch type. The IS425A software supports the following switch types.

- AT&T 5ESS Custom
- AT&T 5ESS National ISDN-1 (NI-1)
- NORTEL DMS-100 Custom
- NORTEL DMS-100 National ISDN-1 (NI-1)
- SIEMENS National ISDN-1 (NI-1)

Service Profile IDentifier (SPID)

When you subscribe to the ISDN line, you need to determine how many SPIDs (one to eight per ISDN line) your application requires. The IS425A can use either one or two SPIDs. The most frequently used SPID formats are:

FORMAT	DETAIL
A	Area Code + Phone Number + Suffix
B	01 + Phone Number + Suffix

These formats are defined as follows:

1. "Area Code" is the standard three-digit area code.
2. "Phone Number" is the standard seven-digit phone number, also called the Directory Number (DN).
3. "Suffix"
    - For Format A, the suffix could be:
        a) 0101 d) 0100
        b) 0000 e) 000
        c) 1111 f) 100
    - For Format B, the suffix could be:
        a) 0 b) 000

2 Hardware Installation

2.1 General Procedures

To ensure a successful installation, we recommend that the installer prepare the following items before proceeding:

1. Select adequate communication software (HyperTerminal, Terminal, ProComm Plus, etc.)
   Note: For the operation and installation of the communication software, please refer to the communication software manual.
   - If you want to use the AT commands set with Windows 95 then HyperTerminal is the communications software supplied by Microsoft. (We suggest using the BLACK BOX® Man to Machine Interface software instead of the AT command set.)
   - You may use the AT command set if you are using Windows 3.X via the Terminal software or any similar software. The MMI may or may not work on your version of Windows 3.X
2. Subscribe to ISDN from your telephone service provider. Tell the telephone service provider that you are going to use an ISDN Terminal Adapter with a built in NT1. Refer to **Chapter 10** for a detailed explanation of ISDN ordering.
3. Have your personal computer (PC) or workstation ready.
4. Check the packing list. If something is missing, please contact Black Box for assistance.

2.2 About Your IS425A

LEDs

In front of the IS425A there are nine LED indicators. The states of the LEDs are listed below.

	GREEN	RED	YELLOW	FLASHING	SOLID
Power	ON				
Line	U-Interface Activated	U-Interface Deactivated			
Tel1	Active			In Progress	Connected
Tel2	Active			In Progress	Connected
Data	1 B-Channel Connection	2 B-Channel Connection		DTE Connecting	DTE Connected
TD	Transmitting Data				
RD	Receiving Data				
DTR	Data Terminal Ready				
TEST			ON		

Rear Connections

The rear panel provides the following. The DIP Switch setup is provided in **Appendix C**.

ON/OFF	Power toggle switch
Power	DC power input
Cord holder	Power cord holder
Tel1	RJ11 jack for analog device
Tel2	RJ11 jack for analog device
S/T-Interface	RJ45 jack for an ISDN S/T device
U-Interface	RJ11 jack for an ISDN line
DIP switch	OFF (default), refer to **Appendix C**
Data	Female DB9 connector

2.3 Installing the IS425A

Plug It In

⇒ **Warning: Always turn the IS425A power off before connecting or disconnecting cables**.

1. Plug the DB9 cable into the IS425A's DATA Port. Insert the other end of the cable into a communication port on the PC/workstation or other Data Terminal Equipment (DTE).
2. Plug the RJ11 cable into the IS425A's U-Interface. Insert the other end of the cable into the ISDN wall jack.
3. Plug the RJ45 cable into the IS425A's S/T-Interface. Insert the other end of the cable into the ISDN S/T terminal equipment.
4. Plug another RJ11 cable into the IS425A's Tel 1 and/or Tel 2 Port. Insert the other end of the cable into any analog device (traditional telephone, modem, fax machine or answering machine).
5. Plug the AC/DC power adapter into the POWER connector.
6. Secure the power adapter cord on the rear panel by using the attached hook on the right side of the POWER connector.
7. Insert the other end of the AC/DC power adapter into the wall socket.

Termination Resistance Setting

You may need to adjust the termination resistor if your IS425A is connected to any other ISDN terminal equipment, especially ISDN phones. Position DIP Switches 7 and 8 on the rear panel to set the termination resistance. In most cases, the default setting is 100Ω.

Switch Positions	**ON**	**OFF**
DIP Switch7	100Ω	0Ω
DIP Switch8	100Ω	0Ω
S/T Bus Termination	If an equal amount of resistance (0 to 100 Ohms) is applied to both the IS425A and to the S/T equipment farthest from the IS425A, it assures the maximum power of the transmitted signal, thus it improves signal quality.	

Turn on the Power

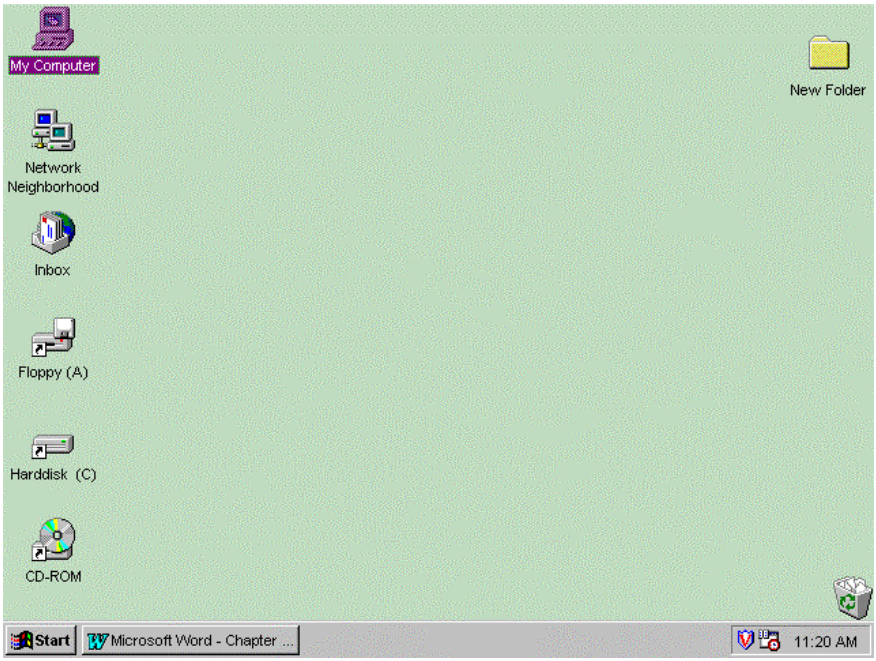
Please check the LED indicators when you turn the power switch ON. All the LEDs should flash in a preset sequence for a few seconds. If the U-Interface line is not plugged into the IS425A then the LED indicators will stop flashing and only the green Power LED and the red Line LED will be lit. If the U-Interface is connected, the Line LED will turn green.

Congratulations you have just installed the IS425A!

3 Software Installation

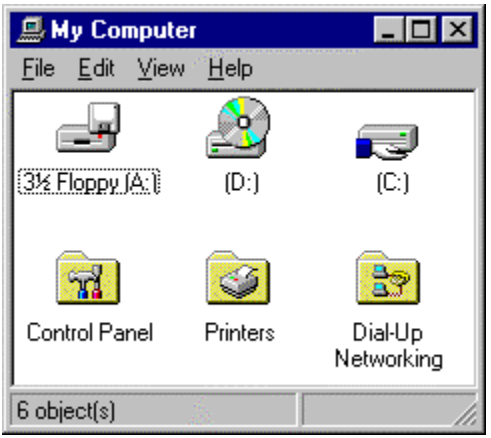
3.1 Software Installation for Windows 95

1. Insert the diskette labeled **"BLACK BOX® IS425A Installation Disk 1 of 2"** into your PC's 3.5" (A:) disk drive.

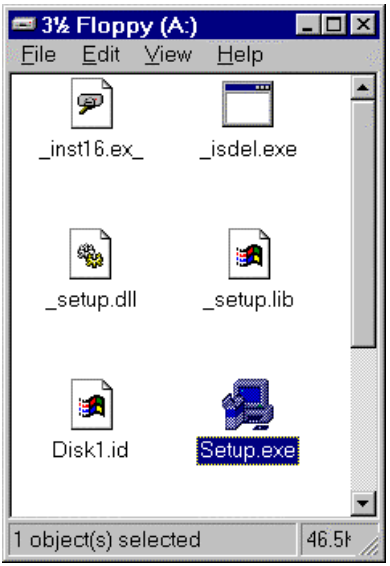


2. Double click the **"My Computer"** icon.

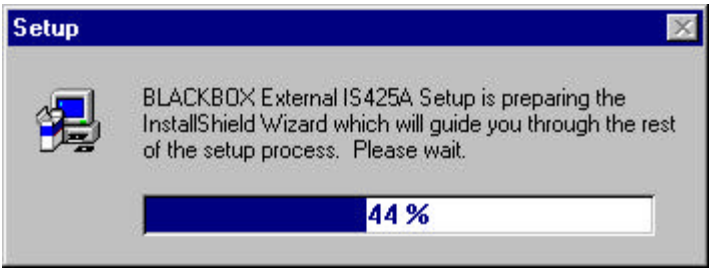
3. The **My Computer** window appears. Double Click the **"3½ Floppy (A:)"** icon.



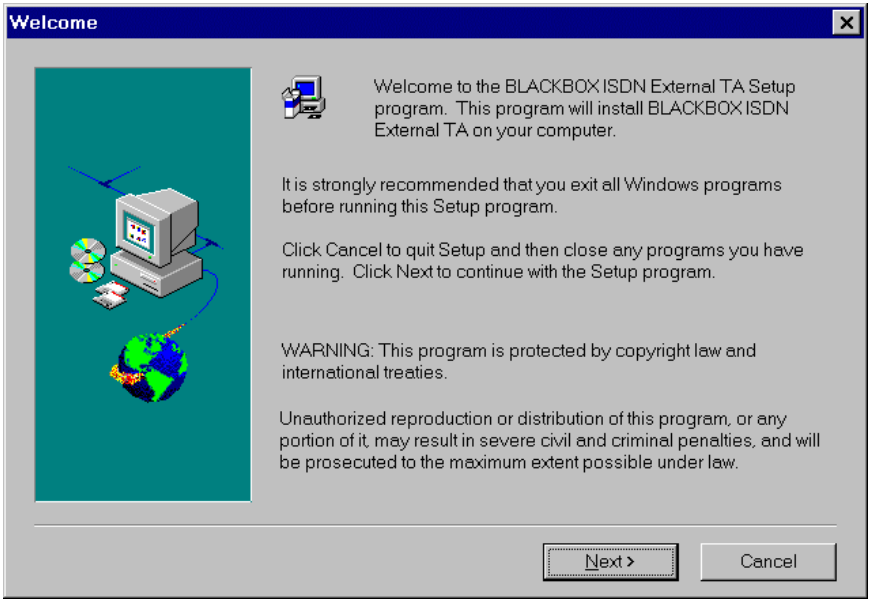
4. The **3½ Floppy (A:)** window appears. Double Click the **"Setup.exe"** icon.



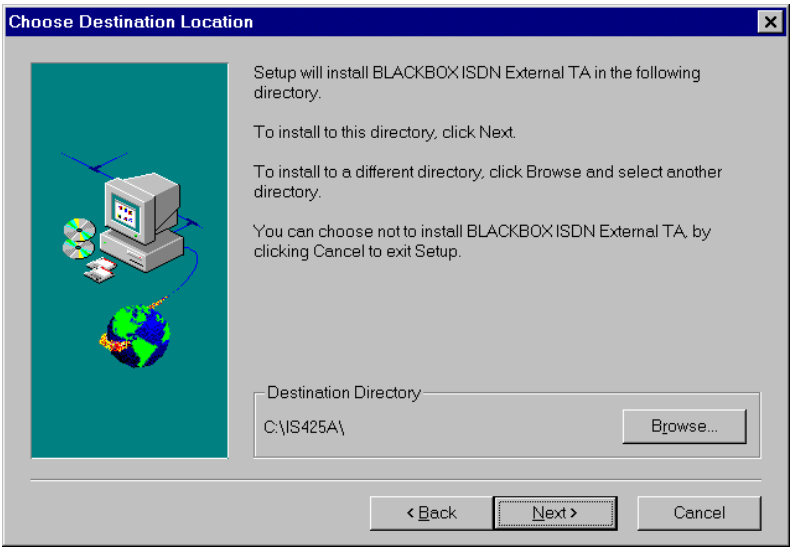
5. The **Setup** window appears.



6. The **Welcome** window appears. Click the **Next** button.

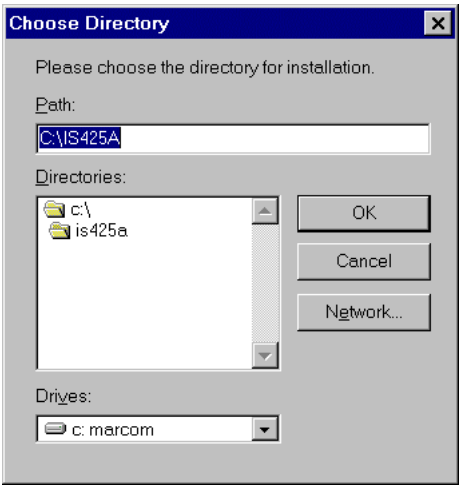


7. The **Choose Destination Location** window appears.

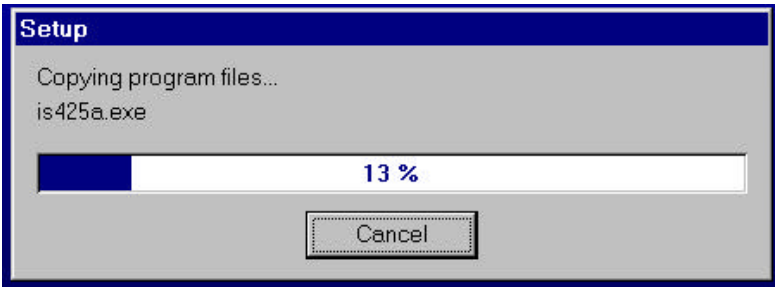


8. If you click the **Browse** button, the **Choose Directory** window appears. You may leave the default directory **C:\IS425A** or choose your own.

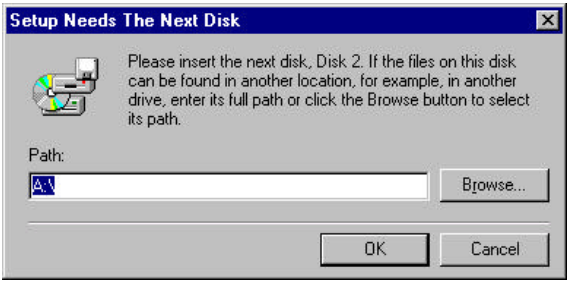
⇒ *For our purposes, we will use the default directory C:**IS245A.***



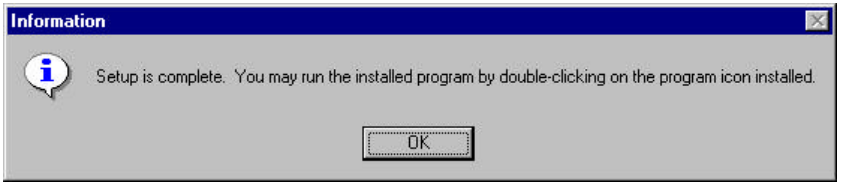
9. Once you have chosen the directory, click the **Next** button. The Setup window appears.



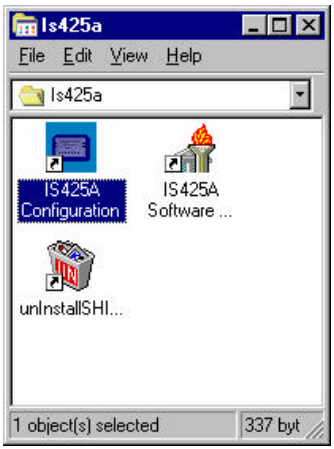
10. The **Setup Needs The Next Disk** window appears. Insert the diskette labeled, **"BLACK BOX® IS425A Installation Disk 2 of 2"** into your PC's 3.5" (A:) disk drive. Click the **OK** button.



11. When the program is through installing, the **Information** window appears.



12. Click the **OK** button. It will place you in the **Windows Desktop Screen.** There you will find the **IS425A** window.



3.2 Installation for Windows 3.x & DOS

Follow the installation instructions provided with the communication software (Terminal, ProComm Plus…) you choose. Along with the communication software be sure to use Black Box's AT Command Set in **Chapter 9** of this manual.

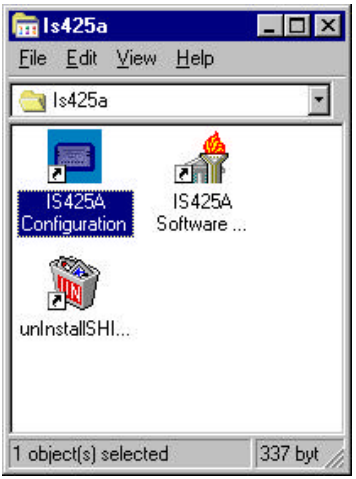
Note: The Man to Machine Interface (MMI) is designed for use with Windows 95. It may work normally on some Windows 3.x systems, but may work unpredictably on others.

4 Software Configuration

4.1 Configuring the IS425A with MMI (Windows 95)

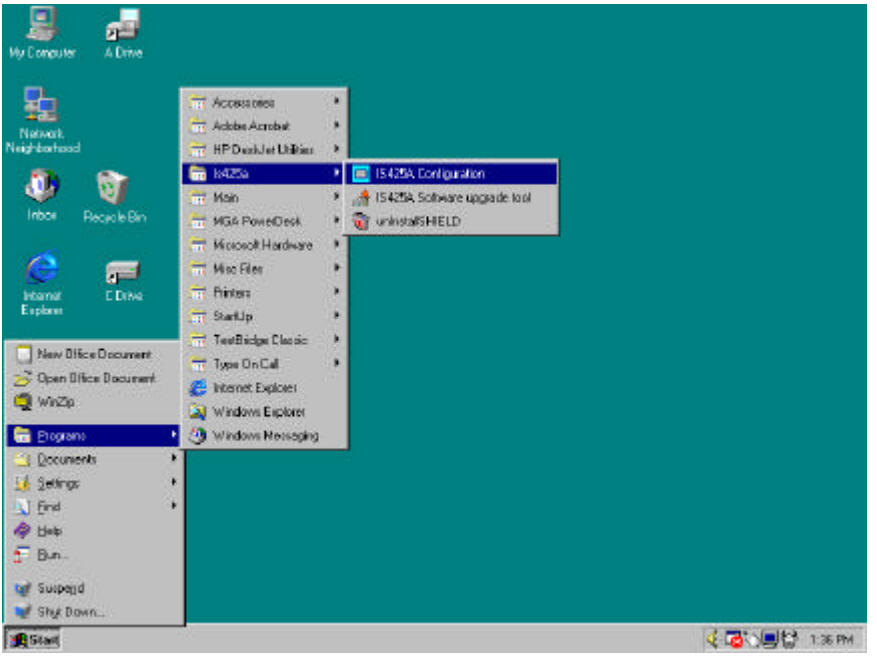
1. If you have just installed the IS425A software, you will see the **IS425A** window. Click on the **IS425A Configuration** icon.

   ☞ *Proceed to step number 6.*

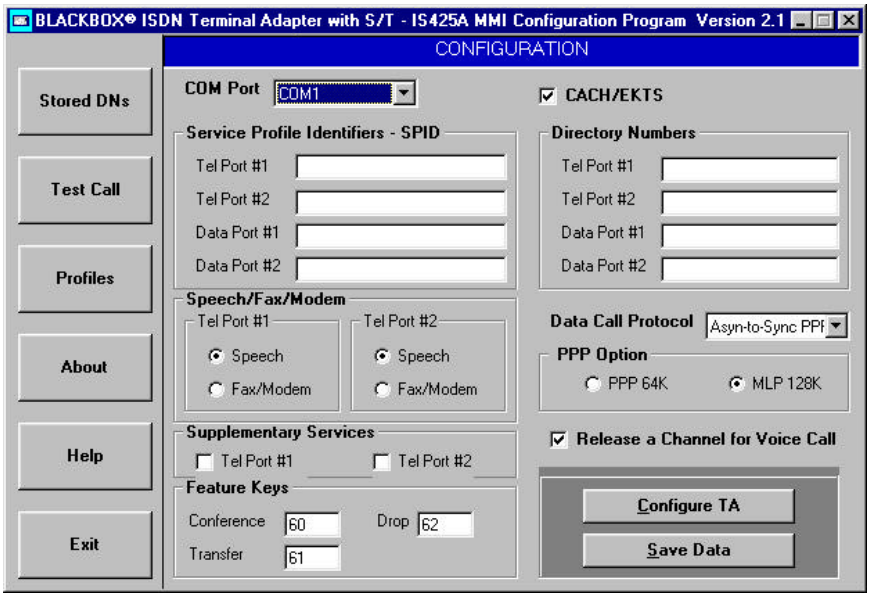


2. If you have installed the software, but closed the **IS425A window**, click the **Start** button.
3. Highlight/select **Programs.**
4. Highlight/select **IS425A.**

5. Highlight/select and click on **IS425A Configuration.**



6. The **Configuration** window appears.

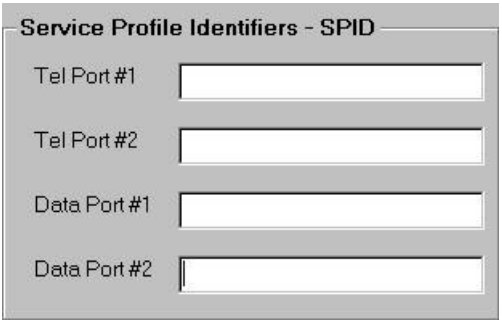


Configuration

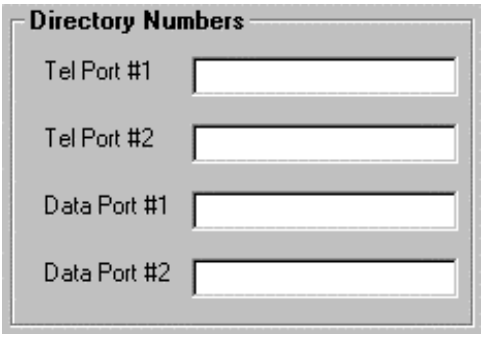
1. Click the **COM Port** down arrow button ▼ to choose the port connected to the IS425A .

2. In the section labeled **Service Profile Identifiers - SPID,** click inside the **Tel Port #1** window and enter a SPID. A SPID is the number that identifies each terminal equipment to the Telephone Company. Notice that the SPID is automatically copied to **Data Port #1**.

   ⇒ ***Note:*** *Your local phone company assigns SPIDs. Only the Data Port and the Tel Ports can share SPIDs. The Tel Port or Data Port cannot share the same SPID with any S/T devices.*



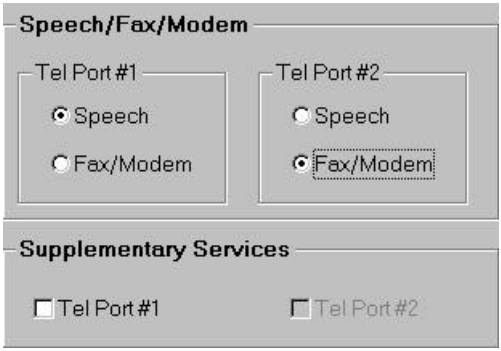
3. In the section labeled **Directory Numbers,** click inside the **Tel Port #1** window and enter the phone/directory number that corresponds to the **Tel Port #1** SPID window. Notice that the DN is automatically copied to **Data Port #1**.



4. Repeat steps 3 and 4 for **Tel Port #2.**

   ⇒ You must enter a different SPID and Directory number than the SPID and Directory number entered in TEL Port #1.

5. **Speech/Fax/Modem** (Tel Port #1 or Tel Port #2)**:**

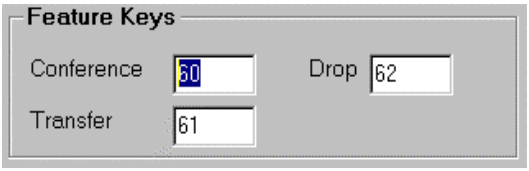


⇒ If you choose **Speech** for either Tel Port, you can choose the **Supplementary Services** function.

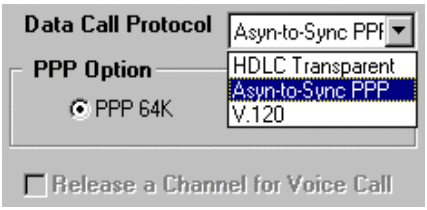
⇒ If you choose **Fax/Modem** for either Tel Port, you cannot choose the **Supplementary Services** function.

6. **Feature Keys** enter the feature key numbers for Conference, Transfer, and Drop as assigned by your phone company.

⇒ ***Note:*** *60, 61, and 62 are the national default numbers.*



7. **Data Call Protocol** click the down arrow button to choose one of the following:



   ⇒ **HDLC Transparent** (High-level Data Link Control) allows remote access for the IS425A.
   ⇒ **Asyn-to-Sync PPP** (Asynchronous to Synchronous Point to Point Protocol) allows 64Kbps or 128Kbps Internet access.
   ⇒ **V.120** (Rate Adaption) is a 64Kbps protocol featuring compression for higher data rates.

8. **PPP Option** is available only if you choose Async to Sync PPP. You are given a choice for either 64Kbps or 128Kbps speed.
   ⇒ **PPP 64K** is one B-Channel. The speed for Internet access with one B-channel is 64Kbps per second.
   ⇒ **MLP 128K** is two B-Channels. The speed for Internet access with two B-channels is 128Kbps.
   ⇒ **Release a Channel for Voice Call** allows bandwidth on demand. This is only an option if you choose MLP 128Kbps.

      ☞ *Example:*

      You are accessing the Internet with both B-Channels (128Kbps). While you are still on-line, you receive a voice call or decide to make a voice call. In this mode, one of the B-Channels will drop allowing the call to go through, reconnecting when the call is finished.

9. After you input the proper settings, click the **Configure TA** button. This sends the new configuration to the IS425A hardware.
   ⇒ *This is now your active profile (i.e., the one you are using). It will not be stored as a user profile unless you do so.*

CONGRATULATIONS, YOU HAVE CONFIGURED THE IS425A!

4.2 Software Configuration for Windows 3.x or DOS

The following information in your communication software needs to be configured:

- **COM Port:** You must select the COM Port where the IS425A connects with your PC.
- **Data Rate:** You can select any one of the following data rates: 600bps, 1200bps, 2400bps, 4800bps, 9600bps, 19200bps, 38400bps, 57600bps, 115200bps and 230400bps.
- **Data Format:** The default data format of the IS425A is 8 data bits no parity bit and 1 stop bit (8N1) format. Besides, 7E1 and 7O1 are also supported by the IS425A.
- **Flow Control:** The default flow control is the hardware CTS/RTS flow control. Of course, the software (Xon/Xoff) flow control may be your choice.
- **Initial Setting:** At the beginning of your communication software execution, the program will send a series of AT Commands to initialize your terminal adapter. You may enter the initial setting into your communication software to customize the initialization. For example, for Internet access "AT&F1" or "AT&F2" is recommended. We suggest these as "Modem Init Strings" unless you have User Profiles of your own (see Section "**9.4 Profile Descriptions of the IS425A**).

Call Type	Command
HDLC Transparent	AT&F0
Async-to-Sync PPP	AT&F1
Multi-link PPP	AT&F2
V.120	AT&F5

- **Entering Switch Type:** Set the switch type using the command "AT!C0=n" with the following codes:

n=0	Auto Detection
n=1	AT&T 5ESS Custom
n=2	AT&T, SIEMENS, or NORTEL NI-1
n=3	NORTEL DMS-100 (Custom)

- **Entering SPIDs:** Set the SPID numbers with the command "AT!Cn=<number>" using the following codes for "n":

n=6	sets the SPID for Data Port #1
n=7	sets the SPID for Tel Port #1 (should be the same as Data Port #1)
n=8	sets the SPID for Data Port #2
n=9	sets the SPID for Tel Port #2 (should be the same as Data Port #2)

- **Entering DNs:** Set the Directory Numbers using the command "AT!Nn=<number>" with the following codes for "n":

n=0	sets the DN for Data Port #1
n=1	sets the DN for Tel Port #1 (should be the same as Data Port #1)
n=2	sets the DN for Tel Port #2
n=3	sets the DN for Data Port #2 (should be the same as Data Port #2)

- Enter the Voice Port Capabilities

  ⇒ **AT!Bn=x**

n=1,2	Select Tel Port #1 or #2
x=0	SPEECH (default)
x=1	AUDIO

- **Displaying Configurations:** Many features of the IS425A can be customized to suit your needs. The "AT&Vn" command reports summary information on these features, as well as commands and options to set them. For more specific information on each of these commands, see Section **"9.6 Description of AT Commands"**.

- **Saving Configurations:** When the IS425A is configured correctly, use the "AT&W1" or "AT&W2" command, which stores the active profile as User Profile #1 or #2 respectively.

  ⇒ *Note: The Switch, SPIDs, and DNs are not saved as part of the profile, but are stored separately automatically.*

- **Problems:** If the response "OK" from TA can not be received during any step, please refer to the Section "**9.5 Problems in Command Executions**" in **Chapter 9**.

5 How To Use the MMI

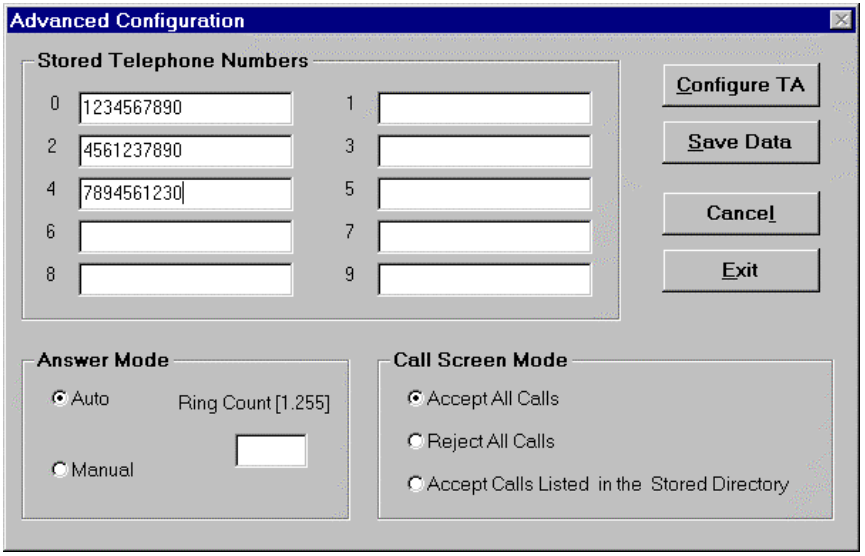
5.1 Introduction

In Chapter 4, you learned to configure the IS425A using the MMI. This chapter will show the added features the MMI provides.

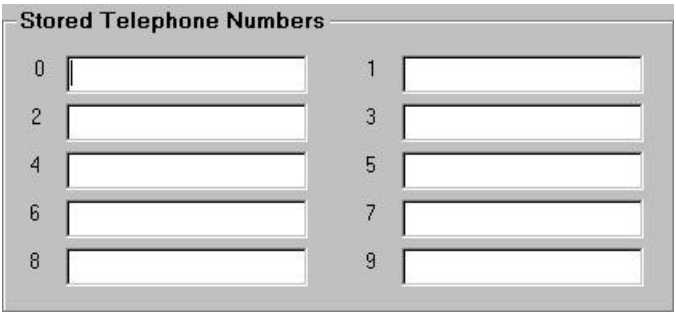
5.2 The Stored DNs Button

1. Click the **Stored DNs** button. 

2. The **Advanced Configuration** window appears.



3. In the section labeled **Stored Telephone Numbers,** you may program up to ten (10) phone numbers.
   ⇒ *This allows only those 10 individuals to contact you when you are on the Internet using both B-Channels (128Kbps).*



4. In the section labeled **Answer Mode** you may set the IS425A to answer automatically. Simply click the circle next to **Auto** 

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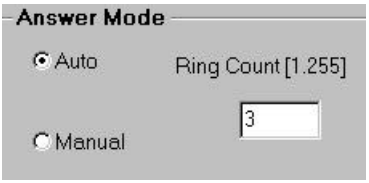
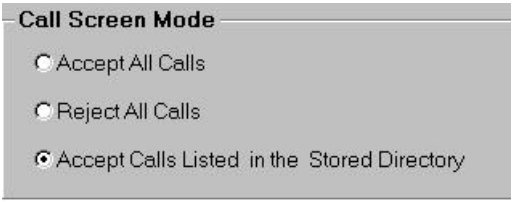


5. If you choose auto answer, you can manually adjust the **Ring Count** (i.e., how many rings before the PC automatically answers).
6. If you want to answer the incoming call, click the circle next to **Manual** 

.
7. In the section labeled **Call Screen Mode**, you may choose to accept, or reject all calls. You may also choose to accept only the calls you list above in the **Stored Telephone Numbers** section.



⇒ If you choose to accept all incoming calls, click the circle next to **Accept All Calls** (Accept All Calls).

⇒ If you choose to reject all incoming calls, click the circle next to **Reject All Calls** (Reject All Calls).

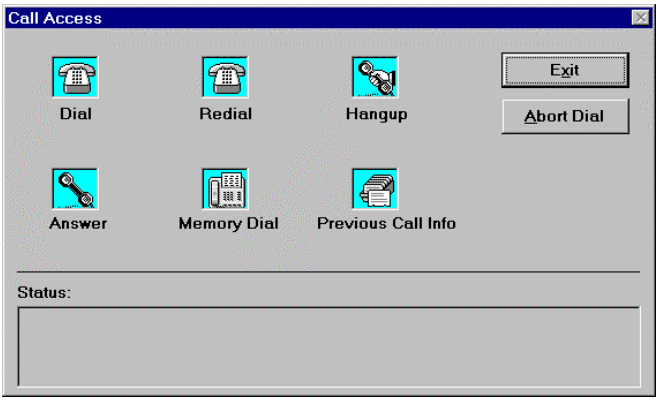
⇒ If you choose to screen your incoming calls, click the circle next to **Accept Calls Listed in the Stored Directory** (Accept Calls Listed in the Stored Directory).

8. To configure the IS425A with the present settings, click the **Configure TA** button.
9. To save the present settings, click the **Save Data** button.

5.3 The Call Button

1. Click the call button to make a call. 

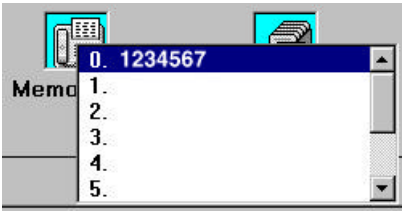
2. The **Call Access** window appears.



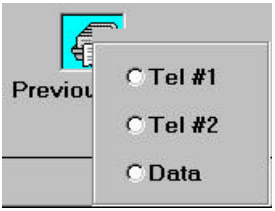
3. To make a call, click the **Dial** button.

4. The **Dial** window appears. Enter the number you are calling and click the **OK** button.

5. The IS425A calls the entered number.
6. To redial the last number you called, click the **Redial** button.
7. To end the call, click the **Hangup** button.
8. To manually answer an incoming call, click the **Answer** button.
9. To call one of the last ten (10) numbers dialed, click the **Memory Dial** button. A window will open revealing the last 10 numbers called. To dial one of these numbers, highlight/select and click.



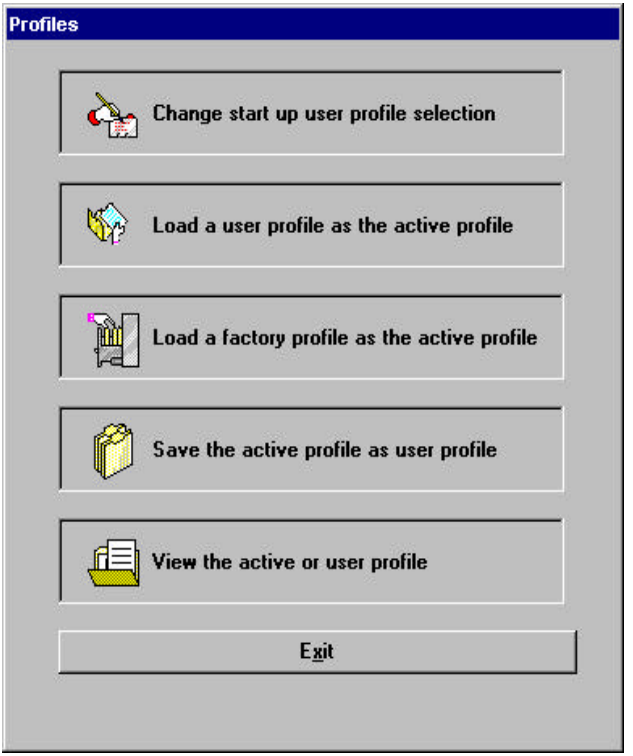
10. To reveal the past history of the Tel ports or the Data Port, click the **Previous Call Info** button. To choose the port you want to view, click the circle next to the desired port. The history information will show in the **Status** box.



5.4 The Profiles Button

1. Click the **Profiles** button. 

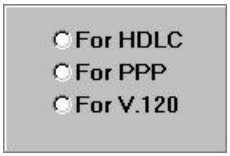
2. The **Profiles** window will open.
   ⇒ *Profile is the setup configuration of the IS425A.*



3. To change the start up profile, click the **Change start up user profile selection** button.
4. Click the circle next to the profile you want as the start up profile.

5. To load and use a profile stored in memory as the active profile, click the **Load a user profile as the active profile** button**.**
   ⇒ *The user can have 3 profiles. One may be active. The other two are stored in memory. The one that is active and not stored in memory will be lost when the power is disconnected.*
6. Click the circle beside the user profile you want to replace with the new profile.

7. To load a factory profile as an active profile, click the **Load a factory profile as an active profile** button**.**



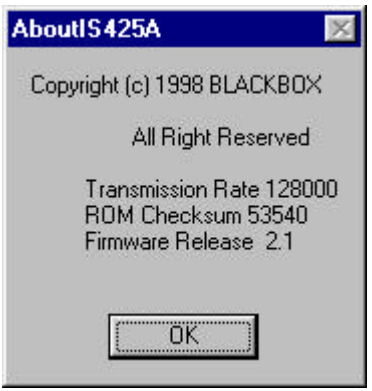
8. If you want to save the active profile you are now using, click the **Save the active profile as the user profile** button**.** Then choose the profile you wish to save it as.
   ⇒ *Note: If you have saved user profiles already, you will copy over one of the profiles stored.*

9. To view the settings of each profile, click the **View the active or user profile** button. Then click the circle next to the profile wanted.
   ⇒ *This may be used as a diagnostic tool.*

5.5 The About Button

1. Click the **About** button, 

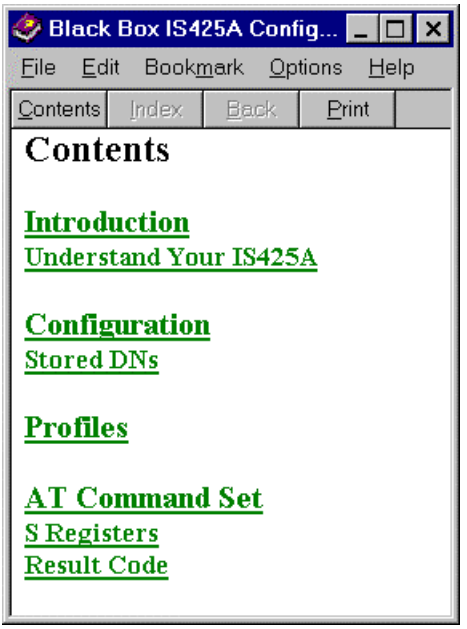
to get the IS425A version information.



5.6 The Help Button

1. Click the Help button. 

2. The Help window opens



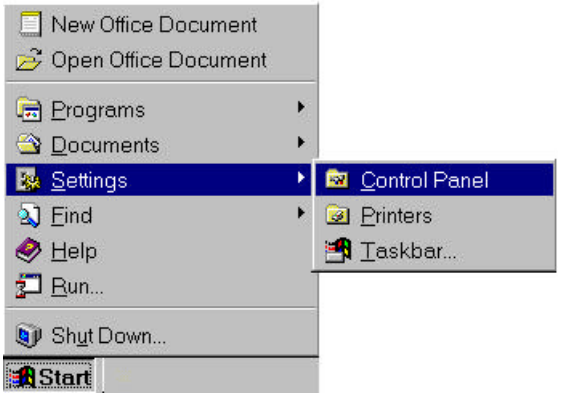
3. Highlight your choice and click the mouse button.

6 Network Connections

6.1 Creating a Network Connection with Windows 95

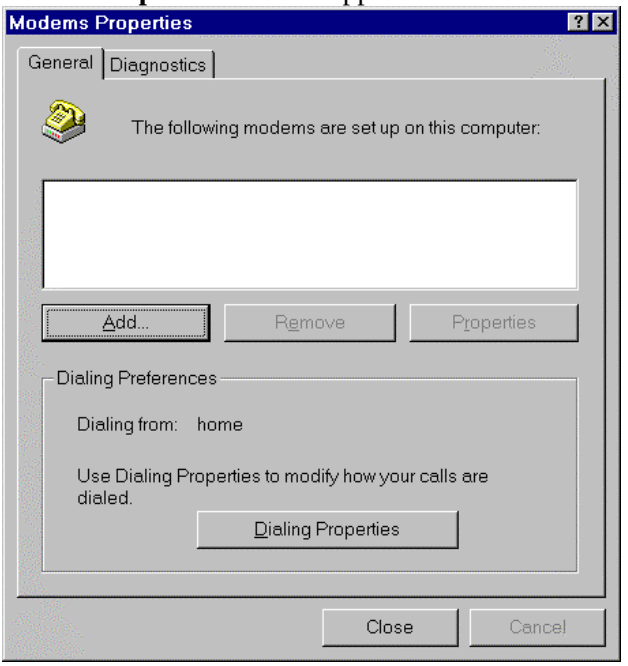
You must first create a network connection before you make a data call. To make a network connection, follow the steps below:

1. Click the **Start** button on your taskbar.
2. Highlight **Settings**.
3. Click on **Control Panel**.

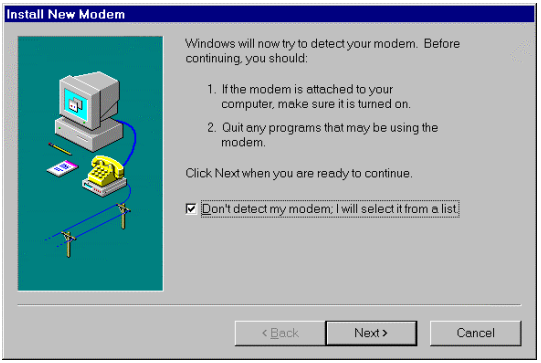


4. The **Control Panel** window appears. Double click the **Modems** icon.

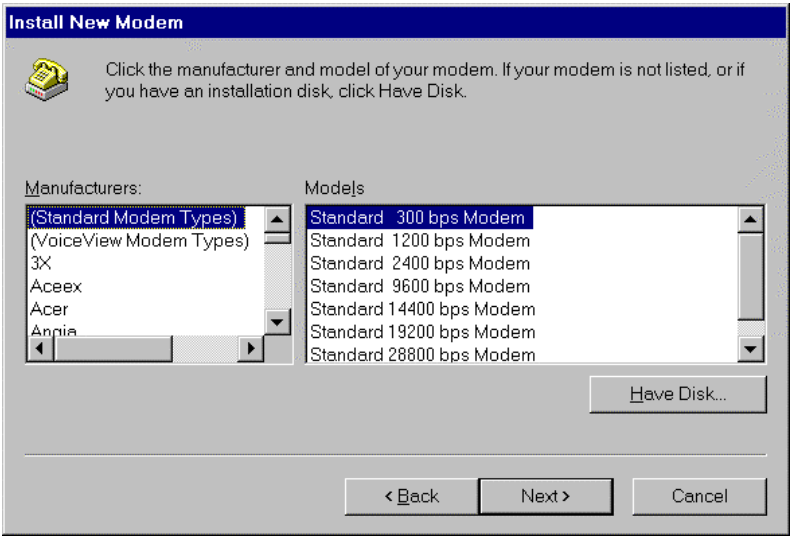
5. The **Modems Properties** window appears. Click the **Add** button.



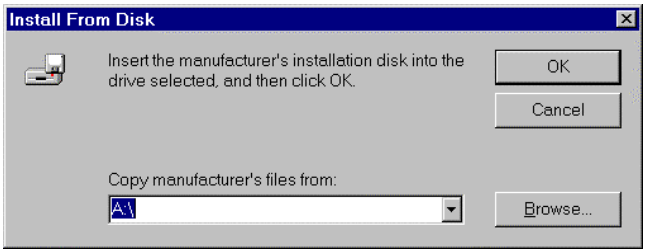
6. The **Install New Modem** window appears. Click the "**Don't detect my modem; I will select it from a list**" box. Click the **Next** button.



7. Another **Install New Modem** window appears. Click the **Have Disk** button.

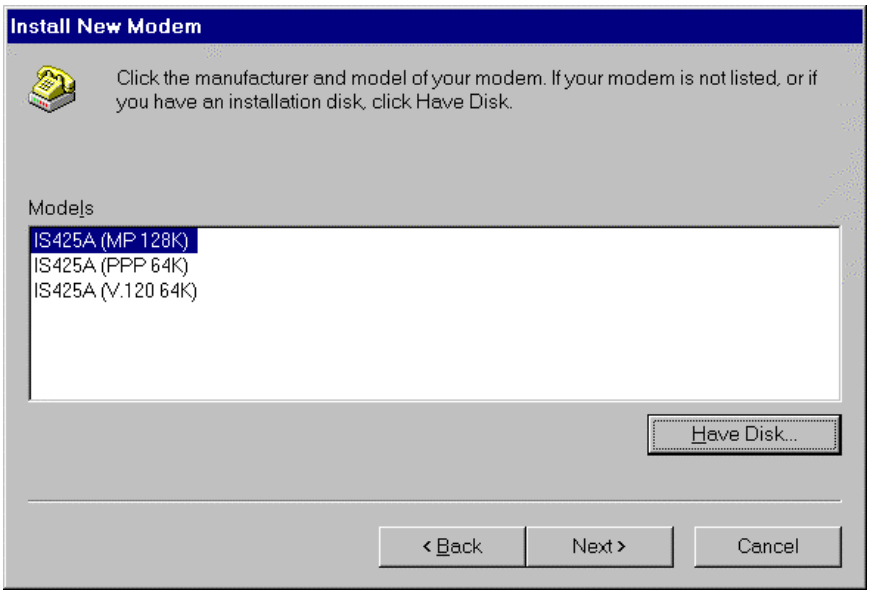


8. The **Install From Disk** window appears. Type in **A:** and click the **OK** button. Make sure the "**BLACK BOX® IS425A Installation Disk 1 of 2"** is in Drive A of your PC.

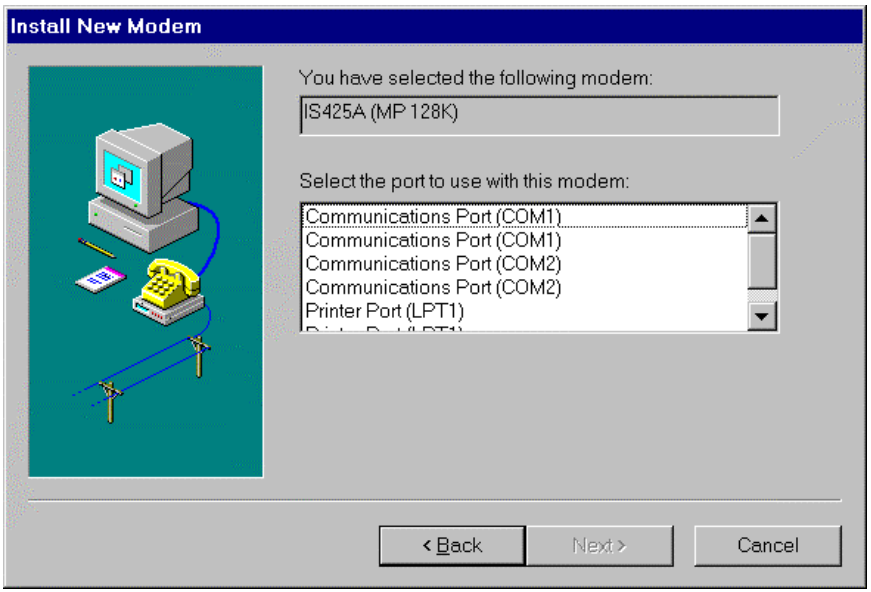


9. Another **Install New Modem** window appears. Highlight the mode you want to use, and click the **Next** button.

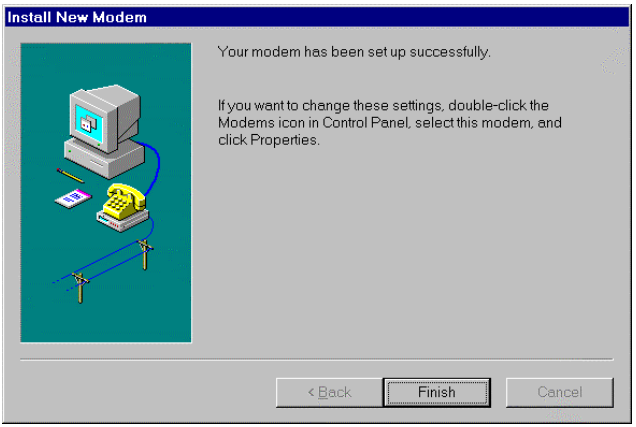
   *Note: **MP128K** is the default startup profile.*



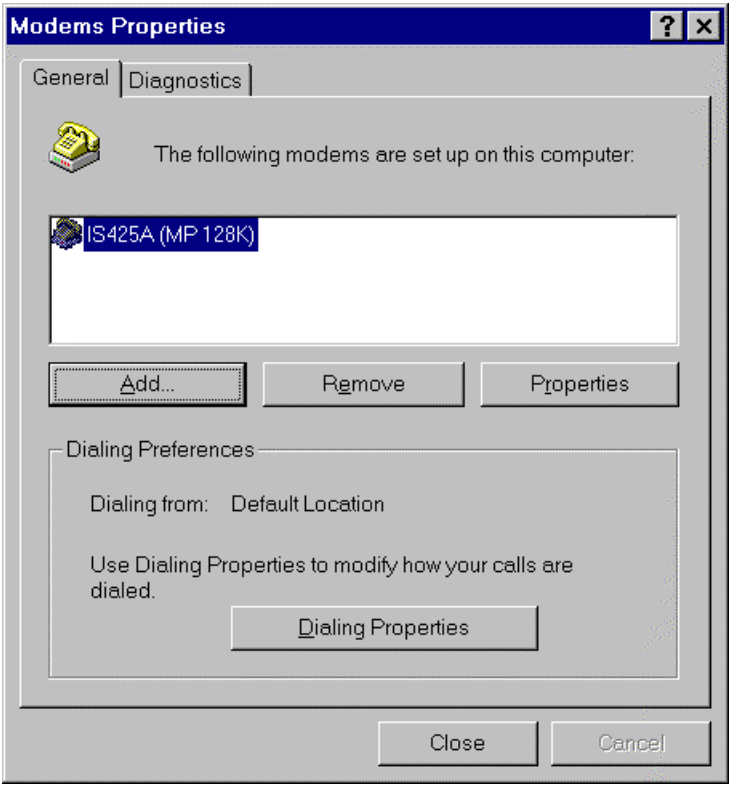
10. Another **Install New Modem** window appears. Highlight **Communications Port (the port connected to the IS425A)**, and click the **Next** button.



11. The **Install New Modem** window appears again. Click the **Finish** button.

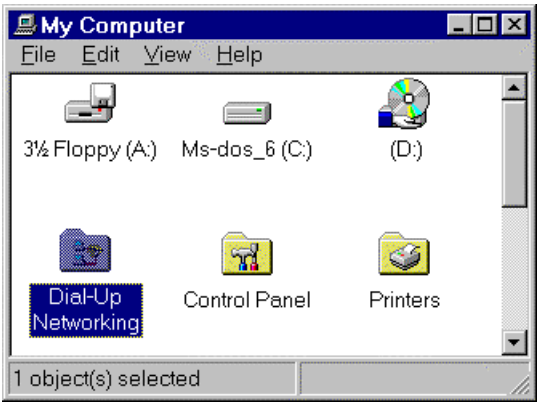


12. The **Modems Properties** window appears. Click the **close** button.



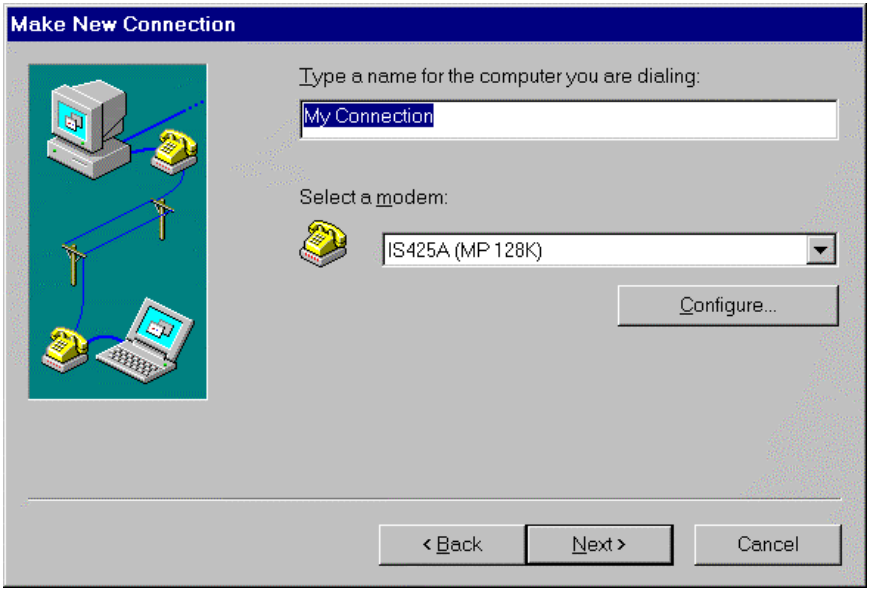
6.2 Configuring Your Network Connection

1. On the main menu of Window 95, double click **My Computer**.
2. Double click the **Dial-Up Networking** icon.



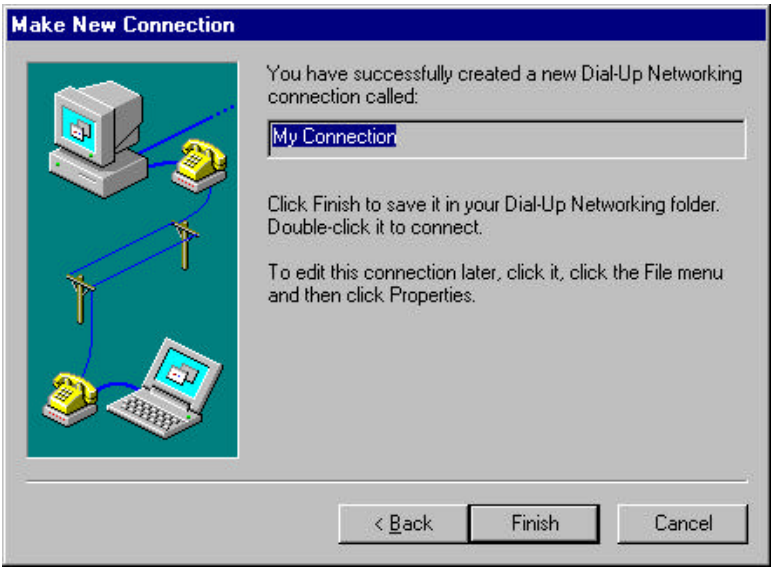
3. The **Dial-Up Networking** window appears. Double-click the **Make New Connection** icon.

4. The **Make New Connection** window appears. Choose the IS425A setting that you installed earlier and click **Next**.

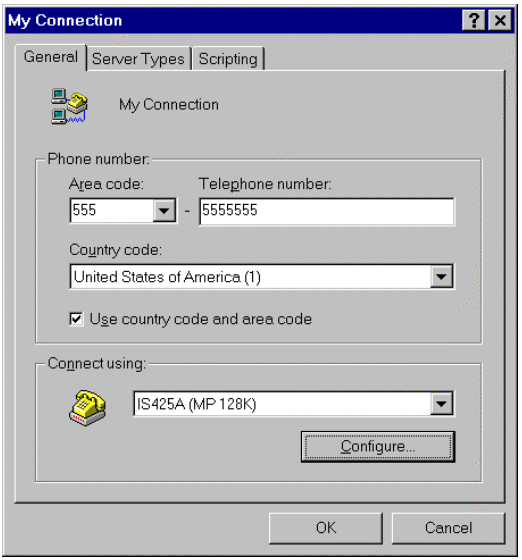


5. Enter the number to dial for your connection and click **Next**.

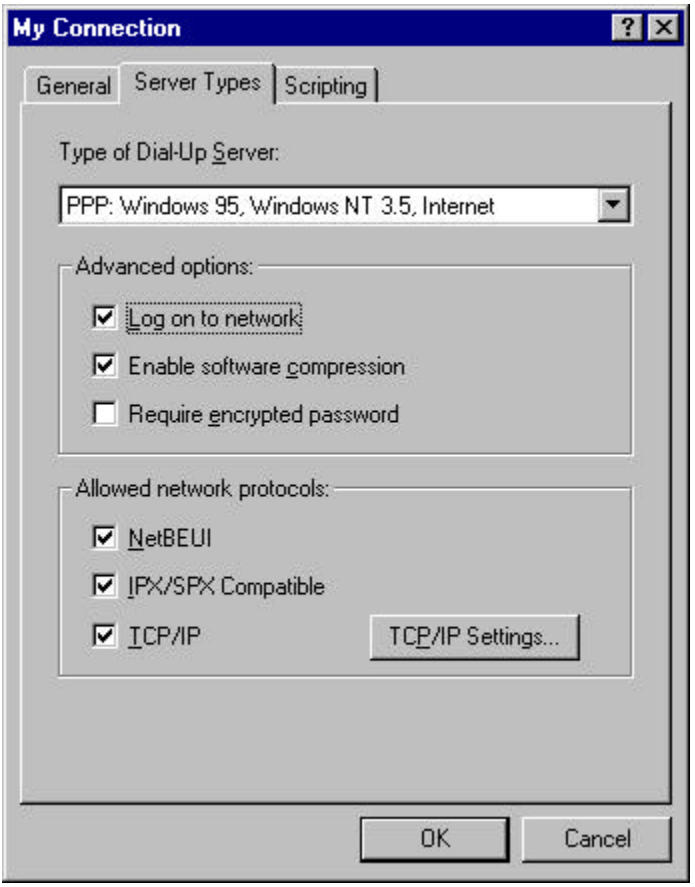
6. Click **Finish** to confirm your connection.



7. Right-click on your new connection and choose **Properties**. Uncheck the "**Use country code and area code"** box if you do not need it for your application.

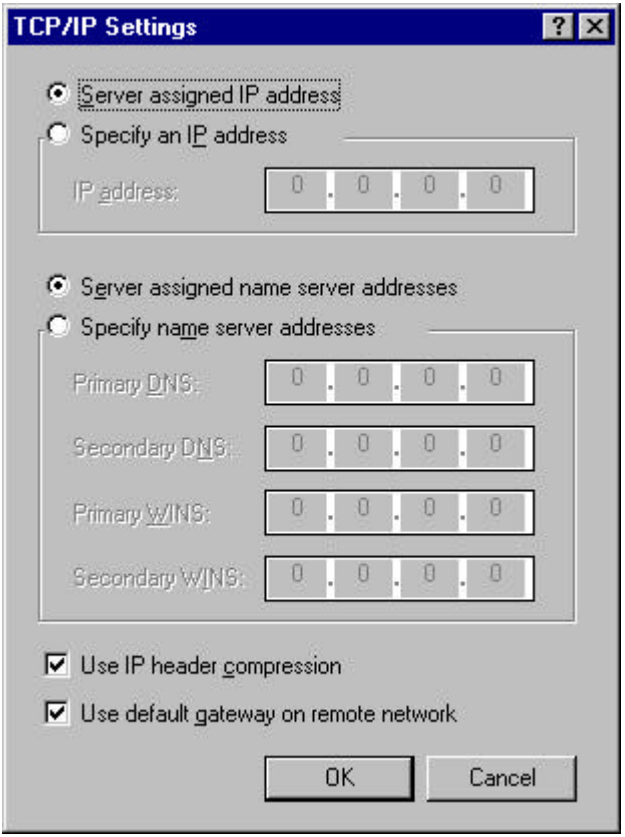


8. Click the **Server Types** tab.



9. Check and/or uncheck the **Advanced options** and **Allowed network protocols** as needed by your application. If you are connecting to the internet, you need to contact your Internet Service Provider for this information.

10. If you are using TCP/IP, click the **TCP/IP settings** button.



11. Set the IP Address and Domain Name Server Addresses as needed by your application. If you are connecting to the Internet, contact your Internet Service Provider for this information.

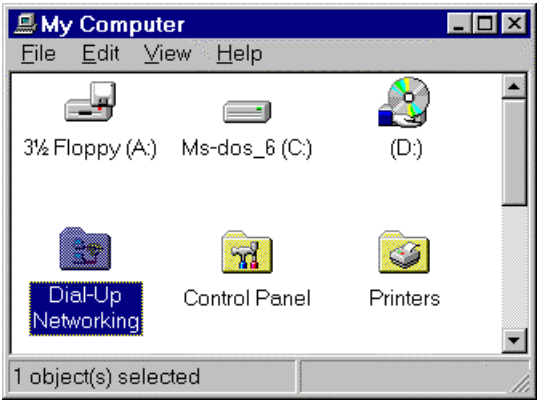
12. Click **OK**, then **OK** again.

CONGRATULATIONS, YOU CAN NOW MAKE A NETWORK CONNECTION!

7 Data Calls

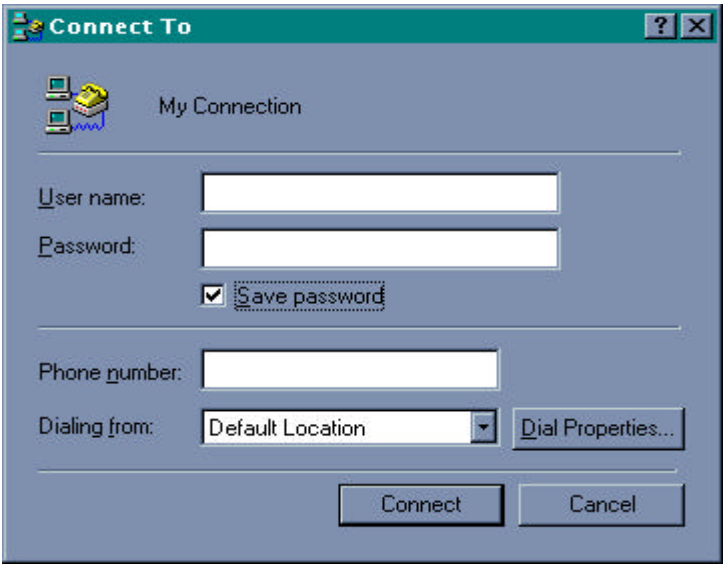
7.1 How to make a Data Call with Windows 95

1. On the main menu of Window 95, double click **My Computer**.
2. Double click the **Dial-Up Networking** icon.



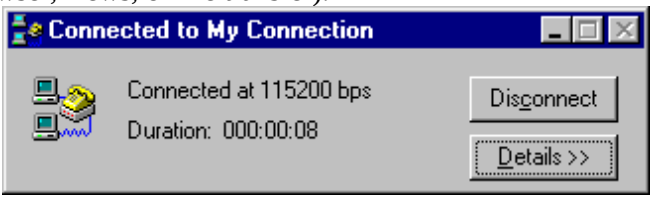
3. The **Dial-Up Networking** window appears. Double click the connection icon (**My Connection**) that you defined for the Internet access by using the IS425A. (See **Chapter 6**).

4. The **Connect To** window appears. Input **User name**, **Password,** and **Phone number**.



5. Click the **Connect** button to connect with the Internet server. The **Connecting to My Connection** window appears.

6. The above window will be displayed. This means the physical connection between the IS425A and the Internet server has been established. The hand shaking is now in progress. When the window below appears, you can use your Internet application program (Browser, News, or file transfer).



7. The connection can be released by clicking **Disconnect**.

7.2 How to make a Data Call Using AT commands

The **IS425A** supports various data call types (HDLC transparent, Async-to-Sync PPP, MultiLink PPP, and V.120). The section, "Making a data call" demonstrates a data call by using the AT Command Set in the terminal emulation program.

1. Verify the DIP Switches 1 through 6 are in the OFF position. If not, power the unit off and set the DIP Switches to OFF. Power the unit on after the changes have been made.
   ⇒ *Termination Note: Leave DIP Switch 7 & 8 set to ON. If changed, these will effect the operations of the S/T device connected to the IS425A.*
2. Enter the dialing command
   ⇒ **ATD <phone number> <ENTER>**
   * The <phone number> is the phone number of the DTE that you wish to connect with and press the Enter key.
     Example: ATD4125678 <ENTER>

   ⇒ **CONNECT <baud rate/call type>**
   * If the above message is displayed, the remote site has answered. The IS425A is now in the On-Line state. Data transfer with the remote site is now possible.
     Example: CONNECT 38400/V.120

8 Supplementary Service

8.1 Call Management Features

The IS425A provides call waiting, call hold, call transfer, and conference.

- Call Hold and Call Waiting can be provisioned without supplementary services. Each of these features must be provisioned by the Telephone Company before the IS425A can utilize them.
- The IS425A provides a Call Waiting tone. It does not provide the Hold-tone. The person on hold will hear nothing.
- Call Transfer and Conference need to be subscribed from the Telephone Company.
- For supplementary service, you must configure the analog port for "speech". The factory setting is "speech", which can be changed by re-configuring the analog port (for MMI see **Chapter 4** and for AT Commands see **Chapter 9** or **Appendix A**).

8.2 Flash

The word "flash" is used though out this chapter to describe a telephone term called "flash-hooking".

- To utilize the *flash* function, press down the telephone receiver button and release it.
- The time you hold the receiver button down should be approximately one half second. The *flash* should never exceed one second or it will become a disconnect. If you *flash* to quickly, the IS425A may not recognize the *flash*.

Note: It's a good idea to practice using flash, before you start placing or receiving calls. Your analog phone may also have a "flash" button that could perform this function for you.

8.3 Disconnecting a Call

- To disconnect an active call, press down the telephone receiver button and hold it down at least one second.
- If you have any calls on hold, after a few seconds the phone will ring with a "reminder ring". Pick up the receiver to reconnect to the call on hold.

8.4 Retrieving a Call on Hold

- If you are switching between two calls, simply *flash* to retrieve the inactive call.
- If there is not another active call, then simply hang up the receiver. After a few seconds the IS425A will signal you with a reminder ring. This indicates that there is still a call on hold. Pick the receiver up to connect.

8.5 Transferring Calls

- To transfer an active call, use *flash* to get to a single dial tone.
  ⇒ *If you hear a busy signal, there is no available call appearance to place the call on.*
- Dial the number of the location where you wish to transfer the call.
- It is possible to announce to the second party that you are transferring a call to them.
- To complete the transfer, simply hang up.
- If the second party does not want to take the transfer call, you can cancel the transfer by letting the second party hang up first.

8.6 Conferencing Calls

- To start a conference call, acquire the first party in an active call.
- Next, use *flash* to get to a single dial tone.
  ⇒ *If you get back a busy signal, there is no available call appearance to place the call on.*
- After you receive a dial tone, dial the number you wish to conference.
- Before you *flash*, it is possible to announce to the second call that you are about to put them into a conference call with the first party.

- If the second party does not want to enter into a conference call, you can cancel the conference by letting the second party hang up before you do.
    - ⇒ *You cannot conference a call that arrives on your call waiting.*

8.7 Drop Last Call

- In a conference call, you can drop the last party added by using another *flash*.
    - ⇒ We recommend using the Drop function instead of allowing other callers to disconnect during a conference. If one of the parties of a conference disconnects, and you flash afterwards, the drop will be sent causing you to lose the remaining caller.
- If you drop the last call, you can initiate another transfer or conference.

8.8 Signaling

- **Ringing on analog phones**
    - ⇒ **Normal Ring:** A single ring of 2 second duration followed by 4 seconds of silence signals an incoming call.
    - ⇒ **Reminder Ring:** A single ring of half second duration followed by a half second of silence signals a call is waiting on hold.
- **Ringing from inside the IS425A**
    - ⇒ **Alarm Ringing:** A single continuous ring that does not stop. This signals that one of the analog lines has been left off-hook. To turn it off, just hang up.

9 AT Command Set

9.1 Introduction to the AT Command Set

The AT Command set is widely used in almost all modem controls. You must use a terminal or the terminal emulation capability of your communication software package. In general, AT Commands are responsible for instructing the IS425A to do a task. You send these commands to your IS425A from your PC using communication software. When the IS425A receives a command, it will respond with an AT result code on your terminal. This chapter explains the AT Commands and its result codes.

9.2 Functional States

When operating via the AT Command interface, the IS425A is always in one of the following four functional states:

1. **Command Mode**
2. **Call-in-Progress state**
3. **On-Line state**
4. **Escape Command Mode**.

The Command Mode

The Command Mode is the default mode when the IS425A is powered on or after a disconnect. While in this mode, the IS425A accepts commands from the Data Terminal Equipment (DTE).

The On-Line State

After dialing the number and completing the linkup hand shaking, the IS425A will make a connection with the remote terminal adapter and enter the **On-Line state**. In this state the system sends and receives data.

However, it does not accept commands, except for the escape sequence "+++". When the link is lost or intentionally dropped the IS425A will clear the call and re-enter the Command Mode.

The Call-in-Progress State

The Call-in-Progress state is the transition state between the Command Mode and the On-Line state. After a call is placed, a connection must be established within a preset period of time (S7 Register). If a connection does not occur during the Call-in-Progress state, or if a key on the DTE keyboard is pressed (a dial interrupt occurs), the IS425A will abandon the call and re-enter the Command Mode.

The Escape Command Mode

Once the IS425A has entered the On-Line state, you may escape from this state by entering the escape sequence "+++". The escape sequence will cause the IS425A to enter the **Escape Command Mode** and respond with the "OK" message. In the Escape Command Mode, most of the commands can be invoked just as in the Command Mode. In the Escape Command Mode the IS425A does not terminate the connection with the remote side. To return to the On-Line state from the Escape Command Mode, enter the command "ATO".

9.3 Guidelines for Using AT Commands

All AT Commands (except the A/ command) begin with the **AT** prefix and end with pressing the ENTER key. A typical AT Command line is shown below.

AT	Command String	<Enter>

AT

- The AT prefix is known as the "**Attention Characters**." It can be uppercase or lowercase but the IS425A will not recognize a combination of the cases (**At** or **aT**).
- It also informs your terminal (IS425A) of your computer's speed, parity and character length. The data character formats (how your data is structured) for the **AT Command** set.

- It can be set using your communication software. It must be one of the following:
  - ⇒ 8 data bits + no parity + 1 stop bit.
  - ⇒ 7 data bits + 1 parity bit + 1 stop bit (Parity can be odd, even, mark, or space.)

Command String

- Commands can be entered one at a time or in strings (several commands at once).
- Strings can have up to 239 characters after the prefix. The prefix code must be in all uppercase or lowercase.
- The letters that follow can be any mixture of uppercase and lowercase.
  - ⇒ The backspace key can be used to edit the command string you have typed.
  - ⇒ The backspace key erases the character to the left of the cursor but will not erase the "AT" characters once they are typed in.
  - ⇒ To re-execute the previous command, the "A/" command supports re-execution of the previous command for users' convenience.

9.4 Profile Descriptions of the IS425A

To meet different application requirements, the IS425A provides a series of parameters (or registers) through which it can be configured. When the IS425A is in the Command Mode or Escape Command Mode, you can use commands to modify these parameters (or registers) and control the operations of the IS425A.

Whenever you modify the values of the parameters (registers) the system automatically keeps the new values in the volatile memory. If you do not save them in a user profile, the changes are temporary and last only until the IS425A is reset.

The IS425A supports three types of profiles they contain all the parameters (registers). Values for these parameters can be saved as user profiles for later use.

1. **Active profile -** is the current operating configuration of the IS425A.
    - It can be configured using AT Commands.
    - The active profile is lost when the IS425A is powered off.
2. **User profile** - is the user's custom-made stored configuration.
    - The IS425A will automatically load a user profile to the active profile whenever the system is powered down.
    - Two user profiles are supported by the IS425A. Use the "**AT&Wn**" command to save the active profile as user profile n=1 or n=2 and use the "**ATZn**" to load user profile n=1 or n=2 as the active profile.
    - Users must specify which user profile is used for power-up profile by issuing the command "**AT&Yn**" where n=1 or n=2
3. **Factory profile -** a series of settings which store four sets of operating parameters commonly used for data communication.
    - These profiles are stored in Flash ROM.
    - They can be loaded to replace the current active profile via the command "**AT&Fn**" where n=0,1,2,5.

9.5 Problems in Command Executions

If your IS425A did not execute a command line, make sure the following is correct:

- You are in the Command Mode and your command line follows the format described in the paragraph entitled, "**Guidelines for Using AT Commands**".
- Verify your COM port speed matches any one of the following speeds: 230400, 115200, 57600, 38400, 19200, 9600, 4800, 2400, 1200 or 600 bps.
- Type "AT" and press the ENTER key. This will lead to a response of "OK". If not, type "AT&F0" and press ENTER key. If your IS425A still does not respond, its connection with your computer may have a problem or your software's COM Port and/or IRQ was incorrectly set.

To ensure you have properly installed your IS425A and the application software, please review the installation instructions in **Chapter 2**.

9.6 Description of AT Commands

A/ = Command Repeat

Format	A/

- "**A/**" is used to repeat the previous command line.
- For example, you can use the "**A/**" command to re-dial a telephone number.
- This is the only command that does not require the AT prefix and the ENTER key.
- The previous command remains in the command buffer until either the next command is entered or the IS425A is powered off.
- If the previous command line does not exist, an "OK" message will be displayed.

A = Manual Answer

Format	ATA <ENTER>

- "**A**" is used to answer an incoming data call, which is indicated by the message "RING<phone number>".
- Incoming calls can be answered using the "ATA" command or by enabling the auto-answer mode via the S0 Register.

D = Dial

Format	ATDnumber <ENTER>

- "D" is used to instruct the IS425A to dial a telephone number.
- Some special characters, like "T", "P", "W", space, and parentheses, will be ignored in a dialing command line.
- When the "D" command is invoked in the Command Mode, the IS425A will enter the Call-in-Progress state and wait for an answer from the remote IS425A.

- When the IS425A is in the Call-in-Progress state, the call can be aborted by pressing any key.

DL = Last Data Call Redial

Format	ATDL <ENTER>

- "DL" is an extension command of "D".
- It is used to re-dial the previous data call if the phone number still remains in the phone number buffer.
- The phone number will remain there until either the next data call is dialed or the IS425A is powered off.
- Once this command is executed, the IS425A will enter the Call-in-Progress state. You may abort this Call-in-Progress state by striking any key during this time.

DS = Memory Dial

Format	ATDS=n<ENTER>

- Where the number "n" is an integer ranging from 0 to 9 that is the index of the phone directory stored in the memory of the IS425A.
- "DS" is an extension command of "D".
- It tells the IS425A to dial the phone number in the internal phone directory.
- The internal phone directory may be stored by the "&Zn" command.

E = Command Echoing

Format	ATEn <ENTER>
n=0	Disable Command Echoing
n=1	Enable Command Echoing (default)

- "En" enables or disables echo of commands in the Command Mode or the Escape Command Mode.
- In the On-Line state, data echo is always disabled.

H = Hang up

Format	ATH <ENTER>

- "H" allows you to clear a data call or to reject an incoming data call manually.
- When this command is invoked, the IS425A enters the Command Mode.
- Any commands that follow the command "H" in the same command line will be ignored.

I = Identification

Format	ATIn <ENTER>
n=0	Display maximum network rate (128000)
n=1	Display the checksum of TA's ROM (28000)
n=2	Reserved
n=3	Display the model ID, Ver x.x

- "In" instructs the IS425A to display its internal information, such as maximum network rate, ROM checksum, model ID, and firmware version.
- An example of the model ID and the firmware release number is shown as **Ver x.x**, where x.x is the version number.

O = Go on Line

Format	ATO <ENTER>

- "O" command is only effective in the Escape Command Mode.
- When the IS425A is in the Escape Command Mode, the "O" will force the IS425A to return to the On-Line state.
- Any command that follows the command "O" in the same command line will be ignored.

Q = Quiet Mode Control

Format	ATQn <ENTER>
n=0	Result codes are displayed (default)
n=1	Result codes are suppressed

- "Qn" is used to instruct the IS425A to display or suppress the result code after a command execution.
- Suppressing result codes are useful.
  - ⇒ For example: A printer is connected to your IS425A. However, you do not want the result code from the IS425A printed after each print action.

S? = Query S Register

Format	ATS? <ENTER>

- "S?" is used to query the content of all the S Registers.
- All detailed information about the S Registers is described in the section below entitled **S Registers**.

Sn? = Query Designated S Register

Format	ATSn? <ENTER>

- Where the number "n" is the index of the specified S Register
- If you are curious about the content of one specific S Register, "Sn?" command is suitable for your use.
- Only the value of the S Register you specified is displayed.
- For further information on the S Registers, refer to the section entitled **S Registers**.

S = Program S Register

Format	ATSn=x <ENTER>

- Where the number "n" is the index of the specified S Register and the number "x" is the programmed value.
- "Sn=" command allows you to program or change the content of a specific S Register. To make sure of your change, you may also view the new value by issuing the "S?" or "Sn?" commands. All detailed information about the S Registers is described in the section entitled **S Registers**.

V = Result Code Format

Format	ATVn <ENTER>
n=0	Result codes are displayed as numbers
n=1	Result codes are displayed as text (default)

- "Vn" determines the way result codes are sent to the DTE.
- The relationship between these two forms are shown in the section entitled, "**Result Code"**.

X = Connect Result Code Format

Format	ATXn <ENTER>
n=0	Connect result codes are displayed in short form.
n=1	Connect result codes are displayed in complete form. (default)
n=2	Enable voice result codes and all result codes are displayed in complete form.

- "Xn" determines the format of the connect result codes.
- If short form is selected, no detailed message is displayed.
- If complete form is used, DTE baud rate and call type messages are appended after the word "CONNECT".
- Sometimes one might need to filter incoming voice calls. After the voice result codes enable, the IS425A will send a RING result code. It will be followed by the caller's identification telephone number, via its data port once an incoming voice call present. This allows the user to answer the call selectively according to the Caller ID.

The table below illustrates the result code format under the three settings.

Result Code Xn	0	1	2
RING	O	X	X
RING xxxx	X	O	O
CONNECT	O	X	X
CONNECT xxxx	X	O	O
VOICE CALL	X	X	O

- Where "O" denotes the result code is defined under the setting in the column and on the contrary the result code is not defined if it is marked by "X".

Z = Recall Stored User Profile

Format	ATZn <ENTER>
n=1	Load user profile 1 as active profile
n=2	Load user profile 2 as active profile

- "Zn" loads a user profile as the active profile.
- When this command is invoked your IS425A will abort all existing calls and reconfigure itself to the setting stored in the selected user profile.
- The "Zn" command must be the last command in the command line.

+++ = Escape Sequence

Format	+++

- The escape sequence causes the IS425A to switch from the On-Line state to the Escape Command Mode.
- The sequence consists of an escape character string followed by one interval of escape prompt delay then a valid AT Command is mandatory after the IS425A responds, "OK".

&C = Carrier Detect (CD) Control

Format	AT&Cn <ENTER>
n=0	CD is always on
n=1	CD goes on only when a call is established (default)

- The CD can be set to indicate a call establishment.

&D = Data Terminal Ready Action

Format	AT&Dn <ENTER>
n=0	IS425A ignores DTR signal.
n=1	IS425A enters the Escape Command Mode when the DTR signal goes ON-to-OFF while IS425A is during the On-Line state.
n=2 (default)	IS425A clears a data call when it detects an ON-to-OFF transition on DTR IS425A does nothing when it detects an OFF-to-ON transition (108/2 mode for DTR).
n=3	IS425A clears data call when it detects an ON-to-OFF transition on DTR. IS425A dials the 0th stored phone number when it detects an OFF-to-ON transition (108/1 mode for DTR).

- "&D" determines how the IS425A handles the data terminal ready signal.

&F = Load Factory Profile

Format	AT&Fn <ENTER>
n=0	Load factory profile 0 as the active profile (for HDLC transparent calls and asynchronous DTE).
n=1	Load factory profile 1 as the active profile (for PPP calls and asynchronous DTE).
n=2	Load factory profile 2 as the active profile (for Multilink PPP calls and asynchronous DTE).
n=3	Load factory profile 3 as the active profile (for diagnostic use only).
n=5	Load factory profile 5 as the active profile (for V.120 calls and asynchronous DTE).

- "&Fn" loads a factory profile as the active profile.
- Nine-set configuration profiles suitable for various types of data calls are stored in the IS425A.
- Once the desired profile is loaded the system is automatically reinitialized.

&K = Flow Control Setting

Format	AT&Kn <ENTER>
n=0	Disable flow control
n=3	Bi-directional RS/CS flow control default
n=4	Bi-directional Xon/Xoff flow control

- "&Kn" specifies the local flow control between the IS425A and the DTE.
- It takes effect only when the system is in the On-Line state after a data call has been established.

&L Display Last Call Information

Format	AT&Ln <ENTER>
n=0	Display the information of the last data call placed on the data port.
n=1	Display the information of the last voice call placed on analog port Tel 1.
n=2	Display the information of the last voice call placed on analog port Tel 2.

- "&Ln" allows you to view the information about the last calls that were placed on the data port and analog ports respectively.

&S = Data Set Ready (DR) Control

Format	AT&Sn <ENTER>
n=0	DR always on (default)
n=1	DR on during communication

- "&Sn" determines how the IS425A handles the data set ready signal.

&V = View Configuration Profile

Format	AT&Vn <ENTER>
n=0	Display the active profile.
n=1	Display the user profile 1.
n=2	Display the user profile 2.
n=3	Display system parameters and analog port setting

- "&Vn" allows you to view the active and stored user profiles.

&W = Store Active Profile as User Profile

Format	AT&Wn <ENTER>
n=1	Store active profile as user profile 1
n=2	Store active profile as user profile 2

&Y = Select Profile on Power-Up

Format	AT&Yn <ENTER>
n=1	Select user profile 1 as the default profile
n=2	Select user profile 2 as the default profile

- "&Yn" determines a user profile to be loaded as the default active profile each time the IS425A is powered on or reset.

&Z = Store Phone Directory

Format	AT&Zn= phone number<ENTER>

- "n" (ranging from 0 to 9) represents the stored numbers in the phone directory.
- "&Zn" stores a phone number in location "n" of the phone directory.

&Z? = List Phone Directory

Format	AT&Z? <ENTER>

- "&Z?" instructs the IS425A to list all the phone numbers that were stored in the phone directory.

!B = Set Analog Port Attribute

Format	AT!Bn=x <ENTER>
n=1,x=0	Set the attribute of analog port Tel 1 to SPEECH type.
n=1,x=1	Set the attribute of analog port Tel 1 to AUDIO type.
n=2,x=0	Set the attribute of analog port Tel 2 to SPEECH type.
n=2,x=1	Set the attribute of analog port Tel 2 to AUDIO type.

- If supplementary service is used and a call comes in while the analog port is in use, the IS425A will send the call waiting tone to the user. This tone signifies the second call.
- However, this is not always welcome especially during modem or facsimile connection. The call waiting tone may disturb the carrier signal and corrupt the connection. To avoid such annoying problems, the !B command allows you to select the attribute of the two analog ports.
- Users may disable the call waiting tone by selecting AUDIO type.

- In short if your analog port is connected to a telephone set, you may choose SPEECH type for call waiting service. On the other hand, if it is connected to a modem or FAX machine, it is recommended that you set the port to AUDIO type.

!Bn? = Query Analog Port Attribute

Format	AT!Bn? <ENTER>
n=1	Query the attribute of the analog port Tel 1
n=2	Query the attribute of the analog port Tel 2

- "!Bn?" is used to query the attribute of the specified analog port that were stored by entering the "!Bn=" commands.

!Cn = Set Switch Type and SPIDs

Format	AT!Cn= Switch/SPID <ENTER>
n=0	Sets the Switch Type Automatically
n=6	Sets the SPID of data port 1
n=7	Sets the SPID of data port 2
n=8	Sets the SPID of the analog port Tel 1
n=9	Sets the SPID of the analog port Tel 2

- "!C0=" sets the switch type by the following codes:
  "0" is Auto Detection
  "1" is AT&T 5ESS Custom switch
  "2" is AT&T or SIEMENS NI-1 switch
  "3" is NORTEL DMS-100 switch
  "4" is NORTEL NI-1 switch

!Cn? = Query Switch and SPID Settings

Format	AT!Cn? <ENTER>
n=*blank*	Query all !C settings
n=0	Query the switch type setting
n=6	Query the SPID of data port 1
n=7	Query the SPID of data port 2
n=8	Query the SPID of the analog port Tel 1
n=9	Query the SPID of the analog port Tel 2

- "!C?" is used to query a summary of the switch type setting and all SPID settings.

Format	AT!E0? <ENTER>

!F0 = Program "Feature Keys"

Format	AT!F0= n1/n2/n3 <ENTER>
n1=0~255	Conference Feature Key, default value is 60
n2=0~255	Transfer Feature Key, default value is 61
n3=0~255	Drop Feature Key, default value is 62

- No two can equal the same value.

!F0? = Query "Feature Keys"

Format	AT!F0? <ENTER>

- No two can equal the same value.

!N = Store Self Directory Number

Format	AT!Nn= phone number <ENTER>
n=0	Store the self directory number of Data Port #1
n=1	Store the self directory number of the Analog Port Tel 1
n=2	Store the self directory number of the Analog Port Tel 2
n=3	Store the self directory number of Data Port #2

- "!Nn" is used to store the local directory numbers (the user's phone numbers) assigned to your IS425A.
- Users may also assign an individual extension number to each port on the IS425A.

!N? = Query Self Directory Number

Format	AT!N? <ENTER>

- "!Nn?" is used to query the directory numbers that were stored by entering the "!Nn=" commands.

!R = Screen Incoming Calls

Format	AT!Rn=x <ENTER>
n=0	Data Port
n=1	Analog Port Tel 1
n=2	Analog Port Tel 2
x=0	Accept all incoming calls (default)
x=1	Reject all incoming calls
x=2	Accept calls listed in the stored phone directory

- The "!Rn" instructs the IS425A to screen an incoming call for an individual port.
- x=0 or 1 forces the IS425A to answer or reject a call unconditionally.
- You may want your data or analog ports to answer a call according to a list for security or privacy sake. The IS425A can be set to screen incoming calls, so when a call comes in, the IS425A looks up the stored phone directory (stored by "&Zn" command). Only the call whose phone number matches a number in the directory will be answered.

%A0 = Select Numbering Plan

Format	AT%A0 =n <ENTER>
n=0	Unknown (default)
n=1	ISDN numbering plan

%A2 = Select Call Type

Format	AT%A2 =n <ENTER>
n=0	HDLC transparent rate adaptation
n=1	Asynchronous-to-synchronous PPP protocol
n=2	Multilink PPP
n=3	Asynchronous Inverse MUX
n=5	V.120 rate adaptation

- "%A2" allows you to select the protocol for your data call.
- If you choose asynchronous-to-synchronous PPP, you can make a 64Kbps connection.
- To achieve a maximum ISDN transmission, choose Multilink PPP. This establishes a 128Kbps connection.
- To make bandwidth utilization more effective the IS425A adds and drops a B-Channel dynamically according the real data throughput.
- You can refer to the @M6, @M8, and @M9 commands to get more detailed information about dynamic bandwidth allocation control.
- In some cases, one user establishes a 128Kbps Internet session but another user wants to make a voice call. Command @M5=1 will instruct the IS425A to release a B-Channel from the original MP link.

%A2? = Query Call Type

Format	AT%A2? <ENTER>

- "%A2?" instructs your IS425A to display the call type for the next data call.

%A3=n = Select B-Channel for Leased Line

Format	AT%A3 =n <ENTER>
n=1	B1 Channel
n=2	B2 Channel

- "%A3" determines which B-Channel will be used for leased line connection.
- To make a leased line connection, set the bit 3 of the DIP Switch at the rear panel to the **ON** position.
- The call types Asynchronous Inverse MUX and Multilink PPP are not supported in leased line application.

%L3 = Select Data Forwarding Character

Format	AT%L3=n <ENTER>
n=0	None
n=2	Carriage Return (default)

- "%L3" is used to define specified characters as data forwarding characters.
- When the character is received from the DTE, the current packet is forwarded. This includes this character.
- When call type is PPP hexadecimal number 7E is used as the default forwarding character.

%L4 = Set the Idle Timer Delay

Format	AT%L4=n <ENTER>
n=0	No data forwarding on time-out (default)
n=1 to 255	Data forwarding on time out of value multiplied by 50ms

- "%L4" is used to define the duration of an interval between successive characters received from the DTE.
- When exceeded will cause the PAD (Packet Assembler / Disassembler) to terminate the assembly of a packet and to forward the packet just as if a forwarding character had been recognized.

@M3 = CHAP Encryption Control

Format	AT@M3=n <ENTER>
n=0	Disable CHAP password encryption protocol (default)
n=1	Enable CHAP password encryption protocol

- CHAP is a password encryption protocol that is used to guarantee the security during password authentication with ISP.
- If CHAP encryption is enabled, one should turn off the CHAP option in your application program.
  - ⇒ For example: the "Require encrypted password" option of the server type menu under WIN95 Dial-Up Networking icon.

@M5 = Bandwidth Release Control on a Voice Call Request

Format	AT@M5=n <ENTER>
n=0	Disable bandwidth release when there is a voice call request.
n=1	Enable bandwidth release when there is a voice call request. (default)

- "@M5" is used to determine whether to release a B-Channel during an MP session when there is a voice call request.

@M6 = Define Throughput Threshold to Add a Second Channel

Format	AT@M6=n <ENTER>

- Where n ranges from 0 to 64 and the unit is in kilobits per second. (if n=0 to 64, and the unit is in kilo-bits per second.)
- When a Multilink PPP call is established the IS425A begins to monitor the traffic and might allocate the bandwidth according to the real throughput.
- If the throughput is under a pre-defined threshold and persists a period, it will release a B-Channel.
- If the traffic is getting above another threshold and persists a period it will try to make a second call and bind the two B-Channels together for transmission.

@M8 = Define Throughput Threshold to Release a Second Channel

Format	AT@M8=n <ENTER>

"n" ranges from 0 to 64 and the unit is in kilobits per second.

- When "@M8" is set to 0, it indicates the IS425A won't release a second channel even though the throughput is very low.

@M9 = Define the Persist Time to Add or Drop a Second Channel

Format	AT@M9=n <ENTER>

"n" ranges from 0 to 255 and the unit is in 5 seconds.

9.7 S Registers

The S Registers are variables used to control various local operating characteristics of the DTE (enabling the auto-answer mode). A detailed description of the S Registers is given in the following table.

Register	Value	Unit	Description
S0	0-255	Count	Establishes the number of RING result codes after which the IS425A answers the call. A value of 0 disables auto-answer mode. (default=0)
S1	0-255	Count	**Read-only**. S1 is incremented each time the IS425A sends a RING result code to the DTE. It is cleared when the call is answered or cleared. (default=0)
S2	0-127	ASCII code	Used to define the escape character. Escape process is disabled if the value in S2 is greater than 127. (default=43)
S3	0-127	ASCII code	Used to define the character. Recognized as a carriage return CR by IS425A. (default=13)
S4	0-127	ASCII code	Used to define the character. Recognized as line feed LF by IS425A. (default=10)
S5	0-127	ASCII code	Used to define the character. Recognized as backspace (BS) by IS425A. (default=8)
S7	1-50	Seconds	Specifies the maximum waiting time between end of dialing process and completion of connection. Value of 0 means IS425A waits indefinitely. (default = 50)
S12	0-255	1/10 seconds	Determines prompt delay after IS425A receive an escape string (default = 10)
S25	0-255	1/20 seconds	Determines minimum time that a change in DTR must persist in order to be recognized by IS425A. (default = 2)

9.8 Result Code

Result codes are informational messages sent from the IS425A and displayed on your monitor. These messages are the IS425A's response to the commands you issue to the IS425A. A result code can be either a word or a numeric representation.

- *By default, your IS425A returns a word response after a command is issued. For example, if your IS425A successfully executes a command line, it will send you the response "OK". However, if your IS425A is operating under a programming language that either cannot handle character strings or handles them inefficiently, you may choose to use the "V0" command to have your IS425A return numerical responses.*

Num	Word	Description
0	OK	Command has been successfully executed
1	CONNECT	IS425A has made a connection
2	RING {Caller ID} {call type}	IS425A has detected an incoming ring
2	VOICE1RING {Caller ID }	A voice call comes in at the analog port Tel 1.
2	VOICE2RING {Caller ID }	A voice call comes in at the analog port Tel 2.
3	NO CARRIER	Line has been disconnected
4	ERROR	IS425A has found an error in your command line
5	CONNECT 1.2K/{call type}	IS425A has made a 1200bps connection
6	NO DIAL TONE	Network out of order or channel unavailable or channel unacceptable or resources unavailable
7	BUSY	IS425A has detected a busy signal while dialing a call
10	CONNECT 2.4K/{call type}	IS425A has made a 2400bps connection

11	CONNECT 4.8K/{call type}	IS425A has made a 4800bps connection
12	CONNECT 9.6K/{call type}	IS425A has made a 9600bps connection
16	CONNECT 19.2K/{call type}	IS425A has made a 19200bps connection
17	CONNECT 38.4K/{call type}	IS425A has made a 38400bps connection
18	CONNECT 57.6K/{call type}	IS425A has made a 57600bps connection
21	CONNECT 115.2K/{call type}	IS425A has made a 115200bps connection
22	CONNECT 230.4K/{call type}	IS425A has made a 230400bps connection

Note:

1. *{Caller ID} indicates the phone number of the calling terminal adapter.*
2. *{DTE speed} indicates the COM Port speed of your communication software.*
3. *{call type} indicates the call type of the current data call. If you dialed the call, the call type should be same as the "%A2" setting.*

10 Ordering ISDN

Ordering a new ISDN line is one of the most challenging steps in creating a digital environment Black Box would like to help make this a smooth transition. Be sure your line has what you want for the best price.

10.1 Basics of Ordering ISDN

Many Telephone Companies use ISDN Ordering Codes (IOC), also called "Capabilities Packages", to simplify the ordering process. These codes are somewhat standardized, with few variations among the Telephone Companies. Unfortunately, these codes are not fully standardized, nor fully up to date; therefore, we have included information to help you maximize the efficiency of your line. To do this, you must understand some basic ISDN rules:

1. Each device requires a SPID, and some require more. The IS425A requires 2 SPIDs, one to share between each Data and Tel Port. If you use additional devices, like ISDN phones or Video Conferencing equipment, you will need more SPIDs. If you need a 128Kbps connection, usually you will need 2 SPIDs in the device.
2. Some areas do not allow more than 2 SPIDs. This problem will soon be solved, but it isn't yet. This limits you in which devices can be active at a time, but good time management can help solve this problem. Each device on-line requires a SPID (or two), but if you take devices off-line while they are not used, the other devices can use those SPIDs.
3. There are 2 B-Channels on a BRI. Each device when calling (or being called) uses a full 64Kbps B-Channel to connect, so only two devices can work at once. Note that 128Kbps connections use both B-Channels, so no other devices may work at that time. Note that SPIDs do not necessarily equal B-Channels, or vice-versa.
4. Many CO switches have National ISDN (NI-1) or Custom settings. If possible, order the NI-1 settings.

10.2 Suggested Ordering Codes

IS425A (alone) – The IS425A uses both Voice and Data, and can access a variety of the voice capabilities that make ISDN valuable. To use this value, your must decide how to provision your line to get the best value from the telephone company.

These are the voice options you should consider:

1. Basic Voice (Caller ID only) -- Code "S", and see the ACO note just below.
2. Supplementary Services (Call Waiting, Hold, Conference, Transfer, and Drop). You may opt for ordering "S" plus any or all of these services. – "P", "Q", "U" or "V" (READ ON!)

Here's where things get complicated. On some switches, there is a feature called CACH/EKTS. Using CACH/EKTS is better and easier, but is sometimes more expensive. It is also sometimes unnecessary; you only need CACH/EKTS if you want more than basic voice services. Bottom Line – if it doesn't cost anything more, get CACH/EKTS; and if it does, decide if it's worth it for you. In general, it is recommended that you get CACH/EKTS if possible.

NOTE: If you cannot or do not get CACH/EKTS, it is important that you order Additional Call Offering (ACO) feature. This allows the IS425A to allow a 128Kbps call to drop to 64Kbps for incoming voice calls. Of course, if you do not want this feature, do not order it.

For the IS425A alone, the recommended package for full usage is "V"; however, "V" is usually the most expensive. It may or may not be cheaper to order "S" and add the specific features you want.

AO/DI or PADs – Some equipment makes use of the D-Channel for low bandwidth data transfers. If are going to use these devices, or you are going to use a device that supports Always On/Dynamic ISDN (AO/DI), you may want to provision the line with D-Channel Packet, or X.25, capabilities. – "P" or "Q"

"P" and "Q" also include supplementary services with most Telephone Companies, so these features may not have to be provisioned separately. The difference between "P" and "Q" is that "Q" has CACH/EKTS provisioning. Again, you must decide if you want CACH/EKTS, but it is recommended.

ISDN Phones – Some of the most complex and beneficial equipment in the ISDN world, ISDN Phones require special provisioning as well. Fortunately, most phone vendors supply you with the necessary provisioning information for their equipment. The IS425A analog ports act as ISDN Phones as well, so much of the same provisioning options apply. Usually phones will suggest the codes "U" or "V".

ISDN Routers – Routers are devices that reside on networks that forward information broadcast from its network to a remote network like the Internet or a remote LAN. Many routers have built in server capabilities and many other features for use on LANs. ISDN routers will not need any more provisioning than the IS425A unless specifically stated in your routers documentation. If the routers use D-Channel Packets or AO/DI, see AO/DI earlier this chapter.

Video Conferencing – Desktop Video Conferencing equipment is an excellent application of ISDN, and with the IS425A, some units can bring the Internet or other data applications into the picture. Provisioning notes for your video equipment should be included with that equipment in its documentation.

Remember that these devices should add provisioning not replace it. If you want code "V" for your IS425A, but your video says code "R" (a data only code), use code "V", and add any notes from equipment documentation.

10.3 SPIDs and IOCs

Sometimes the provisioning will be for the entire line (all SPIDs), or sometimes just specific SPIDs. For example, If you have the IS425A, a PAD unit, and an ISDN Phone. If you order "Q" with four SPIDs, you can get the full functionality of each device with any SPID. Some users and some Telephone Companies prefer to assign IOCs by SPID, and will assign the first 2 SPIDs code "S" for the IS425A (i.e. with a fax machine and answering machine), the third SPID code "V" for the ISDN Telephone, and the last SPID code "P" (with a special order – no supplementary services) for his PAD unit.

It is also important to note that the number of SPIDs is not tied to the IOC, so you must specify to the Telephone Company how many you need.

10.4 Summary of Recommended IOCs

This is a summary of the IOCs that work best for the IS425A, and usually work easily with other equipment:

"S" -- Circuit Switch Voice and Data on both B-Channels with basic voice service and Caller ID. If you order this code, it is recommended that you also order ACO as explained earlier.

"P" -- Circuit Switch Voice and Data on both B-Channels with supplementary voice services and D-Channel Packets. Again, if you order this code, it is recommended that you also order ACO as explained earlier.

"Q" -- Circuit Switch Voice and Data on both B-Channels with supplementary voice services using CACH/EKTS and D-Channel Packets.

"U" -- Circuit Switch Voice and Data on both B-Channels with many advanced voice features (ask your Telephone Company exactly what is included, usually supplementary services are included). Again, if you order this code, it is recommended that you also order ACO as explained earlier.

"V" -- Circuit Switch Voice and Data on both B-Channels with many advanced voice features (ask your Telephone Company exactly what is included, usually supplementary services are included). This code includes CACH/EKTS provisioning.

NOTE: Always check with your telephone company for specific code information.

Alternative IOCs

There are other forms of IOCs, especially the EZ-ISDN packages. If the EZ codes are used, the codes "EZ-2" and "EZ-2A" are almost identical to "U" and "V" respectively. Try to use these codes if possible, although "EZ-1" and "EZ-1A" may only be available. "EZ-1" and "EZ-1A" are like "U" and "V", but with fewer features. Check with your Telephone Company for specific code information.

11 Troubleshooting Tips

11.1 Common Problems and Solutions

1. If you can not make calls out after initially programming the IS425A, you may have chosen the incorrect switch type. It is important to note that all AT&T switches are 5ESS and all NORTEL switches are DMS-100. The difference is whether they are using National ISDN 1 (NI-1) or their own Custom settings. If they are using NI-1, choose the appropriate NI-1 switch.

2. To display all the D-Channel signaling messages type
   ⇒ **AT^ <ENTER>**
   Example: DIAG:
   08 01 39 05 04 03 80 90 A2 18 01 89 34 01 40 3B 02 82 81 6C 09 41 81 35 35 35 31 30 30 30 96 7B 01 81
   END

To disable this function, use any other AT Command.

3. If your Supplementary Services is not operating correctly, verify the following information:
   ⇒ Both Speech and Supplementary Service are selected for the analog ports using supplementary services
   ⇒ AT!F0=xx/xx/xx This is usually set for 60/61/62 and corresponds to Conference, Transfer, and Drop.

4. If you are having trouble connecting to the IS425A , and your mouse is locking up, verify which COM Port each is using. If you have a serial mouse using COM Port 1 or 3, then install the IS425A on COM Port 2 or 4. If you have a mouse is using COM Port 2 or 4, install your IS425A on COM Port 1 or 3.

5. If you are having trouble getting the IS425A to properly configure using the MMI, look at the top of the MMI window. It should say "Black Box® ISDN Terminal Adapter with S/T - IS425A MMI Configuration Program Version 2.1"; contact our technical support line immediately if it does not say this.
   If the MMI version is correct, start a terminal connection (see **Chapter 4**) and type **ATI3 <ENTER>**. The response should be "Ver 2.1"; if this is not the response, contact our technical support line to get the newest version.

6. If the data port calls at 128Kbps will not drop to 64Kbps to allow incoming calls, please verify the following information:

   ⇒ In the MMI, you have set the **Data Call Protocol** to "Asyn-to-Sync PPP", with the **PPP Option** set to "MLP", and the **Release a Channel for Voice Call** is checked. Alternatively, enter AT@M5=1 by terminal software.

   ⇒ The SPIDs and DNs for each Data Port and corresponding Tel Port are the same (i.e. Data #1 and Tel #1 are the same).

   ⇒ Your line is provisioned with either CACH/EKTS or ACO. Without CACH/EKTS or ACO, the IS425A will only drop a channel for outgoing calls, not incoming calls.

7. If you are using an ISDN telephone or another device that requires PS2 power (power from the NT1), then you must purchase a separate power supply. The IS425A does not provide PS2 power; however, you may contact Black Box Sales Department to purchase a PS2 Adapter.

8. If you are using an ISDN telephone or Video Conferencing, but it will not work, try setting DIP Switches 7 and 8 to ON (**see Chapter 2**).

9. If the TEST LED (yellow), DIP Switch 1 (remote configuration) is set to ON (enabled) in the local side. Set DIP Switch 1 to OFF to continue normal usage. If DIP Switch one is OFF, then call Technical Support.

Appendix A: AT Command Summary

Note: 1) The information is mandatory when in {} and optional when in [ ]
2) If T, P, or W follow the D command, it will be ignored.
3) <MINUS> <SPACE> ( ) <BRACKET> , in dialing number will be ignored

A/ **Command Repeat**

ATA **Manual Answer**

ATD{Number} **Dial**

ATDL **Last Data Call - Redial**

ATDS=n **Memory Dial**

n=0 - 9	Index of pre-stored phone number

ATEn **Command Echoing**

n=0	Echo disabled
n=1	Echo enabled (default)

ATE? **Query Command Echoing**

ATH **Hang Up**

ATI **Identification**

ATI0	MAX Network Rate (128000)
ATI1	Checksum of ROM
ATI3	Version number

ATO **Go On Line**

ATQn **Quiet Mode Control**

n=0	Result Code enabled (default)
n=1	Result Code disabled

ATQ? **Query Quiet Mode Control**

ATS? **Query All S Registers**

ATSn? **Query Specific Sn Register**

ATSn=x **Program Sn Register**

n=0	Auto-Answer	x=0~255 Rings	Default=0 (Disabled)
n=1	Ring Count	Read Only!	
n=2	ESC Char	x=0~127	Default=43
n=3	CR Char	x=0~127	Default=13
n=4	LF Char	x=0~127	Default=10
n=5	BS Char	x=0~127	Default=8
n=7	Wait for Conn	x=1~50s	Default=50
n=12	Esc Prompt Delay	x=0~255(*0.1s)	Default=10
n=25	Detect ER	x=0~255(*0.05s)	Default=2

ATVn **Result Code Format**

n=0	Short Form
n=1	Long Form (default)

ATV? **Query Result Code Format**

ATXn **Connect Result Code Format, default ATX0**

	0	1	2
RING	O	X	X
RING XXXX	X	O	O
CONNECT	O	X	X
CONNECT XXXX	X	O	O
VOICE CALL	X	X	O

ATX? **Query Connect Result Code Format**

ATZn **Recall Stored User Profile**

n=1	Load user profile 1 as active profile
n=2	Load user profile 2 as active profile

AT&Cn Carrier Detect Control

n=0	Always ON
n=1	ON during communications (default)

AT&Dn Data Terminal Ready Action

n=0	None
n=1	Go to Escape Command Mode
n=2	According to 108/2 (default)
n=3	According to 108/1 (DTR dial)

AT&Fn Load Factory Profile

n=0	HDLC
n=1	PPP
n=2	MP
n=3	Async Inverse MUX (for diagnostic use only)
n=5	V.120

AT&Kn Flow Control Setting

n=0	None
n=3	RTS/CTS (Request to Send)/(Clear to Send) default
n=4	Xon/Xoff

AT&K? Query Flow Control Setting

AT&Ln Display Last Call Information

n=0	Data Port
n=1	Analog Port 1
n=2	Analog Port 2

AT&Sn Data Set Ready

n=0	Always ON
n=1	ON during communication (default)

AT&S? Query Data Set Ready

AT&Vn **View Configuration Profile**

n=0	Active profile
n=1	User profile 0
n=2	User profile 1
n=3	System Parameters and Analog Port Setting

AT&Wn **Store Active Profile as User Profile**

n=1-2	(the selected suffix of the configurations)

AT&Yn **Select Profile on Power-up**

n=1-2	(the selected suffix of the configurations)

AT&Y? **Query Select Profile on Power-up**

AT&Zn=x **Store Phone Directory**

n=0~9	Directory number
x	Stored number up to 32 digits

AT&Z? **List Phone Directory**

AT!Bn=x **Select Voice Port Capability**

n=1,2	Select Voice Port
x=0	SPEECH (default)
x=1	AUDIO

AT!Bn? **Query Voice Port Capability**

AT!Cn=x Select Switch Type and Set SPIDs

AT!C0=0	Auto Detection
AT!C0=1	AT&T 5ESS
AT!C0=2	AT&T & Siemens NI1
AT!C0=3	NORTEL DMS-100
AT!C0=4	NORTEL NI1

AT!C6=xxxx	Program Data Port SPID 1
AT!C7=xxxx	Program Data Port SPID 2
AT!C8=xxxx	Program Voice Port 1 SPID
AT!C9=xxxx	Program Voice Port 2 SPID

xxxx is up to 20 characters (valid characters are 0 1 2 3 4 5 6 7 8 9)

AT!C? Query All SPIDs & Switch Types

AT!C0?	Query Switch Type
AT!C6?	Query Data Port SPID 1
AT!C7?	Query Data Port SPID 2
AT!C8?	Query Voice Port 1 SPID
AT!C9?	Query Voice Port 2 SPID

AT!F0=n1/n2/n3 Program "Feature Key" for 3-way Conference, Transfer, & Drop

n1=0~255	Conference feature, (default) n1=60
n2=0~255	Transfer feature, (default) n2=61
n3=0~255	Drop feature, (default) n3=62

AT!F0? Query Feature Keys

AT!Nn=xxxx Store Self Directory Number of Data Port & Voice Port

n=0	Data Port 1 DN
n=1	Voice Port 1 DN
n=2	Voice Port 2 DN
n=3	Data Port 2 DN
xxxx	Directory Number, Up to 24 Digits

AT!N? Query Self Directory Number

AT!Rn=x Screen Incoming Call, for Data Ports and Voice Ports

n=0	Data Port
n=1	Voice Port 1
n=2	Voice Port 2
x=0	Accept all calls (default)
x=1	Reject all calls
x=2	Accept calls listed in the stored phone directory(0-9)

AT!Tn=x Enable/Disable: Transfer All Call & Local Transfer

n=1	For Voice Port
x=0	Disable: Transfer All Calls & Local Transfer (default)
x=2	Enable: Local Transfer

AT!Tn? Query: Transfer All Call & Local Transfer

AT!Z0= Remote DN for Local Transfer all Calls, up to 24 Digits

AT!Z? Query: Remote DN for Local Transfer all Calls, up to 24 Digits

AT%A0=n Select Numbering Plan

n=0	Unknown (default)
n=1	ISDN Numbering Plan

AT%A0? Query: Select Numbering Plan

AT%A2=n Select Call Type

n=0	HDLC transparent
n=1	PPP (default)
n=2	MLP
n=3	Async Inverse MUX (diagnostic use only)
n=5	V.120

AT%A2? Query Call Type

AT%A3=n Select B-Channel for Lease Line

n=1	B1 Channel (default)
n=2	B2 Channel

AT%A3? Query: B-Channel for Leased Line

AT%Hn=x Select HLC (High Layer Capabilities)

n=0	For Data Port
n=1	For Voice Port 1
n=2	For Voice Port 2
x=0	Disable (default)
1	Telephony
4	G2/3 Fax
33	Document Application Profile for G4 FAX Class 1
36	Document Application Profile for Formatted Mixed Mode
49	Teletex
50	Document Application Profile for Videotex Interworking
53	Telex
56	Message Handling System
65	OSI Application

AT%Hn? Query: HLC (High Layer Capabilities)

AT%Ln=x Program %Ln Register

n=3	Data Forwarding Character
x=0	None
x=2	CR (default)
n=4	Idle timer delay
x=1~255 (*0.01s)	(default is x=2)

Note: When using PPP, 7E is automatically the forwarding character.

AT%Ln? Query: %Ln Register

AT%C0=N0{+ or -},N1{+ or -},...,Nm{+ or -} Select Call Back Phone Directory

+	Enable
-	Disable (default)
N0, N1…..Nm = 0~9	

AT%C0? List Call Back Phone Directory

AT@M3=n **Enable/Disable CHAP**

n=0	Disable (default)
n=1	Enable

AT@M3? **Query: Enable/Disable CHAP**

AT@M5=n **Enable/Disable "Drop One B Channel for Voice Call"**

n=0	Disable
n=1	Enable (default)

AT@M6=n **Level of Data Loading to Add One Channel**

n=0~64	(*Kbps)
n=40	Default

AT@M6? **Query: Level of Data Loading to Add One Channel**

AT@M8=n **Level of Data Loading to Drop One Channel**

n=0~64	(*Kbps)
n=40	Default

AT@M8? **Query: Persist Time to Add or Drop One Channel**

AT@M9=n **Persist Time to Add or Drop One Channel**

n=0	Two B-Channels fixed (default)
n=1~255	(*5sec)

AT@M9? **Query: Persist Time to Add or Drop One Channel**

AT@M10=n **Program "Max retry count" for 2nd Call of MP**

n=0~255	(default=3)
n=0	Means "retry forever"

AT@M10? **Query: Program "Max retry count" for 2nd Call of MP**

Appendix B: Command Result Code

Result Code:

OK	Command was Accepted
CONNECT	Call Connected
RING	Indication of Incoming Call
NO CARRIER	Call Disconnected
ERROR	Command Error
NO DIAL TONE	Channel not Available
BUSY	Line Busy or Delay Call

Extend Result Code: (only for ATX1)

CONNECT<Baud Rate><Call Type>	Call Connected
RING<Calling Address><Call Type>[:<User User Info>]	Indication of Incoming Data Call

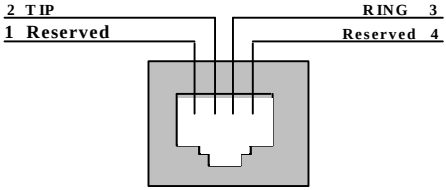
Appendix C: DIP Switch Settings

Bit 1	Remote Configuration	ON: Enable	OFF: Disable
Bit 2	Local Loopback	ON: Enable	OFF: Disable
Bit 3	Reserved		
Bit 4	Reserved		
Bit 5	Reserved		
Bit 6	Forced Software Download	ON: Enable	OFF: Disable
Bit7 Bit8	S/T Termination Resistor Selector	Bit 7&8 ON: 100 Ω	Bit 7&8 OFF: None

Appendix D: IS425A Specifications

U-Interface

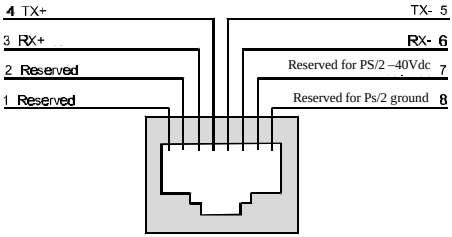
- U-Interface conforms to ANSI T1.601, 1992
- Connector: (1) RJ-11
- Line: Two-wire, full duplex
- Data Rate: 144Kbps available to subscriber
- Line Code: 2B1Q per T1.601, 1992
- O/P Amplitude 2.5V, zero to peak



U-Interface Pin Assignment

S/T-Interface

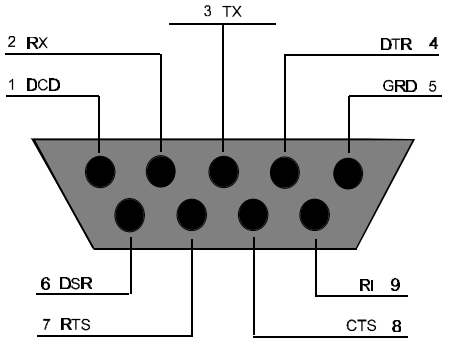
- S/T-Interface conforms to ANSI T1.605, 1991
- Connector: (1) RJ-45
- Line: Four wire, full duplex
- Data Rate: 144Kbps
- Line Code: 100% duty cycle per T1.605, 1992; ITU/CCITT I.430
- O/P Amplitude: 0.75V, zero to peak
- PS2 Power: The IS425A does not provide PS2.



S/T-Interface Pin Assignment

Data Interface

- Data Interface conforms to ANSI
- Connector: (1) DB-9 female
- Asynchronous data rate: 230.4Kbps
- Dial-up Interface: AT command (Async), DTR assertion
- Loopback for self-test & for DTE diagnosis (local, network, remote)
- B-Channel protocol: V.120; Clear channel (64Kbps); HDLC transparent; PPP, Multilink Protocol (MP-PPP)
- Dynamic bandwidth allocation when using MP-PPP; BACP



RI - Ring Indicator
CTS - Clear to Send
RTS - Ready to Send
DSR - Data Set Ready
DTR - Data Terminal Ready
TX - Transmit
RX - Receive
DCD - Data Carrier Detect

Analog Interface

- Analog Interface conforms to ANSI
- Connector: (2) RJ-11
- REN: 2
- Power Feeding: -48V, 25mA minimum
- Ringing Signal: 87Vrms, 20Hz
- Dialing: DTMF & Pulse (10pps & 20pps)
- Tone Generation: Busy Tone
- Caller ID Interface: FSK signal between the first & second ring
- Programmable bearer capability: Speech or 3.1KHz Audio (fax/modem)
- Supplementary Service: Call Waiting, Hold, Transfer, Three-party Conference

Power

- AC/DC power adapter: 110V ± 10V, 60Hz
- Consumption: < 8 Watts

Switch Capability

- AT&T 5ESS Custom
- AT&T 5ESS National ISDN 1 (NI-1)
- NORTEL DMS-100 Custom
- NORTEL DMS-100 National ISDN 1 (NI-1)
- SIEMENS National ISDN 1 (NI-1)

Physical Dimensions

- 220mm(w) x 150mm(d) x 35mm(h)
- 8.63”(w) x 5.88”(d) x 1.38”(h)

Operating System

- Windows 3.1 & 3.11
- Windows 95
- MS DOS

Advanced Features

- Remote on-line configuration
- Software upgradeable by downloading to the DB9 port
- Local loopback for DTE initiating loop test
- Network loopback

Environment

- Operating Temperature: 32°F to 122°F and 0°C to 50°C
- Storage Temperature: -13°F to 140°F and -25°C to 60°C
- Relative Humidity: 0 to 95% non-condensing

Appendix E: Glossary

ACO *Additional Call Offering*. A feature in ISDN that allows calls to be received during congestion on one or both B-Channels like call waiting. Implied in CACH/EKTS provisioning.

BRI *Basic Rate Interface*. An ISDN line composed of (2B+D) two 64Kbps B-Channels and one 16Kbps D-Channel. The B-Channel may be used for both voice and data signals. The D-Channel is used for signaling and X.25 packet access. All channels are full duplex.

B-Channel *Bearer Channel*. ISDN bearer service channel operating at 56 or 64Kbps, carrying user voice or data, circuit switched, packet, or frame-mode services may be obtained on this channel.

CACH/EKTS *Call Appearances Call Handling/Electronic Key Telephone System*. A protocol system provisioned in the CO that allows easier usage of ISDN Telephones and equipment, but may be unavailable or more expensive.

CO *Central Office*. A location for the local telephone switch. The switch connects and routes the end user's calls to the ISDN network.

CPE *Customer Premises Equipment*. According to the FCC, any communications equipment placed at the customer's site, including modems, telephone sets, PBXs, and NT1s.

Custom A *switch* setting in the local Telephone Company's Central Office.

D-Channel *Data* Channel. The ISDN out-of-band signaling channel, carrying ISDN user-network messages. It can be used to carry packet or frame-mode user data. The D-Channel operates at 16Kbps in a BRI.

Full Duplex. The transmitting of information in both directions at once.

ISDN *Integrated Service Digital Network*. A digital network that provides a wide variety of communication services. A standard set of user-network messages, and integrated access to the network.

ISP *Internet Service Provider*. A company that provides access to the Internet.

Kbps *Kilobits per second* (1000 bits per second). A term used to describe the speed of transferring data.

LED *Light Emitting Diode*. A diode placed within a circuit. It lights indicating specified statuses.

MLP *Multilink Protocol*. An ISDN Internet connection combining both B-Channels for a 112Kbps or 128Kbps data rate. Sometimes described as PPP/MP (Point to Point/Multilink Protocol).

NI-1 *National ISDN-1*. Defined by Bellcore, *NI-1* a process of identifying and implementing ISDN service features in a consistent way across different vendor's switches and CPE, resulting in a more consistent service definition and CPE portability. A *switch* setting that could be used by your telephone company.

NT1 *Network Termination 1*. An ISDN device on the customers' premise responsible for the termination of the ISDN line.

Packets A term used to describe the transmission of data in block form.

PC *Personal Computer*. A small frame computer designed for a single user.

POTS *Plain Old Telephone Service*. A term used to refer to an analog telephone.

PPP *Point-to-Point Protocol*. An ISDN Internet connection using one B-Channel for a 56Kbps or 64Kbps data rate.

Protocol A set of guidelines used for the interaction of computers and like devices.

S/T The protocol reference point where an ISDN device attaches to an NT1 device.

SOHO *Small Office/Home Office*. A term used to signify the size of a business.

SPID *Service Profile Identification*. The number that each terminal equipment uses to identify itself to the Telephone Company.

Switches In North America the switches that support ISDN are AT&T 5ESS, NORTEL DMS-100, and SIEMENS EWSD. Most switches have *Custom* or *NI-1* settings available.

TA *Terminal Adapter*. A protocol converter used to allow non-ISDN terminal equipment to access the network using ISDN protocols and procedures.

TE *Terminal Equipment*. ISDN compatible equipment that translates the digital signal to a user interface (phone, modem, TA, or PC…)

TEI *Terminal Endpoint Identifier*. A subfield in the LAPD address field that identifies a given TE device on the ISDN interface.

TID *Terminal Identifier.* A one to four digit number attached to the phone number. It is used identify terminal equipment.

TR *Termination Resistance.* An equal amount of resistance (50 or 100 Ohms) applied to both the NT1 device and to the TE farthest from the NT1. It reduces the reflection and it insures the maximum power of the transmitted signal. Thus, it improves signal quality.

U The protocol reference point between ISDN network termination (NT1) equipment and the central office.

CERTIFICATION NOTICE FOR EQUIPMENT USED IN CANADA

The Canadian Department of Communications label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements. The department does not guarantee the equipment will work 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 might 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.

User should ensure for their own protection 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 such connections themselves, but should contact the appropriate electrical inspection authority, or electrician, as appropriate.

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.

FEDERAL COMMUNICATIONS COMMISSION
and CANADIAN DEPARTMENT OF COMMUNICATIONS
RADIO FREQUENCY INTERFERENCE STATEMENT

Class B Digital Device. This equipment has been tested and found to comply with the limits for a Class B computing device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. This equipment generate, uses and can radiate radio frequency energy, and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. If this equipment does cause harmful interference to radio or telephone reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult an experienced radio/TV technician for help.

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

To meet FCC requirements, shielded cables and power cords are required to connect this device to a personal computer or other Class B certified device.

This digital apparatus does not exceed the Class B limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of the Canadian Department of Communications.

Le Présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe B prescrites dans le Réglement sur le brouillage radioélectrique publié par le ministére des Communications du Canada.