DIVA T/A ISDN Modem Reference Guide

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What is ISDN?

While you've heard of ISDN, there's a good chance you're unsure whether you need it - or even what, exactly, it is. Even though ISDN is globally available, it's so new that understanding it may require a little investigation.

In simple terms, ISDN is a replacement for plain old telephone service, which was never designed to meet the needs of the information age. ISDN uses the same wiring that currently serves homes and businesses. You get ISDN service from the same companies who provide telephone service, and you use it to connect telephones, computers, and fax machines. The difference is that you get much faster, much more dependable connections for voice, data, fax, and even video - all through a single line. There is no other technology that comes close to delivering such communications benefits today.

International ISDN standards were established about 10 years ago. Since then, telephone companies throughout the world have raced to upgrade their equipment to ISDN standards. As ISDN service availability has spread, many millions of computer users have turned to ISDN, and new users are coming on board even faster.

ISDN stands for Integrated Services Digital Network

"**Integrated Services**" refers to ISDN's ability to deliver two simultaneous connections, in any combination of data, voice, video, and fax, over a single line. Multiple devices can be attached to the line, and used as needed. That means an ISDN line can take care of most people's complete communications needs, without forcing the purchase of multiple analog phone lines at a much higher transmission rate.

The "**Digital**" in ISDN refers to its purely digital transmission, as opposed to the analog transmission of plain old telephone service. If you're using a modem for Internet access at this moment, your Internet service provider's modem has converted this site's digital content to analog signals before sending it to you, and your modem converts those signals back to digital when receiving (the same thing happens with every keystroke and mouse click you transmit). When you connect with ISDN, there is no analog conversion. ISDN transmits data digitally, resulting in a very clear transmission quality. There is none of the static and noise of analog transmissions that can slow transmission speed.

"**Network**" refers to the fact that ISDN is not simply a point-to-point solution like a leased line. ISDN networks extend from the local telephone exchange to the remote user and include all of the telecommunications and switching equipment in between. When you have ISDN, you can make connections throughout the world to other ISDN equipment. If your ISDN equipment includes analog capabilities, you can also connect to analog modems, fax machines, and telephones, even though they may be connected to plain old telephone service.

Benefits

While ISDN accommodates telephones and fax machines, its most popular advantage is in computer applications. You can plug an ISDN adapter into a phone jack, like you would an analog modem, and get a much faster connection with no "line noise."

The most common ISDN service, Basic Rate Interface (BRI), provides two 64 Kbps channels per line. When the two channels are bonded in a single connection, you get a speed of 128 Kbps, which is about four times the actual top speed of the fastest analog modems. Compression can increase throughput to around 250 Kbps.

Telecommuters, for example, benefit immensely from ISDN. Whether you access the corporate LAN in the evenings or maintain a full-time, remote home office, ISDN is the next best thing to being there. E-mail, database access, and file transfers improve dramatically, making it seem like you're locally attached to the LAN.

Internet access is another great application for ISDN. Compared with even the fastest modem access, ISDN makes Web graphics appear almost immediately, and can reduce download times by over 75%. ISDN can even provide advantages over shared, higher-bandwidth office connections; PC Magazine advises that an ISDN connection can deliver better performance than a T1 shared among users on a LAN. And in many markets, it's actually cheaper than an isolated analog business line.

Such large-scale file transfer applications as medical imaging, insurance and law enforcement imaging, and the preparation of printed materials are additional arenas where ISDN proves highly beneficial. With the dramatic reduction in file transfer time, ISDN makes even multi-megabyte files available to recipients within minutes, not hours.

Videoconferencing is an emerging ISDN application that's growing fast in popularity and ISDN is currently the only practical way of making it happen.

ISDN Communication Channels

In the ISDN interface, a number of communication channels are carried over a digital line. These communication channels can vary by the type of information they transmit and by the transmission speed they support. The number and type of channels used may vary.

The communication channels can be of the following types:

B-Channel - 64 Kbps

D-Channel - 16 or 64 Kbps

H-Channel - 384, 1536, or 1920 Kbps (not yet commercially available)

Different combinations of these channels are used to support different types of usage (e.g., basic, primary and broadband).

B-Channel

The B-channel is a user (bearer) channel that carries a subscriber's digital traffic (e.g. digitized video, voice, audio, or digital data, or perhaps a mixture). The bandwidth of this channel is 64 Kbps. The control signals used to set up the connection, however, are not sent over the B-channel. The call establishment is done on the D-channel using common-channel signaling. This concept will be discussed shortly.

Two kinds of connections can be established over a B-channel:

- Circuit-Switched
- Packet-Switched

Circuit-switched connections are ideal for voice traffic for several reasons. Voice data is "delay-sensitive", meaning that it must not be delayed, and that it must be received in the order in which it was transmitted. There is a call set-up time that is characteristic of circuit-switched connections. This time lag is quite acceptable when measured against the length of a typical telephone call.

In a **packet-switched** data network or PSDN, data to be transmitted is broken up into individual units called **packets** that are then routed from sender to receiver. The sender/receiver can be any type of terminal, printer, computer or other device that supports an interface to the network.

D-Channel

The primary function of the D-channel is to carry common-channel signaling information to manage and control circuit-switched calls on B-channels.

The D-channel can also be used for packet-switching or low-speed telemetry when it is not involved in control signaling. Message signaling takes priority over data packet-switching.

The D-channel functions at 16 Kbps for Basic Rate Interface or 64 Kbps for Primary Rate Interface. The speed is dependent on the end-user's interface.

H-Channel

The H-channel is used for high-speed user data traffic at bit rates higher than 64Kbps. Examples of services which require these higher rates are: fast facsimile, teleconferencing, and video. An H-channel user can subdivide the channel using TDM to meet specific requirements.

Connecting to ISDN - BRI and PRI

There are two types of access interfaces to the ISDN: Basic Rate Access (also referred to as Basic Rate Interface (BRI)) and Primary Rate Access (also referred to as Primary Rate Interface (PRI)).

Basic Rate Access

Basic Rate Interface or Access consists of two B-channels operating at 64 Kbps and one D-channel operating at 16 Kbps. It is also commonly referred to as 2B+D.

Primary Rate Access

The primary rate interface is designed for users with large capacity requirements.

There is no single transmission rate defined for primary rate access. In North America and Japan, for example, primary rate interface is based upon the T1 rate (defined in detail shortly) of 1.544 Mbps. In Europe, by comparison, the rate is 2.048 Mbps.

What is EZ-ISDN/IOC?

(North America only)

We highly recommend that you use our toll free ISDN ordering service to make sure you get the correct ISDN line the first time. The service is free to our customers. Dial 1-888-800-DIVA.

EZ-ISDN / IOC simplifies the ordering of your ISDN line. It lets you use simple codes to order pre-configured packages of ISDN features and services.

The North American ISDN User's Forum (NIUF) and Local Exchange Carriers (LEC) administer the assignment of codes. Bellcore administers the National ISDN Ordering Code (IOC) process.

We recommend the use of the following ISDN Ordering codes:

- **IOC "S"** offers basic voice/data features without the advanced calling features described below. If you select this option, make sure to get Additional Call (ACO). ACO is required for Call Bumping (also known as Dynamic Bandwidth Allocation--DBA) and Call Waiting to work correctly. **IOC "S1"** includes ACO, however it is not supported everywhere.

- *EZ*-**ISDN 1** (or IOC: "U") adds voice/data to both B-channels. The Advanced calling features such as Call Conference, Call transfer, etc., are only available on one B-channel.

- *EZ*-**ISDN 1A** (or IOC: "V") adds VoiceMail to *EZ*-**ISDN 1**.

- **EZ-ISDN 3 or 3A.** For the latest information on ordering Always On/Dynamic ISDN (AO/DI), please refer to www.isdnzone.com.

ACO is required for Call Bumping(DBA) and Call Waiting to work correctly. Calling Features are additional functions (such as Call Forwarding, 3-way Call) available on DIVA T/A models equipped with analog device ports.

Note: If you want to use DIVA T/A's Calling Features, ask your ISDN service provider for the values of the Feature Keys. You need these values to ensure the DIVA T/A has full access to the features.

What is AutoSPID?

(North America only)

AutoSPID is a new National ISDN protocol feature which enables the DIVA T/A to download a list of Service Profile Identifiers (SPIDs), Directory Number and Call Type information from the ISDN line, and to determine whether the SPIDs are currently initialized by other devices.

Note: Check with your ISDN service provider to determine if they support the AutoSPID feature.

This feature effectively eliminates the need for you to configure any ISDN parameters.

AutoSPID works in the following manner:

- If there are no SPIDs configured, then AutoSPID attempts to determine and then assign SPIDs and DNs to the location designated to store the AutoSPID parameters.

- If AutoSPID fails to detect the SPIDs, try entering the DNs (in a 10 digit format) and the DIVA T/A will attempt to perform generic SPID guessing.

- Unless the SPIDs and DNs are configured correctly, whether through AutoSPID, SPID guessing, or configured manually, ISDN will fail to initialize (the D-LED will flash).

The only way to use the DIVA T/A without entering SPIDs, is to configure the ISDN numbers for Non-Initializing Terminal mode.

Non-Initializing Terminal Mode

(North America only)

Non-Initializing Terminal (NIT) mode is a new National ISDN protocol feature which enables the DIVA T/A to operate without SPIDs. Your ISDN provider must support NIT mode to be able to use it.

To configure the DIVA T/A for Non-Initializing Terminal mode, deselect the SPID checkbox in the Windows Configuration Tool, or specify Yes for the Non-Initializing parameter in the VT-100 Configuration Tool.

Note: Check with your ISDN service provider to determine if they support Non-Initializing Terminal mode.

What is Multilink PPP?

Multilink PPP combines two 64 Kbps ISDN channels to provide a maximum transmission speed of 128 Kbps.

The DIVA T/A serves as an intermediary between its host workstation and the remote device to which data is being transmitted. All the protocol processing required for the negotiation of a Multilink PPP connection is performed on the DIVA T/A itself. The PC forwards asynchronous PPP packets to the DIVA T/A which, in turn, converts the packets for synchronous transmission and negotiates the various authentications required to establish the Multilink PPP connection with the target system over ISDN lines. This allows for the more efficient use of the ISDN line without requiring any changes to the PPP stack currently loaded on your PC.

DIVA T/A supports COM port rates of up to 230.4 kbps. However, some computer COM ports are limited to 115.2 kbps. If you want to use your DIVA T/A at its maximum speed, install a "fast COM port" card (UART 16650 based).

What is BACP/BOD and DBA?

BACP/BOD

DIVA T/A supports the Bandwidth Allocation Control Protocol (BACP) and Bandwidth on Demand (BOD). These two features combine to allow the DIVA T/A to establish multilink sessions that provide larger amounts of bandwidth than that offered over a single dialup channel. Such multilink sessions are established according to procedures defined in the Internet Engineering Task Force (IETF) PPP Multilink specification (RFC 1717).

BACP/BOD works by informing the DIVA T/A which dial-in ports are presently available for a multilink session. It allows the answering location to reserve those ports for the calling party and provides the calling party with the telephone numbers of those ports.

BACP/BOD also allows a user at the calling location to establish a multilink session by knowing only one telephone number instead of all the numbers to be dialed for the full session. With BACP/BOD, the answering location provides the calling location with a list of the remaining telephone numbers to be used for the connection, and the additional channels are dialed by the calling equipment transparently to the user. This effectively raises a 64 kbps connection into a 128 kbps connection.

BACP/BOD also decides whether the second B-channel is required or not. When bandwidth demand goes up, the second B-channel can automatically be established, and conversely, when bandwidth demand goes down, the second B-channel can be dropped. The primary advantage, therefore, is a reduction of dial up charges; the second B-channel is only used (and hence paid for) when required.

DBA

DIVA T/A also supports Dynamic Bandwidth Allocation (DBA), known also as Call Bumping. DBA automatically drops one B-channel to allow an incoming or outgoing telephone, fax or modem call. When the voice call is over, DBA automatically re-establishes the multilink session by reconnecting the second B-channel, if the throughput requires it.

It is recommended that you use DBA with BACP/BOD so that you can have greater flexibility when using the DIVA T/A.

Note: If an analog device is used on the server side of the connection, DBA will not restore a channel that has been bumped.

What is Always On / Dynamic ISDN (AO/DI)

AO/DI is only available if you have subscribed to it, your ISDN service provider supports it, and you are using Multilink PPP.

AO/DI uses the ISDN D-channel X-25 packet service to maintain an "always on" connection between you and your Service Provider. Low bandwidth requirements can be met using this constant connection, such as sending and receiving e-mail, credit card verification, etc.

If additional bandwidth is required, for example, to download a large file, AO/DI, in conjunction with Bandwidth on Demand (BOD), automatically adds B-channels of 64 Kbps each, for a total of 128 Kbps speed when both B-channels are in use. When the additional bandwidth is no longer required, one or both B-channels are dropped, leaving the D-channel connection in place.

AO/DI enhances ISDN use in a number of ways:

- AO/DI can quickly and automatically adjust to the voice and data needs of end-users. For example, if both B-channels are bonded in a data connection, and an incoming call is received, one of the B-channels is automatically freed up for the telephone call. If a fax call also comes in, the remaining B-channel may be allocated to the fax call. The data connection continues on the D-channel until a B-channel is available, if needed.

- As B-channels are invoked only when additional bandwidth is needed, connection costs are significantly reduced.

What is Data Compression?

To establish communications over a PPP link, each end of the connection must first send packets to configure and test the data link. After the link has been established, optional facilities may be negotiated as needed. One such facility is data compression. A wide variety of compression methods may be negotiated, although typically only one method is used for both directions of the link.

Data compression is a process where the effective throughput is increased by encoding data in such a way that fewer bits are required to represent it. For example, a text file might be compressed by representing common words with single characters; thus if the word "the" is represented by the character "@", it will be transmitted three times faster. Popular compression algorithms typically reduce the size of the data by 50%, effectively doubling the rate at which it is transmitted.

The Compression Control Protocol (CCP) works with MLPPP and is responsible for configuring, enabling, and disabling data compression algorithms on both ends of the point-to-point link. PC Compression negotiation takes precedence over the DIVA T/A negotiation for performance considerations (for example, the PC compression may reduce the number of bytes that go through the serial interface, the PC has the quicker CPU, etc.). The DIVA T/A compression negotiation, however, will assume control should no compression be detected or the initial negotiation fail. No user configuration is required to enable the DIVA T/A's compression functionality.

Compression algorithms currently supported by the DIVA T/A include Stacker LZS (Hi/fn), MPPC (Microsoft), and Ascend.

AT Commands

This section contains a description of all AT Commands relevant to DIVA T/A.

Locating Commands

To make it easier for you to locate a command, this guide has organized commands in two ways.

AT Commands are grouped into several categories. Use the table in the section AT Command Groups on page 16 to locate the relevant category.

An alphabetical list of commands is also available. It is found in the section Alphabetical List of Supported AT Commands on page 17.

AT Command Format

When issuing AT commands, you must abide by the following syntax conventions:

- A command line consists of a prefix, body, and terminator. Each command line must begin with "AT" (except A/).
- AT commands must be terminated by a carriage return (except A/).
- Commands entered in upper or lower case are accepted.
- The body is a string of commands restricted to printable ASCII characters (032 - 126).
- Space (ASCII 032) and control characters other than CR (ASCII 013) and BS (ASCII 010) in the command string are ignored.
- A command line may be aborted by entering < Ctrl-x > (ASCII 024).
- The default terminator is the ASCII <CR> character. Characters that precede the AT prefix are ignored. This is programmable through S-Register 3.
- The DIVA T/A recognizes the backspace character for editing. When echo is enabled, a backspace or delete is echoed as a backspace character followed by a space character, and another backspace. The code used for the backspace character is programmable through register S5. Values equal to 0 or greater than 32, or the carriage return character value, cannot be used for the backspace character.

AT Command Format—Continued

- The AT sequence may be followed by any command. Exceptions are: ATZ (reset), ATD (dial), ATA (answer), AT>H (help), and AT@MENU which cannot be followed by other commands on the same command line.

- Execution of commands ATD and ATA, either as a result of a direct command or a re-execute command, will be aborted if another character is entered before completion of the handshake.

- The maximum number of characters on any command line is 80 (including "A" and "T").

- If a syntax error is found in a command, the remainder of the line will be ignored and an ERROR code will be returned.

- Missing decimal parameters (*n*) are assumed as 0.

- Most commands entered with parameters out of range will not be accepted and the ERROR response will be returned to the DTE.

- The next command will only be accepted by the DIVA T/A once the previous command has been fully executed.

AT Command Groups

Alphabetical List of Supported AT Commands

The following table summarizes the AT Commands supported by the DIVA T/A. Go to the specified page number for more information.

Note: Static parameters are preceded by an asterisk " *". Changes made to static parameters do not take effect immediately (this contrasts with "dynamic" parameters where the changes take effect the moment they are made). To implement a change to a static parameter, use the AT&Wn command; the changes will be implemented when you restart your system.

AT Command	Description	Page
ATA	Answer Calls	43
ATDn	Dial a Number	46
ATEn	Local Echo	37
ATIn	View Product Information	28
ATO	Return Online	28
ATQn	Quiet Result Codes	37
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ATWn	Connect Message Control	37
ATXn	Extended Result Codes	38
ATZn	Restarts the DIVA T/A	51
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AT!C4=n	*Enable/Disable Non-Initializing mode (first B channel)	33
AT!C5=n	*Enable/Disable Non-Initializing mode (second B channel)	33
AT!C6=n	*ISDN SPID Number for first B-channel (applicable to North America only)	33
AT!C7=n	*ISDN SPID Number for second B-channel (applicable to North America only)	34
AT!D1=n	Specify DTE Speed.	34
AT!D2=n	Specify Databits length	34
AT!D3=n	Specify Parity	34
AT!D4=n	Specify number of Stopbits.	34

AT Command	Description	Page
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AT!X10=n	Specifies the delay before opening 1st B-channel	59
AT!X11=n	Specifies the 1st B-channel Opening Threshold	59
AT!X12=n	Specifies the 1st B-channel Closing Threshold	60
AT!X13=n	With BACP disabled, specifies the second B-channel Retry Delay	55
	With BACP enabled, specifies the delay before opening 2nd B-channel	60
AT!X14=n	Specifies the 2nd B-channel Opening Threshold	60
AT!X15=n	Specifies the 2nd B-channel Closing Threshold	60
AT!X16=n	Strips the area code from phone numbers.	61
AT!X17=n	Specifies the X.25 transmit queue threshold.	61
AT!X21=n	Specifies the Logical Connection Number.	61

AT Command	Description	Page
AT!X22=n	Specifies whether the AO/DI feature is enabled or disabled.	61
AT@DATE=	Set Date	29
AT@DATE?	Current Date	29
at@dump	Dump Memory *Note: This command is only available when you are in monitor mode; it is not available when you are in command mode.*	72
at@load	Load New Firmware *Note: This command is only available when you are in monitor mode; it is not available when you are in command mode.*	72
at@msg	Display Cause for Entering monitor *Note: This command is only available when you are in monitor mode; it is not available when you are in command mode.*	72
at@quit	Exit the monitor mode. *Note: This command is only available when you are in monitor mode; it is not available when you are in command mode.*	72
AT@TIME=	Set Time	29
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AT Command	Description	Page
AT*Sn=v	*Disable Calling Features (Analog Device)	71
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at>F	Restores All Profiles to Factory Settings *Note: This command is only available when you are in monitor mode; it is not available when you are in command mode.*	72
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AT>VC	View Current Profile	52
AT>VCC	View Call and COM Port Parameters	29
AT>VCD	View Dynamic Parameters	29
AT>VCP	View Protocol Parameters	29
AT>VCS	View Static Parameters	30
AT>VD	View Link and Connection Status Information	30
AT>VDD	Initialization Status Display (North America Only)	30
AT>VDC	View Connection Status	30
AT>VDL	View Link States	30

General AT Commands

Command	Description
ATIn	**View Product Information:** Displays information about your DIVA T/A.
	n=0 Displays static ID for the DIVA T/A
	n=1 Displays software checksum
	n=2 Reports "OK"
	n=3 Displays software version
	n=4 Displays capability string
	n=8 Displays "Eicon Technology DIVA T/A ISDN Modem"
	n=9 Displays the external COM port plug and play ID of the DIVA T-A
	n=20 Displays hardware code for the DIVA T/A
	n=100 Displays a list of supported countries in which analog devices can be used.
ATO	**Return Online:** In the online data mode, the DIVA T/A is ready to send and receive data, providing you are connected. Normally, the DIVA T/A remains in this mode until your computer sends the data mode escape sequence (+++) or until the call is terminated. *Note: This command can only be used when the DIVA T/A is in the online escape mode.*

Command	Description
AT@DATE=	**Set Date:** Sets the date on the DIVA T/A. This command is useful when the DIVA T/A sends the call ID to a telephone with Call Display (*North America only*). Format is mm-dd-yy *Note: This command is only available on models equipped with analog device ports.*
AT@DATE?	**Current Date:** Displays the current date of the system. The format is mm-dd-yy *Note: This command is only available on models equipped with analog device ports.*
AT@TIME=	**Set Time:** Sets the time on the DIVA T/A. This command is useful when the DIVA T/A sends the call ID to a telephone with Call Display. The format is hh:mm:ss *Note: This command is only available on models equipped with analog device ports.*
AT@TIME?	**Current Time:** Displays the current time of the system. The format is hh:mm:ss. *Note: This command is only available on models equipped with analog device ports.*
AT>VCC	**View Call and COM Port Parameters:** Displays the Call and COM Port dynamic parameters.
AT>VCD	**View Dynamic Parameters:** Displays all dynamic parameters (Call, COM, V.120, PPP, MLPPP).
AT>VCP	**View Protocol Parameters:** Displays the protocol parameters (V.110, V.120, PPP, MLPPP).

Command	*Description*
AT>VCS	**View Static Parameters:** Displays all static parameters (ISDN, protocol selection, analog device).
AT>VD	**View Connection and Link Status Information:** This command displays link and connection status for troubleshooting problems. Your Eicon Technology Customer Services representative may ask you to display this information.
AT>VDC	**View Connection Status:** Displays the connection status.
AT>VDD	**Initialization Status Display (North America only):** Displays information about the detection progress, the initialization of the logical channels, as well as auxiliary information.
AT>VDL	**View Link States:** Displays information about the link states.
AT>VT	**View Stored Telephone Numbers:** Display a list of all stored telephone numbers currently saved on your DIVA T/A.
AT>H*s*	**View Help Information:** Displays full or partial help for any AT command, where *s* specifies which AT command help is requested for.
AT>?	**Last AT Command Result Explained:** The AT>? Command reports the result of the last AT command issued. This command is useful for debugging long strings of AT commands and for determining which command was rejected and why.

Command	Description
A/	**Re-execute Previous Command:** Re-executes all the commands in the command buffer. This command is mainly used to place another call (using the ATD dial command) that failed to connect due to a busy line, no answer, or a wrong number. This command is *not* preceded by AT nor followed by Enter.
+++	**Escape Sequence:** The escape sequence is used to return to the command state from data state. To issue the escape sequence, wait one second then enter the escape character three consecutive times (+++) and wait another second. Its value is stored in S-Register 2. The default value of the escape character as stored in S-Register 2 is '+'.

ISDN Configuration Commands

Use the following commands to configure your DIVA T/A for ISDN.

Command	Operation

AT!C1=n   **ISDN Switch Type.** Specifies the ISDN Switch Type.

For North American Firmware:

n=0
National ISDN

n=1
AT&T 5ESS Custom

n=9 (Default for North America)
Auto-detect switch type. The DIVA T/A automatically determines the correct switch type to be used (National ISDN or AT&T 5ESS Custom).

For International Firmware:

n=2
EuroISDN (default)

n=3
Australia - Microlink (TPH1962/TS013).

n=4
INS-Net64 (Japan).

n=10
British Telecom specific. Used in the UK when the dial tone is not heard in the handset.

n=11
Australia - OnRamp (Telstra's ETSI service)

Note: These parameters are static. They do not take effect until you restart your DIVA T/A.

Command Operation

AT!C4=n   **Enable/Disable Non-Initializing mode (first B Channel):**

(North America only).

Specifies whether the first B-channel in the ISDN settings is set to Non-Initializing.

n=0
Disable Non-initializing mode (default)

n=1
Enable Non-initializing mode

Note: These parameters are static. They do not take effect until you restart your DIVA T/A.

AT!C5=n   **Enable/Disable Non-Initializing mode (second B channel):**

(North America only).

Specifies whether the second B channel in the ISDN settings is set to Non-Initializing mode.

N=0
Disable Non-initializing mode (default)

N=1
Enable Non-initializing mode

Note: This parameter is static. It does not take effect until you restart your DIVA T/A.

AT!C6=*n*   **SPID Number for 1st B-channel:**

(North America only).

The SPID (Service Profile Identifier) as assigned by your local telephone company. This number is a unique ID which identifies an ISDN terminal to the local ISDN switch.

Note: This parameter is static. It does not take effect until you restart your DIVA T/A.

Command Operation

AT!C7=*n* **SPID Number for 2nd B-channel:**

(North America only).

The SPID (Service Profile Identifier) as assigned by your local telephone company. This number is a unique ID that identifies an ISDN terminal to the local ISDN switch.
Note: This parameter is static. It does not take effect until you restart your DIVA T/A.

AT!D1=n **DTE Speed.** Specifies the speed of the DTE. The default setting is 115200.

AT!D2=n **Databits length.** Specifies the length of the Databits. The default setting is 8.

AT!D3=n **Parity.** Specifies the parity. The default setting is 0(none).

AT!D4=n **Stopbits**. Specifies the number of Stopbits. The default is 1.

AT!Ln **Set ISDN Encoding Law.** Specifies the type of encoding law for ISDN voice calls. The selection will be used for Data over Voice (DOV) calls, and by the analog devices.
n=0 (default)
If switch type is EuroISDN or TPH, A-law is typically used; if switch type is INS-Net64, NI-1, or 5ESS, µ law is used.
n=1
µ law
n=2
A-law
Note: This parameter is static. It does not take effect until you restart your DIVA T/A.

Command   *Operation*

AT!N1=*n*   **ISDN Number for 1ˢᵗ B-channel.** Your local ISDN
            number as assigned by your telephone company. The
            DIVA T/A uses this number to identify itself when
            placing calls and to recognize incoming calls. This
            number is a string with up to 20 characters. Valid
            characters are: 0-9, *, and #. Default: null string (a value
            is required).

            *Note: This parameter is static. It does not take effect
            until you restart your DIVA T/A.*

AT!N2=*n*   **ISDN Number for 2ⁿᵈ B-channel.** Your local ISDN
            number as assigned by your telephone company. The
            DIVA T/A uses this number to identify itself when
            placing calls and to recognize incoming calls. This
            number is a string with up to 20 characters. Valid
            characters are: 0-9, *, and #. Default: null string (a value
            is required).

            *Note: This parameter is static. It does not take effect
            until you restart your DIVA T/A.*

AT!N3=*n*   **ISDN Subaddress for 1ˢᵗ B-channel.** The ISDN
            subaddress is used to further identify the terminal on the
            ISDN basic rate interface. In cases where two terminals
            share the same directory number, the subaddress
            identifies which terminal will answer a particular
            incoming call. This number is a string with up to 20
            characters. Valid characters are: 0-9, *, and #. Default:
            null string (this is an optional value).

            *Note: This parameter is static. It does not take effect
            until you restart your DIVA T/A.*

Command   Operation

AT!N4=*n*   **ISDN Subaddress for 2nd B-channel.** The ISDN subaddress is used to further identify the terminal on the ISDN basic rate interface. In cases where two terminals share the same directory number, the subaddress identifies which terminal will answer a particular incoming call. This number is a string with up to 20 characters. Valid characters are: 0-9, *, and #. Default: null string (this is an optional value).

Note: This parameter is static. It does not take effect until you restart your DIVA T/A.

AT!On   **Default Outgoing Call Type:** Specifies the default call type for outgoing calls (when a user enters an ATD command without a special modifier). If a modifier is used, it will override this parameter.

n=0
Data call
n=3
Data over voice bearer capability call

COM Port Configuration Commands

Use the following AT commands to configure the DIVA T/A's COM port.

Command	Description
ATE*n*	**Local Echo:** Specifies whether command echo is enabled or disabled on your computer. Where: n=0 Disable local echo n=1 Enable local echo (default) *Note: If you do not see commands entered on your screen, enable command echo. If you see double characters, disable command echo.*
ATQ*n*	**Quiet Result Codes.** Specifies whether or not result codes are sent to the DTE. Where: n=0 Result codes sent (default) n=1 Result codes not sent
ATV*n*	**Result Code Format:** Specifies whether your DIVA T/A displays messages as numbers or words. Where: n=0 Numbers n=1 Words (default)
ATW*n*	**Connect Message Control.** Specifies the format of connection messages. n=0 Upon connection, the DIVA T/A reports the DTE speed only; for example, CONNECT 19200 (default). n=1 Upon connection, the DIVA T/A reports the DCE speed, the protocol, and the DTE speed. n=2 Upon connection, the DIVA T/A reports the DCE speed; for example, CONNECT 64000.

Command	Description
ATXn	**Extended Result Codes:** Specifies which subset of the result messages will be used by the DIVA T/A to inform the DTE of the results from commands. n=0 Provide basic result codes: sends only OK, CONNECT, RING, NO CARRIER, ERROR, and NO ANSWER. n=1 Provide basic result codes and appropriate connection speed (e.g., CONNECT 2400, CONNECT 19200). n=2 Provide basic result codes, connection speed, and DIALTONE detection. n=3 Provide basic result codes, connection speed, and BUSY signal detection. n=4 Sends all messages (default) n=5 Terminal screen displays the remote number along with the RING message. If the remote number is not known the message UNKNOWN is displayed.
AT&Cn	**Data Carrier Detect.** Specifies the Data Carrier Detect (DCD) output. Where: n=0 DCD always enabled n-1 DCD tracks connection (default)

Command	Description

AT&Dn   **Data Terminal Ready:** Controls the interpretation of the Data Terminal Ready (DTR) input.

    n=0

    Ignore status of DTR signal.

    n=1

    Monitor DTR signal: when an on-to-off transition of DTR signal occurs, enter the command state. Return to the online state when the ATO command is issued.

    n=2

    Monitor DTR signal: when an on-to-off transition of DTR signal occurs, hang up and enters the command state (default).

    n=3

    Monitor DTR signal: when an on-to-off transition of DTR signal occurs, hang up and reset.

    n=9

    Monitor DTR signal: when an off-to-on transition of DTR signal occurs, automatically dial the stored telephone number 0

    n=11

    Monitor DTR signal: when the DTR goes up, dial pre-stored number. Hangup connection when DTR goes Down. (Combination of AT&D2 and AT&D9).

AT&Kn   **Flow Control (AT&Kn).** Specifies whether flow control is enabled or disabled. Flow control stops data flow when the buffer is full, and restarts it when buffer space becomes available.

    n=0

    Disables flow control

    n=3

    Enables RTS/CTS flow control (default)

    n=4

    Enables XON/XOFF flow control

    n=6

    Enables both RTS/CTS and XON/XOFF flow control

Command	Description
AT&Sn	**Data Set Ready:** Specifies the behavior of the DSR output.
	n=0
	DSR always on (default)
	n=1
	DSR always on after protocol is connected
AT\Vn	**Connect Message Control:** This command controls the format of connection messages
	n=0
	Upon connection, the DIVA T/A reports the DTE speed only; for example, CONNECT 19200 (default).
	n=1
	Upon connection, the DIVA T/A reports the DCE speed, the protocol, and the DTE speed. (same as ATW2).

S Register Commands

Command	Operation
ATSn=v	**S-Register n to Value v:** Use this command to set S-Register n to the value v. See the section S Register Parameters on page 41.
ATS*n*	**Establishes S-Register n as the Selected Register** The ATS*n* command establishes S-Register *n* as the last register accessed, where *n* is the number identifying the S-Register. For example, ATS7 establishes S7 as the last accessed register.
ATS*n*?	**Reports the Value of S-Register n:** This command reports the last value stored into S-Register *n*. If *n* is omitted, the value of the last accessed S-Register is reported.
AT=n	**Last Accessed S-Register to Value n:** Use this command to set the last accessed S-Register to the new value *n*.
AT?	**View Last Accessed S-Register:** Displays the contents of the "selected" S-Register. The "selected" S-Register is the last S-Register that was accessed using an S-Register command, or selected with the ATSn command.

S Register Parameters

ATS0=n	**Rings to Auto-Answer:** Allows you to enable or disable auto-answer. Setting a value other than "0" instructs the DIVA T/A to auto-answer after n rings. A value of "0" instructs the DIVA T/A to disable the auto-answer mode. Specify a value between 0-255 (default is 0).
ATS1=n	**Ring Count** Default = 0 *Note: This register is reset to 0 if 8 seconds elapse since receipt of the previous ring*

Command	Description
ATS2=n	**Escape Sequence Character**

Use this command to configure the character used to escape from the data mode and return to the AT command mode.

n can be a value between 0-255 (default is ASCII 043, translates into the "+" character).

A value of 128-255 disables the escape function.

Command	Description
ATS3=n	**Carriage Return Character**

Sets the character that the AT command processor uses to detect the end of a command line in both the receive and transmit directions.

n can be a value between 0-127(default is ASCII 013 which translates into the carriage return character).

Command	Description
ATS4=n	**Line Feed Character:**

Sets the character that the AT command processor uses to indicate the end of each status message.

n can be a value between 0-127 (default is ASCII 010 line feed).

Command	Description
ATS5=n	**Backspace Character**

Sets the backspace character used for command line editing.

n can be a value between 0-32 (default is ASCII 008 backspace).

Call Control Commands

Command	Description
ATA	**Answer Calls:** Instructs the DIVA T/A to accept an incoming call.

AT!T1=n   **Incoming Call Assignment (first B-channel):** Specifies the type of incoming ISDN calls that DIVA T/A can accept on the first B-channel.

$n=0$

Accept Data Calls Only. Specifies that DIVA T/A should only accept data calls. All voice calls will be rejected.

$n=1$

Accept Data and Headset Calls. Specifies that DIVA T/A should accept data and voice calls; voice calls will be routed to the headset.

$n=2$

Accept Data and Modem over ISDN Calls. Specifies that DIVA T/A should accept data and modem over ISDN calls; voice calls will be routed to the internal modem.

AT!T2=n   **Incoming Call Assignment (2nd B-channel):** Specifies the type of incoming ISDN calls that DIVA T/A can accept on the second B-channel.

$n=0$

Accept Data Calls Only. Specifies that DIVA T/A Mobile should only accept data calls. All voice calls will be rejected.

$n=1$

Accept Data and Headset Calls. Specifies that DIVA T/A should accept data and voice calls; voice calls will be routed to the headset.

$n=2$

Accept Data and Modem over ISDN Calls. Specifies that DIVA T/A should accept data and modem over ISDN calls; voice calls will be routed to the internal modem.

Command	Description
AT%A2=n	**Protocol Control:** Specifies the protocol control you want to use for your ISDN connection.

n=blank   Transparent mode

n=2   V.120 rate adaption protocol.

n=4   V.110 rate adaption protocol

n=95   PPP (default International).

n=96   Multilink PPP (default North America).

Note:

• *Both PPP and Multilink PPP require that a PPP communications stack be installed on your computer.*

• *Both the local terminal adapter (DIVA T/A) and the remote device must be set to the same protocol.*

• *If your workstation is configured as a Windows for Workgroups Remote Access Service (RAS) client, you must configure the V.120 rate adaption protocol on both the DIVA T/A workstation and on the remote device (RAS Server ISDN adapter).*

• *Multilink PPP does not support the callback feature used by some servers for security purposes.*

• *When using Multilink PPP for **incoming** calls, only SPAP or PAP authentication is supported. (Windows NT only) In order to support **incoming** calls with Windows NT RAS Server, you must enable the parameter "Allow clear text authentication" in the RAS Server setup. Refer to the RAS online help on how to configure this parameter.*

Note: This parameter is static. Changes do not take effect until you restart your DIVA T/A.

Command	Description
AT%A95=c	**Incoming Data Call Answer:** Specifies how incoming data calls are handled (accepted or rejected).
	c=E
	All incoming data calls can be accepted either by the DIVA T/A (ATS0=1) or by the application (default).
	c=D
	All incoming data calls are rejected upon receipt
AT&Zn=v	**Store Telephone Number:** Specifies stored telephone number(s). The telephone number can be a string with up to 20 characters (0-9, *, #, space, hyphen, parenthesis, and period are accepted). You can store up to ten telephone numbers where *n* identifies the memory location number (0-9) and *v* is the telephone number.

Command	*Description*
ATD*n*	**Dial a Number:** Directs the DIVA T/A to go online, dial the specified number, and attempt to establish a connection.
	Punctuation characters may be used for clarity, with parentheses: hyphens, spaces, and periods being ignored. Also, the "P", "T", "W", "@", and "R" dial modifiers used by modems are ignored since they are not relevant to ISDN.
	The "~" and "&" characters are used to dial two numbers within the same dialing string.
	Modifiers: "**;**" Enter command mode (any character following this modifier is treated as an AT command);

- **L**   Redial last number;
- **S=n**   Dial the number stored in the directory (n=0-9)
- **I**   Establish a 56K ISDN data connection
- **N**   Establish a data connection (overrides AT!O3)
- **V**   Establish an ISDN Data Over Voice connection (overrides AT!O0).
- **X**   Specify your X.25 DTE Address when establishing a Multilink PPP connection using AO/DI.
- **%n**   Enables PAP Token / CHAP dialing, where n is your token password as supplied by your administrator.

ATS1?	**View Ring Count:** Use this command to display the current number of rings (incoming call).

V.120 Configuration Commands

Use the following AT commands to specify the V.120 configuration.

Command	Description
AT!E0=*n*	**V.120 N201 Tx (Maximum Transmit Frame Size):** N201 Tx (Maximum Transmit Frame Size) determines the maximum number of octets in an information field to be transmitted to the remote V.120 device. Valid range is 16-260. Default: 256. *Note: If a larger frame needs to be transmitted, the DIVA T/A segments it into V.120 fragments and expects the remote device to perform reassembly.*
AT!E1=*n*	**V.120 N201 Rx (Maximum Receive Frame Size):** N201 Rx (Maximum Receive Frame Size) determines the maximum number of octets in an information field to be received from the remote V.120 device. Valid range is 16-260. Default: 260.
AT!E2=*n*	**V.120 Multiframe Mode:** The V.120 protocol supports two transfer modes described below: n=E **Multiframe mode** provides acknowledged transfers by using Information (I) and acknowledgment (RR/RNR) frames, and provides error correction and recovery procedures. The link verification procedure is provided by exchanging SABME and UA frames. n=D **Unacknowledged mode** uses Unnumbered Information (UI) frames. The link verification procedure is provided by exchanging XID frames. The unacknowledged mode is less robust than multiframe mode. *Note: The DIVA T/A may automatically switch to the other mode if the link verification frames issued from the remote device do not match the configured mode on the local device. The DIVA T/A always prefers the multiframe mode.*

Command   Description

AT!E3=*n*   **V.120 K Window Size:** *Applicable to the multiframe mode only.* K (Window Size) determines the maximum number of sequential data frames that may be outstanding (not acknowledged) at any given time. Valid range is 1-127 frames. Default: 7.

AT!E4=*n*   **V.120 T200 (Retransmission Timer):** *Applicable to the multiframe mode only.* T200 (Retransmission Timer) is the maximum time allowed to determine if a transmitted frame was received by the remote device, prior to its retransmission. The unit of measurement is 1/10 seconds. Valid range is 1-255. Default: 15 (equal to 1.5 second).

The value specified for T200 (Retransmission Timer) must be less than the value specified for T203 (Link Integrity Timer). Otherwise, the default values are used.

AT!E5=*n*   **V.120 N200 (Maximum Retry Count):** *Applicable to the multiframe mode only.* N200 (Maximum Retry Count) is a system parameter which identifies the maximum number of retransmissions of a frame due to T200 expiry. When the maximum number of retransmissions is reached, the recovery process is started which may cause call disconnection. Valid range is 1-10. Default: 3.

AT!E6=*n*   **V.120 T203 (Link Integrity Timer):** *Applicable to the multiframe mode only.* T203 (Link Integrity Timer) is the maximum time allowed without frames (including data and control) being exchanged. Its purpose is to verify that the remote device is still online and operational. When the Link Integrity Timer expires, recovery procedures are started which may cause the disconnection of the current call.

The unit of measurement is seconds. Valid range is 1-255. Default: 30.

The value specified for T200 (Retransmission Timer) must be less than the value specified for T203 (Link Integrity Timer). Otherwise, the default values are used.

Command Description

AT!E7=*n*   **V.120 Idle Timer (AT!E7=n):** Idle Timer is the maximum time without the exchange of data frames between the local and the remote devices and before the automatic termination of the connection. Its purpose is to reduce communications costs while data is not being transferred for a period of time (operates in both the multiframe and unacknowledgement modes). When Idle Timer expires, this immediately initiates the disconnection of calls. Setting a "0" value disables Idle Timer.

The unit of measurement is minutes. Valid range is 0-10000. Default: 1440 (24 hours)

V.110 Configuration Commands

Use the following AT commands to specify the V.110 configuration.

Command   *Description*

AT!V0=*n*   **V.110 Configuration Override**: Specifies whether the DIVA T/A uses the COM port setting to configure V.110 or overrides them with user settings.

n=0 Use the default settings

n=1 Override the COM port settings as per AT!V1, AT!V2, AT!V3, AT!V4, and AT!V5

Default: n=1

AT!V1=*n*   **V.110 Stream Rate:** Specifies the V.110 Stream Rate

Values for n=1200, 2400, 4800, 9600, 19200

Default: 19200.

AT!V2=*n*   **V.110 Character Length:** Specifies the character length.

Values for n= 7 or 8

Default: 8

AT!V3=*n*   **V.110 Parity:** Specifies the parity used for V.110.

Values for n= 0 (none), 1 (even), 2(odd), 3(one), 4(zero).

Default: 0

AT!V4=n   **V.110 Stop Bits.** Specifies the Stop Bits used for V.110.

Values for n= 1 or 2.

Default: 1

AT!V5=n   **V.110 Flow Control.** Specifies the Flow Control method to be used for V.110.

Values for n= 0 (none), 1 (receive only), 2 (transmit only), 3 (receive and transmit).

Default:1 (receive only).

Profile Commands

The following table describes each profile command:

Command	Description
ATZ*n*	**Restart the DIVA T/A Using Profile *n*:** Restarts your DIVA T/A using stored profile *n*. Use after changing a static parameter.
AT&F	**Use Factory Settings in Current Profile:** Restores and loads all settings in the current profile with the original factory settings. Previously configured ISDN commands, stored telephone numbers, the protocol control values, and the phone lines configuration are retained; all other settings are lost.
AT&V	**View Current and Stored Profiles:** Displays the current and stored profiles as well as stored telephone numbers in your DIVA T/A.
AT&W*n*	**Save Settings as Profile n:** Writes storable parameters of current profile in memory as stored profile *n*. Use when you are satisfied with your current configuration settings and want to save them to a specific stored profile *n*.
AT&Y*n*	**Set Powerup Profile:** Designates stored profile *n* as the powerup profile. Use to load your desired stored profile the next time your DIVA T/A is powered on.
AT>F	**Use Factory Settings in all Profiles:** Restores all stored profiles and the current profile to the original factory settings. Reverts the powerup profile to number 0. Use when you need to reset the unit to its original factory settings. *Warning: All previous user-defined settings are lost.*
AT>FC	**Reset Current Profile and Telephone Numbers.** Resets the current profile and telephone numbers to the default factory settings.

Command	Description
AT>VC	**View Current Profile:** Presents a screen display of the current profile settings on your DIVA T/A.
AT>VP*n*	**View Stored Profile:** Presents a screen display of the desired stored profile *n* where *n* is the number of the stored profile (0,1,2) you want to view.
AT>Z	**Restart the DIVA T/A Using Powerup Profile:** Restarts your DIVA T/A using the powerup profile. Use anytime you want to load the powerup profile.

Multilink PPP Commands

The following table pertains to MLPPP Configuration:

Command	Operation
AT%M1=*n*	**Local Endpoint Discriminator Class.** Where *n* specifies the local endpoint discriminator class See, "Endpoint Discriminator Class/Address" on page 56 for possible values for *n*. Default: 255
AT%M2=*n*	**Remote Endpoint Discriminator Class.** Where *n* specifies the remote endpoint discriminator class. See, "Endpoint Discriminator Class/Address" on page 56 for possible values for *n*. Default: 255
AT%M3=*n*	**Local Endpoint Discriminator Address.** Where *n* specifies the local endpoint discriminator address. See, "Endpoint Discriminator Class/Address" on page 56 for possible values for *n*.
AT%M4=*n*	**Remote Endpoint Discriminator Address.** Specifies the remote endpoint discriminator address. See, "Endpoint Discriminator Class/Address" on page 56 for possible values for *n*.
AT%P5=n	**Bandwidth Allocation Control Protocol(BACP)/Bandwidth on Demand (BOD)** Specifies whether BACP/BOD is enabled or disabled. When enabled, the DIVA T/A will drop to one B channel (reducing costs) when throughput drops below 64K. The DIVA T/A first attempts to negotiate BACP; if this is unsuccessful, the DIVA T/A falls back to BOD. n=0 Disable (default) n=1 Enable *Note: You can use this parameter only if the DIVA T/A has been configured for MLPPP.*

Command	Description
AT%P6=n	**Set Initial Billing Interval Timer.** Sets the timer (secs) to match the amount of time your ISDN provider allocates as the first time interval. *Note: If the value is set to 0, the timer is not used. Setting this value to 0, also effectively sets AT%P7 to 0.* n can be a value from 0 to 65535. Default value=60 seconds
AT%P7=n	**Set Billing Interval Timer.** Sets the timer (secs) to match the amount of time your ISDN provider designates as the minimum chargeable unit for all subsequent billing. *Note: If the value is set to 0, the timer is not used.* n can be a value from 0 to 65535. Default value=60 seconds
AT%P8=n	**Dynamic Bandwidth Allocation.** (Only available on models equipped with analog device ports). Specifies whether Dynamic Bandwidth Allocation (also known as Call Bumping) is enabled or disabled. When enabled, the DIVA T/A will automatically assign one of the two B channels (both used for data) to an incoming or outgoing analog device call (voice). When the call is completed, the DIVA T/A automatically reassigns the second B-channel to the data connection. n=0 Disable n=1 Enable (default) *Note: When BACP/BOD is enabled, the 2nd B channel is assigned as a data connection only if throughput is above 64KPS. Note also that you can use this parameter only if the DIVA T/A has been configured for MLPPP.*

Command	Description
AT%P9=n	**Second B-channel Connection Retries.** Specifies the number of times the DIVA T/A tries to connect to the second B-channel when BOD is disabled. Range: 0-255 Default: 3
AT!X13=n	**Second B-channel Retry Delay.** Specifies the number of seconds the DIVA T/A waits before it re-attempts to connect to the second B-channel. Range: 0-65535 Default: 5

Endpoint Discriminator Class/Address

Class	Description	Address Format
0	Null Class	No address is used.
1	Locally Assigned Address	Uses a hexadecimal format with a maximum length of 40 characters. Valid characters are "0-9, a-f" (ex. AT%M3=b3c665ac1).
2	Internet Protocol (IP) Address	Uses a numerical format with a maximum length of 15 characters. Valid characters are "0-9 and ." (ex. AT%M4=192.219.23.100).
3	IEEE 802.1 Globally Assigned MAC Address	Uses a hexadecimal format with a maximum length of 12 characters. Valid characters are "0-9, a-f" (ex. AT%M3=b3c665ac1).
4	PPP Magic-Number Block	Uses a hexadecimal format with a maximum length of 40 characters, and the length must be a multiple of 8. Valid characters are "0-9, a-f" (ex. AT%M3=b3c665acffff0001).
5	Public Switched Network Directory Number	Uses a normal telephone number with a maximum length of 15. Valid characters are "0-9, *, #).
255	Accept Any Remote Endpoint Discriminator	No address is used. This class is valid only for remote endpoint discriminators (EPDs), and is used to accept any remote EPDs received that are all part of the same bundle.

Always On / Dynamic ISDN AT Commands

Command	*Description*
AT!X1=n	**X.25 Version.** Specifies the X.25 version you are using. There are two X.25 CCITT recommendations available for selection, 1984 and 1988. This information is provided by your Service Provider and should match the X.25 recommendation supported on the switch you are connecting to.

    n=0   1984 (default)

    n=1   1988

AT!X2=n	**X.25 DTE address.** Specifies the X.25 DTE address. An X.25 DTE Address identifies a node on an X.25 network. Every X.25 node has an X.25 address. Your Service provider assigns this value at subscription time.

This number is your 7, 10, or 11 digit X.25 Directory number (11=with leading 1). For example, if 214-111-1234 is your DN, the following combinations are possible:

AT!X2=1111234

AT!X2=2141111234

AT!X2=12141111234

AT!X3=n	**X.25 facilities.** Specifies the X.25 facilities that are to be included each time a call is made.

X.25 facilities are optional network services that let you perform tasks such as reversing charges on your calls, accessing a Close User Group, or specifying a Network User Identification (NUI).

Enter facilities as hexadecimal octets (eight-bit bytes).

For example, if your X.25 long distance provider is AT&T (AT&T=3134), you should specify AT!X3=443134 or to specify a Throughput Class of 9600, enter AT!X3=02AA (or in Canada enter AT!X3=02aa420707430707).

Command	*Description*
AT!X4=n	**Specifies the local ISDN prefixes to be used.** Specifies the local ISDN prefixes to be used on phone numbers received with BACP enabled.
	For example, AT!X4=9 will place a 9 in front of the number you are dialing for situations where you need to dial 9 for an outside line (PBX). AT!X4=1 will place a 1 in front of the number in situations where you are making a long distance call.
AT!X5=n	**X.25 Default Window Size.** Specifies the X.25 default window size. This is the window size used if no window size is specified in the X.25 Facilities field when a call is made. Default value: 2.
	Window sizes of 1 to 7 are standard. A value of 0 is not allowed.
AT!X6=n	**X.25 Maximum Window Size.** Specifies the X.25 maximum window size. It is sometimes desirable to have a large window size. This is particularly true for satellite networks that have significant transmission delays.
	Maximum window size can never be exceeded. If a larger window size is requested when the call is established (through X.25 Facilities field), it is negotiated downward so that the maximum window size is respected. Default value: 7.
	Use a value that is greater than or equal to the default window size.
AT!X7=n	**X.25 Default Packet Size.** Specifies the X.25 default packet size. The packet size used if no packet size is specified in the X.25 facilities field when a call is made. Default value: 128.
	n=16,32,64,128,256,512, or,1024

Command	*Description*
AT!X8=n	**X.25 Maximum Packet Size.** Specifies the X.25 maximum packet size. Maximum packet size can never be exceeded. If a larger packet size is requested when the call is established, it will be negotiated downward so that the maximum packet size is respected.
	Use a value that is greater than or equal to the default packet size. Default is 256.
	n=16,32,64,128,256,512, or,1024
AT!X9=n	**Terminal Endpoint Identifier (TEI).** Specifies the TEI used for X.25 over the D-channel. Your service provider assigns this value. Possible values are 0 to 63 inclusive. Default value is 21.
AT!X10=n	**Delay before opening 1st B-channel.** Specifies the amount of time (in seconds) the throughput on your D-channel must exceed the Opening Threshold (AT!X11=n) before the 1st B-channel is added to the AO/DI connection.
	For example, if you specify 5 seconds, and the Opening Threshold is 70% (AT!X11=70), once the throughput on the D-channel reaches 70%, there will be a delay of 5 seconds before the 1st B-channel is added to the AO/DI connection. If the throughput drops below 70% during the 5 seconds, the 1st B-channel will not be added to the connection.
	Default is 5 seconds.
AT!X11=n	**1st B-channel Opening Threshold.** Specifies the threshold (percentage) that the throughput on your D-channel must exceed before the 1st B-channel is added to the AO/DI connection. Default is 70.

Command	Description
AT!X12=n	**1st B-channel Closing Threshold.** Specifies the threshold (percentage) that the throughput on your B-channel must be below before the 1st B-channel is dropped from the AO/DI connection. Default is 40.
AT!X13=n	**Delay before opening 2nd B-channel.** Specifies the amount of time (in seconds) the throughput on your 1st B-channel must exceed the Opening Threshold (AT!X14=n) before the 2nd B-channel is added to the AO/DI connection. For example, if you specify 5 seconds, and the Opening Threshold is 70% (AT!X14=70), once the throughput on the 1st B-channel reaches 70%, there will be a delay of 5 seconds before the 2nd B-channel is added to the AO/DI connection. If the throughput drops below 70% during the 5 seconds, the 2nd B-channel will not be added to the connection. Default is 5 seconds.
AT!X14=n	**2nd B-channel Opening Threshold**. Specifies the threshold (percentage) that the throughput on your 1st B-channel must exceed before the 2nd B-channel is added to the AO/DI connection. Default is 70.
AT!X15=n	**2nd B-channel Closing Threshold**. Specifies the threshold (percentage) that the throughput on your 2nd B-channel connection must be below before the 2nd B-channel is dropped from the AO/DI connection. Default is 40.

Command	*Description*
AT!X16=n	**Strips the area code from numbers.** Tells BACP to drop the area code from phone numbers received from the remote peer.
	For example, if you are dialing a number with the same area code, if you specify AT!X16=1, the area code is dropped from the number.
	Default is 0.
	n=0 Off
	n=1 On
AT!X17=n	**Specifies the X.25 transmit queue threshold.** When the queued data goes over this limit, for the period of time specified with AT!X10, the 1st B-channel will be added to the AO/DI connection.
	For example, if 1000 bytes are queued in the X.25 link, the 1st B-channel connection will be opened after the delay specified by AT!X10.
	Default is 1000 bytes.
AT!X21=n	**Specifies the X.25 Logical Connection Number.** Specifies the LCN that X.25 will use for establishing the AO/DI connection.
	Default is 1.
	Range: 1 to 4095
AT!X22=n	**Enable/Disable AO/DI.** Specifies whether the AO/DI feature is enabled or disabled.
	Default is 1 (enabled).
	n=0 Off
	n=1 On

Utility Commands

The following table contains a list of Utility Commands.

Command	Operation
AT$CP=n	**Enables or disables compression.**
	n=0 Disable
	n=1 Enable (default)
AT$In	**On Demand SPID Testing.**
	(North America only)
	Lets you test SPIDs on demand

n=<SPID Number> Tests the specified SPID. To perform this test you must be connected to National ISDN or AT&T 5ESS Custom interface. The test is only supported if neither logical channel is initialized (either with a SPID or in NIT mode). If required, clear the SPID and disable NIT mode for both channels, then reset the card. You can then run SPID tests until you have two working SPIDs. Once you have two working SPIDs, further tests will be rejected.

n=<blank> Retrieves any AutoSPID data downloaded during location detection. Note that this command does not initiate the AutoSPID procedure; it simply retrieves historical data.

The following string of information is displayed:

[SPID number, Directory Number, call type, error code]

Call type is indicted by the following codes: v=voice, d=data, p=packet.

Note: If AutoSPID cannot detect Directory Numbers and call types, these fields will be empty. If an AutoSPID download has not been performed, no information will be retrieved.

Command	Description
AT$IG	**SPID guessing.**
	(North America only).
	Specifies that the DIVA T/A should attempt SPID guessing based on the ISDN Numbers you configured with AT!N1 and AT!N2. When the command is entered, the DIVA T/A will attempt to guess the SPID for each B-channel. If SPID initialization is successful, the SPID number is displayed and saved automatically.
	If a datalink problem is encountered during SPID guessing the guessing is aborted and the message "No Carrier" is displayed.
AT$Rn	Fatal Error Reset.
	n=0
	Do not reset on software fatal error, stay in the monitor (default)
	n=1
	Reset unit on software fatal error
	Note: Use the AT&W command to save the parmameter permanently.
AT$SL	Stops a LAPD trace.
AT$SM	Stops a Mail trace.
AT$SP	Stops a PPP trace.
AT$SQ	Stops a Q931 trace.
AT$SX	Stops an X.25 trace.
AT$VI	Displays the initial profile.

Command	Description
AT$VL	Starts and displays a LAPD trace.
	You can specify the total size of the trace buffer and the length of the each trace entry. Use the following syntax:
	AT$VL [trace size, entry length], where trace size and entry length are specified in hexadecimal values.
	For example, to specify a trace size of 32K and an entry length of 256 bytes, enter: AT$VL 8000,100.
	If you do not specify trace size and length, the default values are used. The default trace size is 16K, the default entry length is 128 bytes.
AT$VM	Controls the internal Mail Trace. Your Eicon Technology Customer Services representative may ask you to use this command.
	Format is AT$VM [total size, entry size, filter] (parameters are optional)
	Example:
	AT$VM : starts mail trace with default size of 16K, entry size of 64 bytes, no filter
	AT$VM -p: to pause the mail trace
	AT$VM -r: to reset the mail trace
	AT$VM -s: to restart the mail trace

Command	Description
AT$VP	Starts or displays the result of a PPP trace.
	You can specify the total size of the trace buffer and the length of the each trace entry. Use the following syntax:
	AT$VP [trace size, entry length], where trace size and entry length are specified in hexadecimal values.
	For example, to specify a trace size of 32K and an entry length of 256 bytes, enter: AT$VP8000,100.
	If you do not specify trace size and length, the default values are used. The default trace size is 16K, the default entry length is 128 bytes.
AT$VQ	Starts and displays the result of a Q931 trace.
	You can specify the total size of the trace buffer and the length of the each trace entry. Use the following syntax:
	AT$VQ [trace size, entry length], where trace size and entry length are specified in hexadecimal values.
	For example, to specify a trace size of 32K and an entry length of 256 bytes, enter: AT$VQ8000,100.
	If you do not specify trace size and length, the default values are used. The default trace size is 16K, the default entry length is 128 bytes.

Command	Description
AT$VX	Starts or displays the result of an X25 trace on the D-channel.
	You can specify the total size of the trace buffer and the length of each trace entry. Use the following syntax:
	AT$VX [trace size, entry length], where trace size and entry length are specified in hexadecimal values.
	For example, to specify a trace size of 32K and an entry length of 256 bytes, enter: AT$VX8000,100.
	If you do not specify trace size and length, the default values are used. The default trace size is 16K, the default entry length is 128 bytes.
AT$Y	Enter the monitor on the next reset.
AT$Z	Soft reset the unit and enter monitor.

Analog Device Commands

The following table contains a list of analog device commands. These commands are only available on units with the optional analog device ports.

Command	Description
AT*An=v	**Abbreviated Ring Control.**
	Specifies whether Visual Message Waiting's abbreviated ring is enabled or disabled.
	n=1
	Analog device 1 (voice on port 1)
	n=2
	Analog device 2 (voice on port 2)
	v=0
	disabled
	v=1
	enabled (default)
AT*Bn=v	**ISDN Bearer Capability**.
	Specifies the bearer capability for ISDN calls on the analog device interface.
	n=1
	Analog device 1 (voice on port 1)
	n=2
	Analog device 2 (voice on port 2)
	v=0
	Outgoing Analog device calls use Speech encoding (default)
	v=1
	Outgoing analog device calls use Audio 3.1Khz encoding. This setting is recommended for modem/fax calls.
	Note: These parameters are static. They do not take effect until you restart your DIVA T/A.

Command	Description

AT*Cn   **Analog Device Caller ID Delivery.**

Specifies whether analog device caller ID delivery is enabled or disabled (North America only). When enabled telephones with Call Display will display incoming call information.

n=0

Disable analog device caller ID delivery

n=1 (default)

Enable analog device caller ID delivery

Note: These parameters are static. They do not take effect until you restart your DIVA T/A.

AT*Dn=v   **Internal Dial Access**.

Controls the internal dial access for supplementary services.

n=1

Analog device 1 (voice on port 1)

n=2

Analog device 2 (voice on port 2)

v=0

Disable internal dial access. This setting is recommended for modem/fax calls.

v=1

Enable internal dial access (default)

Note: These parameters are static. They do not take effect until you restart your DIVA T/A.

Command	Description

AT*Fn   **Analog Device Ring Frequency**.

Specifies the analog device ring frequency. When n=0, the ring frequency is determined by the country/region selected with the AT*Pn command.

- n=0   Ring frequency determined by region (AT*Pn) (default)
- n=1   20 Hz
- n=2   25 Hz
- n=3   40 Hz
- n=4   50 Hz

Note: These parameters are static. They do not take effect until you restart your DIVA T/A.

AT*Kn=v   **Analog Device Calling Features.** Specifies the feature key for analog device calling features.

- n=1   Conference Call
- n=2   Call Transfer
- n=3   Call Drop
- n=5   Message Waiting Indicator

v=Any value in the range 1-16383 (the defaults are: Conference Call=60, Call Transfer=61, Call Drop=62, Message Waiting Indicator=63)

Note: These parameters are static. They do not take effect until you restart your DIVA T/A.

AT*M=v   **Visual Message Indicator Refresh Time**. Specifies how frequently DIVA T/A should refresh the Visual Message Indicator. Setting v=0 disables Visual Message Indicator feature.

Range of v= 1 to 60 (specify the time in minutes)

Default is v=30

It is recommended that this setting not be set to below 30 minutes.

Note: These parameters are static. They do not take effect until you restart your DIVA T/A.

Command	Description

AT*Pn **Analog Device Country Specific Parameters.**

Note: On International/Europe Firmware only.

Specifies the country for which a set of parameters (ring pattern, ring frequency, pulse pattern, and gains) will be implemented.

n=1   International (default)
n=2   United Kingdom
n=3   Belgium
n=4   France
n=5   Germany
n=6   Netherlands
n=7   Spain
n=8   Sweden
n=9   Ireland
n=10   Denmark
n=11   Italy
n=12   Norway
n=13   Switzerland
n=14   Austria
n=15   Cyprus
n=16   Finland
n=17   Greece
n=18   Iceland
n=19   Luxembourg
n=20   Portugal

Note: These parameters are static. They do not take effect until you restart your DIVA T/A.

Command   Description

AT*Rn=v   **Analog Device Alternate Ring.**

Specifies whether normal or distinctive ring is used for analog device 1 or 2.

- n=1   Specifies analog device 1
- n=2   Specifies analog device 2
- v=0   Normal Ring (default)
- v=1   Distinctive Ring

Note: These parameters are static. They do not take effect until you restart your DIVA T/A.

AT*Sn=v   **Disable Analog Device Calling Features.** Specifies whether supplementary service is to be disabled for either analog device 1 or analog device 2

- n=1   Specifies analog device 1
- n=2   Specifies analog device 2
- v=0   Disable. Recommended for modem/fax calls.
- v=1   Enable (default)

Note: These parameters are static. They do not take effect until you restart your DIVA T/A.

AT*Vn=v   **Enable/Disable VoiceMail.** Specifies whether VoiceMail is enabled for a particular analog device port.

n=Analog Device port number (1 or 2)

- v=0   Disable (default)
- v=1   Enable

Notes:

If v=0 is selected and voice mail is detected, DIVA T/A automatically enables VoiceMail.

If the SPID corresponding to an analog device port changes, the parameter will automatically be reset to 0. Also, if the DIVA is reset to factory profile, the parameter is reset to 0.

These parameters are static. They do not take effect until you restart your DIVA T/A.

Monitor Commands

The following commands relate to the monitor.

Note: These commands are only available when you are in monitor mode (type AT$Z to enter monitor mode); they are not available when you are in command mode.

Your Eicon Technology Customer Services representative may ask you to use these commands.

Command	Description
at@dump	Dumping memory using XMODEM
	Note: This command needs a terminal emulation program that supports XMODEM.
at@load	Loading new firmware
	Note: This command needs a terminal emulation program that supports XMODEM or 1K-XMODEM.
at@msg	Display cause for entering the monitor
at@quit	Exit the monitor
at>F	Restores all profiles to the original factory settings. Reverts the powerup profile to number 0.
	Warning: All previous user-defined settings are lost.

AT Command Result Codes

This section describes the result codes (also known as status messages) that are displayed after an AT command is issued.

Result codes are displayed as either word messages (long-form English) or number codes (short-form numeric response). Word messages are preceded and terminated by the sequence < CR > <LF>. Numeric codes are terminated by < CR > only. The Result Code Format command (ATV*n*) determines short- or long-form usage.

The following table describes each AT command result code.

Number Code	Word Message	Description
0	OK	The DIVA T/A has successfully executed your command
1	CONNECT	Connection was made: the range of the result code response is restricted by the X command such that no speed reporting is allowed, or the bitrate is less than or equal to 300 bps
2	RING	Incoming ringing is detected on the line
3	NO CARRIER	- Attempt to establish a connection failed - Connection ended
4	ERROR	- Syntax of command is incorrect - Unable to execute command - Command does not exist - Entered command is outside permitted range
5	CONNECT 1200	Connection made at a bitrate less than or equal to 1200 bps

Number Code	Word Message	Description
6	NO DIALTONE	ISDN not initialized
7	BUSY	Remote user busy
8	NO ANSWER	Remote user not responding
10	CONNECT 2400	Connection made at a bitrate less than or equal to 2400 bps
11	CONNECT 4800	Connection made at a bitrate less than or equal to 4800 bps
12	CONNECT 9600	Connection made at a bitrate less than or equal to 9600 bps
13	CONNECT 7200	Connection made at a bitrate less than or equal to 7200 bps
14	CONNECT 12000	Connection made at a bitrate less than or equal to 12000 bps
15	CONNECT 14400	Connection made at a bitrate less than or equal to 14400 bps
16	CONNECT 19200	Connection made at a bitrate less than or equal to 19200 bps
17	CONNECT 38400	Connection made at a bitrate less than or equal to 38400 bps
18	CONNECT 57600	Connection made at a bitrate less than or equal to 57600 bps

Number Code	Word Message	Description
19	CONNECT 64000	Connection made at a bitrate less than or equal to 64000 bps
20	CONNECT 115200	Connection made at a bitrate less than or equal to 115200 bps
21	CONNECT 230400	Connection made at a bitrate less than or equal to 230400 bps
57	CARRIER 57600	Connection made at a bitrate less than or equal to 57600 bps
59	CARRIER 64000	Connection made at a bitrate less than or equal to 64000 bps
60	CONNECT 128000	Connection made at a bitrate less than or equal to 128000 bps
83	PROTOCOL: V.120	V.120 Rate Adaption Protocol
84	PROTOCOL: V.110	V.110. Rate Adaption Protocol
85	PROTOCOL: PPPC	PPP Protocol
86	PROTOCOL: MLPPP	Multilink PPP Protocol