TABLE OF CONTENTS

1 INTRODUCTION

Welcome to the *Reference Manual*. You should have already read the *Getting Started* manual for information on installing your modem. Now that you are familiar with its basic operations, you are ready to learn more about its advanced capabilities.

HOW TO USE THIS MANUAL

This manual is designed so new users can get information about how their modems perform. Experienced users can get reference material to help them change settings and use the modem's advanced features.

Communication Standards contains detailed information about your modem's data communications capabilities and explains its error correction and data compression features.

Using AT Commands and Result Codes provides detailed instructions on using your modem's **AT** commands to perform tasks.

Dialing discusses modem dialing, and **Answering** continues with specialized answering features.

High-Speed Communication addresses 56K modem technology, along with some of the unique aspects of communicating at high speeds.

Voice Features, **Fax Features**, **and** **Video Features** describe features unique to particular modem models. Your modem may not have all of these features. For a complete list of the features supported by your modem, see **Feature List**.

Your modem and software documentation will help you with technical questions about using your modem. However, if you need further assistance, see **Solving Problems** for tips or **Diamond Technical Support** for contact information.

AT Commands, **S Registers** and **Result Codes** are included, along with a **Glossary** to help guide your study of modem technology.

2 DIAMOND TECHNICAL SUPPORT

This section discusses the following:

If you need help with your modem, first try the suggestions in **Solving Problems**. If you still need assistance after trying those solutions, please contact Technical Support in one of the ways described below.

When you contact Technical Support, make sure you have all of the following information available:

- The results of typing the **ATi3** command in your data communications terminal screen (if possible)
- Your computer model (e.g. Pentium or Power Mac 7600)
- Your modem model (e.g. SupraExpress 56e) and serial number
- The names and version numbers of any software you're using with your modem (e.g. FAXcilitate or FaxTalk)

We offer a wide range of methods for obtaining Technical Support. Our Technical Support department can be reached by telephone, fax, or through many online services including our own BBS.

Fax and online services offer several advantages over calling when contacting Technical Support. For instance, Technical Support can be reached by fax or through online services 24 hours a day, seven days a week. Responses will be sent by the end of the next business day. Also, answers to many of the most often asked questions can be accessed via Fax on Demand or on Diamond Multimedia's forum on CompuServe (GO SUPRA).

If you choose to call us, it is very helpful if you have your computer on and are seated at it when you call.

TECHNICAL SUPPORT INFORMATION

24-hr Recording

The Technical Support Information line plays a recording citing the various Technical Support services and how to reach them.

The Technical Support Information line is available 24 hours a day, seven days a week.

In the U.S. and Canada only call: **(800) 774-4965**
From all other areas call: **(360) 604-1499**

Email

To address a question to Technical Support, email **techsupt@diamondmm.com**.

This is an automated electronic mail response service that allows you to search an index of issues and request the solution via email. The automated service will reply in fewer than ten minutes once the message is sent. You can get answers to the most common questions any time of the day or night.

Online

Online services from Technical Support include an FTP site and a Web page. In these locations you will find help files for setting up a variety of software applications, troubleshooting guides, drivers, shareware utilities relevant to our products, as well as sysop order forms.

Our addresses on the Internet are:

World Wide Web	http://www.diamondmm.com
Technical Support Wizard	http://itvweb.diamondmm.com/vweb/
FTP	ftp://ftp.diamondmm.com

Supra BBS

This service offers help files for setting up a variety of software applications, troubleshooting guides, drivers, shareware utilities relevant to our products, and sysop order forms. See instructions for calling our BBS later in this section.

The telephone number for the Supra BBS is **(541) 967-2444**.

CompuServe

The Diamond Communications Division has its own forum on CompuServe. This forum provides you with answers to technical questions and inquiries about your Communications Division product. You can find specific message sections to help you direct your question to the appropriate area. You can also find a number of libraries that contain valuable information about configurations, updates, product announcements,

troubleshooting guides, utilities, helpful documents, and sysop order forms. A conference room is also available.

Our address on CompuServe is **GO SUPRA.**

Technical Support — Fax on Demand

The telephone number for the Fax on Demand is **(800) 380-0030**.
You can choose to have faxed to you a catalog of frequently asked technical questions as well as other information on Communications Division products. After choosing topics that interest you, you can then use this automated system to have short explanations of these topics faxed to you. Complete instructions are provided when you call. Fax on Demand is available 24 hours a day, seven days a week. A touch tone telephone is required to use this service. All Fax on Demand documents are also available on our web page.

Technical Support — TDD

This service provides immediate access to Technical Support for hearing impaired customers.

The TDD lines for Technical Support are open Monday through Friday, 5 AM to7 PM and Saturday 8 AM to 4 PM Pacific Standard Time, unless noted otherwise.

The TDD number for Technical Support is **(541) 967-2451**.

Technical Support — Telephone

We encourage you to use our online services or fax services to contact Technical Support. Those services provide round-the-clock access to our technicians without running up your long distance bill. If you can't reach us by fax or through any of the online services, please call.

The telephone lines for Technical Support are open Monday through Friday, 5 AM to 7 PM and Saturday 8 AM to 4 PM Pacific Standard Time, unless noted otherwise.

The telephone number for Technical Support is **(541) 967-2450**.

Other Ways to Contact Technical Support and Sales

You can send us a fax with your Technical Support questions or sales orders 24 hours a day, seven days a week. Be sure to include your name and return fax number on all faxes.

The fax number for Technical Support is **(541) 967-2401**.

The fax number for Customer Service is **(408) 325-7408**.

If you want to mail something to us (refer to the next section for modem returns), our mailing address is:

Diamond Multimedia Systems, Inc.
Communications Division
7101 Supra Dr. SW
Albany, OR 97321 USA

If you want more information, our toll free telephone number for Customer Service is **1-(800) 468-5846**. You can find out information about your order through the Internet. Our Internet address for general sales is **sales@supra.com**. Our Internet address for order status is **orders@supra.com**.

Supra Bulletin Board System (BBS)

The service only costs a phone call and is available 24 hours a day.

Connecting to the Supra BBS

To connect to the Supra BBS:

1 The Supra BBS phone number is **(541) 967-2444**.

2 In your telecommunications software (e.g., HyperTerminal or Communicate Lite), set your port speed to 57,600 bps or the speed best supported by your computer and Hardware Flow Control. If necessary, also select 8 data bits, 1 stop bit, and N or none (for no parity).

3 In your telecommunications software terminal mode, issue the AT&F0 command (if you are using a PC) or the AT&F1 command (if you are using a Macintosh). Then use your software to dial the BBS number listed above.

4 Once you have connected, follow the BBS instructions for logging on.

If Your Modem Needs Repair

Do not return any equipment to Diamond for service without first contacting Technical Support and obtaining a Return Merchandise Authorization (RMA) number. We need this number for proper tracking of your repair.

Five Year Limited Warranty

Our Warranty to you:

Diamond Multimedia warrants that for a period of five years from the date of original retail purchase, your products will be free from defects in materials and workmanship. If you discover a defect covered by this warranty, we will repair or replace the product at our option using new or remanufactured components. **Diamond's liability is limited solely to the repair or replacement of the defective product.** This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

How to obtain service under this warranty:

To obtain service under this warranty you must deliver the product and the original sales receipt to the dealer you purchased this product from or to Diamond. If you decide to return the product, you must first call Diamond Technical Support and obtain an RMA as explained in the previous section. You are responsible for paying shipping costs to Diamond.

Product failures not covered by this warranty:

This warranty covers defects in manufacture that arise from correct use in a home or office environment. It does not cover damage caused by abuse, misuse, improper modification or repair, moisture, corrosive environments, shipping, or high voltage surges from external sources such as power line, telephone line, or connected equipment. This warranty also does not apply to any product with an altered or defaced serial number.

Limits of liability:

We are only responsible for the repair of this product. We will not be liable to you or anyone else for any damages that result from the failure of this product or from the breach of any express or implied warranties. These include damage to other equipment, lost data, lost profits, or any consequential, incidental, or punitive damages. **IN NO EVENT WILL DIAMOND BE LIABLE FOR ANY AMOUNT GREATER THAN THE CURRENTLY SUGGESTED RETAIL PRICE OF THIS PRODUCT.** Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

Our legal disclaimer:

THIS WRITTEN WARRANTY REPRESENTS THE ENTIRE WARRANTY AGREEMENT BETWEEN DIAMOND AND YOU. THIS WARRANTY MAY NOT BE ALTERED IN ANY WAY OTHER THAN IN WRITING BY AN OFFICER OF DIAMOND MULTIMEDIA. ANY IMPLIED WARRANTIES THAT MAY EXIST INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE SHALL BE LIMITED IN DURATION TOA PERIOD OF FIVE YEARS FROM ORIGINAL RETAIL PURCHASE. NO WARRANTIES, EITHER EXPRESS OR IMPLIED, WILL APPLY AFTER THIS PERIOD. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

3 COMMUNICATION STANDARDS

This section discusses the following topics:

MODEM COMMUNICATION STANDARDS

The International Telecommunications Union (ITU) is an international organization which establishes world wide standards (also referred to as protocols) for communications devices. Protocols define the basic communication link between two modems – that is, the frequency of tones they use and how they modulate the data.

Since early 1997, all major modem manufacturers have been offering modems that can deliver data at up to a theoretical limit of 56kbps, about twice the speed of widely used 28.8-kpbs modems. But without any technology standard, modems from different manufacturers could not necessarily communicate with each other. V.90 is the new "determined" standard which allows for increased compatibility among high speed modems and between modems and Internet Service Providers.

A unique set of protocols is supported for the U.S. and Canada: Bell 103 (300 bps) and Bell 212A (1200 bps), named for the AT&T Bell Labs that developed them.

Almost everyone uses the ITU V standard protocols: V.21 (300 bps), and V.22 (1200 bps). At connections of 2400 bps and faster, ITU standards are universal (given the necessary line conditions and appropriate equipment support): V.22bis (for 2400 bps); V.32 (for 4800 and 9600 bps); V.32bis (for 4800, 7200, 9600, 12000 and 14400 bps); and V.34 (for 2400, 4800, 7200, 9600, 12000, 14400, 16800, 19200, 24000, 26400, 28800, 31200 and 33600 bps). K56flex is used for 32,000, 34,000, 36,000, 38,000, 40,000, 42,000, 44,000, 46,000, 48,000, 50,000 52,000, 54,000 and 56,000 bps rates.

You will probably use only one set of communication standards, unless you make international calls:.

<mod> Numeric	Protocol	Possible Rates (bps)[1]
0	V.21	300
1	V.22	1200
2	V.22bis	2400 or 1200
3	V.23	1200[2]
9	V.32	9600 or 4800
10	V.32bis	14400, 12000, 9600, 7200, or 4800
11	V.34	33600, 31200, 28800, 26400, 24000, 19200, 16800, 14400, 12000, 9600, 7200, 4800, or 2400
12	V.90	56000, 54667, 54000, 53333, 52000, 50667, 50000, 49333, 48000, 46667, 46000, 45333, 44000, 42667, 42000, 41333, 40000, 38667, 38000, 37333, 36000, 34667, 34000, 33600, 33333, 32000, 31200, 30667, 29333, 28000 (Default)
56	K56flex	56000, 54000, 52000, 50000, 48000, 46000, 44000, 42000, 40000, 38000, 36000, 34000, 32000
64	Bell 103	300
69	Bell 212	1200

[1]See optional <automode>, <minimum rate>, and <maximum rate> parameters.

[2]For V.23, originating modes transmit at 75 bps and receive at 1200 bps; answering modes transmit at 1200 bps and receive at 75 bps. The rate is always specified as 1200 bps.

CONNECTION RATES

How the Modem Determines Connection Speed and Protocol

The modem first tries to connect to the remote modem at the highest rate it supports (56,000 bps). If the remote modem can't connect at your modem's highest rate, your modem tries to connect at the next highest rate (54,000 bps). If that doesn't work, it continues trying the remaining supported speeds, one at a time in descending order. This process is called fall back.

If error correction and data compression are enabled (they are when shipped), the modem next tries to "negotiate" error correction and data compression protocols with the other modem. Your modem tries protocols in the following order: first, error

correction; then data compression, and finally, neither error correction or data compression. The protocols used are the most powerful protocols that both modems support.

Because your modem supports so many rates and protocols, the negotiation process can take several seconds to complete. If it seems to take an extremely long time, you may be having line noise problems.

Once connected, your modem sends your computer a Result Code that tells it the connection rate. Depending on how your software handles the Result Code, you see either the Result Code on your screen, or you see your software's interpretation of it. Also depending upon how the modem is set, the Result Code will show the connection rate between the two modems (DCE), or the rate at which the computer is communicating with the modem (DTE).

Error Correction and Data Compression

Your modem features error correction and data compression protocols that allow you to transmit data fast and error-free.

Error Correction

For error correction, the modem breaks your transmission down into blocks of data (frames) and calculates a checksum (the sum of all data bytes in the block). The block and its checksum are transmitted. The receiving modem calculates a checksum on the received data block and compares it with the received checksum. If these numbers are different, the data block was not transmitted properly, and the receiving modem instructs the transmitting modem to resend the data.

Error correction is necessary for high speed communications. However, error correction will not perform miracles on extremely noisy lines. If you have lots of errors, you may need to have your telephone circuits checked or change long distance carriers.

Data Compression

To accomplish data compression, the sending modem analyzes the outgoing data for often repeated patterns (such as the letters "A" and "E" in English text). It then assigns a shorter data code that transmits faster than the original data. The more often the same data code occurs in the transmission, the better compression the modem can achieve.

Certain file types such as text files and graphics screens are good candidates for optimal compression. Files that have already been compressed with a program like Stuffit, PKZIP, or ARC may see little or no performance improvement, because the files are already compressed.

Error Correction and Data Compression Standards

The error correction and data compression standards your modem supports include MNP 2-4 and V.42 for error correction, and MNP 5 and V.42bis for data compression. MNP 5 offers a compression rate of up to 2:1. MNP 5 connections also use MNP error correction.

V.42 is the ITU error correction protocol, also known as LAPM. V.42bis adds BTLZ data compression to the V.42 protocol. It offers compression of up to 4:1. V.42bis connections require V.42 error correction.

Both your modem and the remote modem must support the same data compression/ error correction standards if they are to make a data compressing/error correcting connection.

Using ZModem, XModem, or Pre-Compressed Files

Error Correction:
It is usually advantageous to use MNP 2-4 or V.42 error correction for ANY file transfer, regardless of compression or software-based error correction standards such as Zmodem, Xmodem, etc. The error correction standard strips start and stop bits from each character (to improve throughput) and performs error correction on smaller chunks of data than software-based error correction standards. Thus if an error does occur, less data has to be retransmitted, which takes less time.

V.42bis Data Compression (Mode Default)
V.42bis recognizes that there is no benefit to compressing software-compressed data further, so it does not attempt to use V.42bis compression if no additional compression is possible. Use V.42bis rather than MNP 5 whenever possible to receive these benefits.

For better performance, disable MNP 5 data compression (**%C**) when using an MNP Reliable connection and transferring files that are already compressed by compression software such as ARC, .ZIP, or StuffIt. When files compressed by these programs are transferred using MNP 5, the files may take longer to transfer than files transferred using a Reliable connection and no data compression.

The default settings in your modem require the modem first attempt to establish a V.42/ V.42bis connection, and only attempt an MNP connection if the V.42/V.42bis connection is not possible.

Connection Types

All Normal and Reliable connections use flow control, which allows your computer and modem rates to be different. With Direct connections, the rates must be the same.

You can only use data compression if you have made an error-correcting connection (MNP or LAPM) with another modem that supports data compression. MNP 5 is only used with MNP error correction, and BTLZ is only used with LAPM error correction. If a data compression connection cannot be made, or if data compression has been disabled, only error correction is attempted.

The commands for controlling connections (not to be used during an active connection) are listed in AT Commands, under **AT\N** and **AT&Qn.**

4 Using AT Commands and Result Codes

This section discusses the following topics:

When you use your telecommunications software to perform a task (such as dialing a phone number), it uses the modem's AT commands to perform the task. It is usually easier to let your telecommunications software issue the commands for you than it is to issue the AT commands yourself.

However, when your telecommunications software can not perform a task (or you don't want it to), you can issue the AT commands yourself. These commands can be used to perform various tasks, such as hanging up or changing your modem's speaker volume.

Several sections in this manual explain how to use the AT commands to accomplish specific tasks. This section explains how the AT commands work. The commands are listed in AT Commands.

Issuing AT Commands

To issue AT commands, you must be in your software's terminal mode — also called "local mode" or "command mode." In this mode, the commands you type go to the modem rather than to your software or to the remote computer.

Some software uses terminal mode as soon as you start the program. To determine if you are in terminal mode, type:

AT [CR]
([CR] represents a carriage return.)

If the modem responds with **OK**, it means that the modem has received and understood the command. You are in terminal mode and ready to issue AT commands. If you are not in terminal mode, refer to your software manual to determine how to get there.

COMMAND STATE AND ONLINE STATE

The modem operates in either command or online state:

- When you first turn your computer on, the modem is in command state. It must be in command state to receive AT commands.
- When your modem connects to another modem, it automatically changes to the online state. Your modem must be in the online state for data to be transmitted.

If you're connected to a network, Bulletin Board System or other remote computer (i.e., you're online) you can transmit data, but you must change to command state to send AT commands.

To change from one state to the other, use one of the following methods.

- To change from online to command state, type the escape code (+++) as explained in the next section.
- To change from command state to online state, issue the command **ATO** (go back on-line), **ATA** (answer a call), or **ATD** (dial a number). Command Line Syntax is discussed in this chapter. The AT commands are listed in Appendix B.

ESCAPE CODE

The escape code may be used while you are online to force the modem to the command state without hanging up.

The escape code is a string of three ASCII plus signs (+++) preceded and followed by a one-second "guard time" during which your hands must be off the keyboard. Do not transmit data for at least one second. To issue the escape code when online, do the following:

1 Hands off keyboard. Do not transmit any data for a period equal to the guard time. (The default setting for the guard time is one second.)

2 Type +++ quickly. DO NOT press Carriage Return[CR] or Enter when you finish.

3 Hands off again. Do not transmit any data for another period of time equal to the guard time.

The modem responds to these steps with **OK** (or Ø if in numeric result code mode). If it doesn't, either it received data during the guard time or the escape code was typed too slowly. The time between each plus sign ("+") in the escape code should not exceed the guard time.

The plus signs in the escape code can be changed to another ASCII character by changing the value in Register S2. S Registers contains more information on setting S Registers.

Command Line Syntax

The prefix AT ("ATtention") must start each command line except A/. The modem examines the AT code to determine your computer's serial port rate, parity, word length, and number of stop bits. It then stores your current configuration in its memory.

Most multiple commands can appear on one command line. You can separate these with spaces to improve readability if you like. (The modem ignores the spaces.)

Each command line (except A/) must end with a Carriage Return [CR]. The command is not acted upon until the [CR] key is pressed. The following are valid examples:

AT DT 555-5055 [CR] (Dial a touch tone phone number.)

ATH [CR] (Hang up.)

AT &F &C1 &D2 &W [CR] (Configure modem to the following and store it to memory.)

A/ (Re-execute last command.)

Commands are executed in order, from left to right. If a command contradicts an earlier command, the later command takes precedence.

Command Forms

The International Telecommunications Union (ITU) has made an effort to standardize the AT command set for modems. Some of the resulting command forms are:

- Single character commands (ATA)
- Simple extended commands with no parameters. These commands perform an action or print reports (+GCAP)
- Complex extended commands with parameters (AT+MS)

The complex extended commands also have three forms. These forms allow you to:

- Change the current settings of the extended command (AT+[cmd]=<parameters>)
- View the current settings for an extended command (AT+[cmd]?)
- View the range for the command's parameters (AT+[cmd]=?)

Command Line Buffer

The modem places each command issued into a command buffer that holds up to 160 characters. The modem does not place the AT, carriage return, or line feed characters into the buffer, so the buffer's 160 spaces only hold actual command characters (and any spaces between them). If a command line contains more than 160 characters, the modem stops showing what you type on the screen and it ignores further commands.

Result Codes

After the modem receives a command, it returns a result code. The most common result code is **OK**, which means the modem understood your command.

Result codes can be represented by English words (verbose mode) or with numbers (numeric mode). The Result Code command **ATV** tells the modem whether to respond with verbose or numeric result codes. Words are preceded and followed by a carriage return and line feed characters. Numbers are followed by a carriage return.

For more information, refer to the Result Codes list.

5 DIALING

This section discusses the following topics:

Most of the time you will use your fax or data software to dial numbers, and you will not need the information in this section. However, should you need to direct your software or do a custom set-up, this section provides guidance.

Refer to your software documentation for instructions on using your software to dial numbers and answer calls.

USING THE DIAL COMMAND

Your modem dials phone numbers when you give it the dial command (**ATD**) and a phone number, either alone or with dial modifiers.

For pulse dial lines, the phone number must be an ASCII string containing the numbers Ø through 9. For touch tone dial lines, the phone number must be an ASCII string containing the numbers Ø through 9 and the characters A, B, C, D, #, and *. The telephone number cannot exceed the size of the command buffer (160 characters excluding the AT prefix, the carriage return control character, and the line feed control character).

The modem uses the dial command modifiers (listed below) in the order it encounters them on the command line, from left to right.

Command Modifier	Command Definition
- **( )**	To aid readability, spaces, hyphens and parentheses can be used in the command line without affecting its function.
0-9	Use the DTMF code for the given number.
A-D	Use the DTMF code for the given letter
J	Perform MNP10 link negotiation at 1200 bps (for current call only).
L	Dial last string dialed.

Command Modifier	Command Definition
P	Pulse dial the following digits. (Some country codes may not allow this command after the first digit.)
S*n*	Use dialing string stored in register *n* (Ø to 3).
T	Tone dial the following digits. (Some country codes may not allow this command after the first digit.)
W	Wait for dial tone before processing the next character in the dial string (useful for PBX phone systems), within the time set in S6 and/or S7.
*	Use the DTMF code for "star".
#	Use the DTMF code for "gate".
&	Wait for "bong" Credit Card billing tone (same as $).
$	Wait for "bong" Credit Card billing tone (same as &).
@	Wait for five seconds of silence before continuing.
,	Pause for time specified in S Register 8 before processing the next character in dial string.
!	Hook flash (time specified by S29).
^	(Indicates a data connection.) Call originating pulse toggle. If it is normally on in your country setting, it toggles OFF; if it is normally off, then the tone is toggled ON (as in the case of the US country setting).
;	Return to command state after dialing without going "on-hook" (must be last character in the command line).

In the following command string example, your modem goes off-hook, waits for a dial tone, and then touch tone dials the number 1-405-555-9624.

AT DT 1 (405) 555-9624 [CR]

If your modem does not receive a valid carrier from the remote modem within 50 seconds (the default value of register S7), your modem hangs up and sends the **NO CARRIER** Result Code (or **3** if in numeric mode). If the modem does receive a valid carrier within the time allowed, it sends a **CONNECT XXXX** message indicating a connection has been made.

Automatic Pulse Dialing

If your local telephone system does not support touch tone dialing, the way your modem acts depends on how it is configured.

If your dial string includes the **P** dial command modifier or you have previously issued the **P** command, the modem will pulse dial.

If your dial string includes the **T** dial command modifier or you have previously issued the **T** command, the modem will tone dial.

If your dial string does not include a **P** or **T** dial command modifier and you have previously issued the **T** command, the modem does the following:

1 Listens for dial tone. (Note that changing the **x** command from its default can affect this step.)

2 Tone dials the first digit in the dial string.

3 Waits up to 3 seconds for the dial tone to end.

4 If the dial tone ends, the modem continues dialing.

   If the dial tone does not end, the modem knows your phone system can only handle pulse dialing (because the phone system did not process the tone-dialed first digit). So it switches to pulse mode, pulse dials the first digit, and then pulse dials the rest of the number.

Note that this mode can cause problems with PBX systems — for example, systems where a 9 is dialed to get a dial tone outside a company's in-house phone system. Such systems deliver a second dial tone after receiving the first digit.

With PBX and similar systems, include the **T** or **P** command in the dial string.

Disabling Call Waiting

If you have Call Waiting, we recommend that you disable it before using your modem. If you don't disable it and a call comes in while you are online, you may either lose data or be disconnected. Please refer to your local telephone book or phone company for directions on how to do this. In many locations, you can disable call waiting by placing ***71** or ***70** (followed by a comma to pause the dialing command for two seconds) in the dial string, either just before or after the number you are dialing. For example, you might use:

AT DT *71, 555-0000 [CR]

Call Waiting usually resumes immediately after you hang up, so you have to do this on each call. If your software has a built-in dialing prefix (or macro) you can probably include this code so it is used on every call.

6 ANSWERING

This section discusses the following topics:

Your modem can answer telephone calls and (with help from your data or fax software) manage those calls appropriately. Under certain conditions, the modem can also tell you who is calling before the call is answered.

Your fax and data software should be able to handle most answering tasks. This section discusses the answering process and explains the basic techniques for answering incoming telephone calls. This should help you set up your software and modem for optimal performance. For more information on your software, refer to your software manuals.

ANSWERING CALLS

Your modem provides two ways to answer calls:

- You issue the **ATA** command (in terminal mode) when you detect an incoming call. This makes the modem answer the call immediately. The modem goes online when it detects a carrier.
- You set your modem to auto answer. In this case, your modem automatically answers all incoming calls. The rest of this section explains how to use auto answer.

Your modem answers calls automatically (auto answer) if you set register **SØ** to a value from 1 to 255. This value is the number of rings the modem waits before it answers the call. (If you have Caller ID, you need to add a ring. Refer to the Caller ID section.) The following example sets the modem to answer calls after the second ring:

AT SØ=2 [CR]

If you set the modem to auto answer and your modem shares a line with a telephone, the modem may answer calls before you can intercept it. Be careful with auto answer unless you have a dedicated modem phone line. By default, auto answer is disabled.

If you plan to use your modem to run a Bulletin Board System (BBS), the BBS software should automatically configure it for auto answer operation. If you think that you need

to change it, refer to your BBS software manual or contact the BBS software publisher for details on how your modem should be set.

CALLER ID

See "Feature List" to determine if your modem supports Caller ID.

What is Caller ID?

If you sign up for this service with your phone company, Caller ID allows you to find out who is calling before you answer a telephone call. The phone company sends the following information in between the first and the second rings of an incoming call. (This is why the ring count is off by one ring.)

- the date and time of the call
- the phone number from which the call originated
- possibly a name associated with that phone number

The information displayed varies depending on your phone company and your software.

Potential Applications

Caller ID can be used by many computer applications for improved security, efficiency, and convenience. Here are a few of the potential applications:

- Bulletin Board Systems (BBSs)

  A BBS can positively identify callers without the normal tedious logon sequences, and prevent unauthorized entry due to lost or stolen accounts and passwords.

- Screening Calls

  Your computer can display the number and possibly name of who is calling, so you can decide if you want to answer or not.

- Professional billing

  Your computer can match incoming calls to your client list and automatically create a charge to the client's account for your phone time.

- Database Lookup

  Your customer's record or account can be displayed on your computer screen before you answer the call.

Your ability to take advantage of these applications (and others) depends on your software.

Can You Use Caller ID?

To use the modem's Caller ID feature:

- Your local telephone company MUST provide Caller ID (in single page format), and it must be enabled for your telephone line.

Caller ID is not available in all areas. If your phone company does not offer Caller ID, you cannot use your modem's Caller ID feature. To find out if Caller ID is available, contact your local telephone company.

- You MUST have software that allows you to use Caller ID.

  The "Software Options" section in this chapter explains software requirements.

- Your modem's Caller ID feature must be turned on.

  The "Caller ID AT Commands" section in this chapter provides more information.

  Your modem should be set to answer calls no earlier than the second ring. Caller ID information is sent by the phone company between the first and second ring.

Software Options

The degree to which you can take advantage of Caller ID depends on your software:

- Incoming Data Calls

  Most people use software to take advantage of Caller ID. If configured to do so, when the modem receives an incoming call, it displays the call information in the software's terminal mode screen. After reading the information displayed, you can either let your modem answer the call or you can answer the call yourself using a telephone handset. The "How to Use Caller ID with Telecommunications Software" section in this chapter provides more information.

- Incoming Fax Calls

  To use the Caller ID feature with incoming fax calls, your fax software must support Caller ID. Refer to your fax software manual to learn how to use this feature.

- Additional Applications

  Many widely used BBS programs now support Caller ID.

Caller ID AT Commands

The following **AT** commands enable and disable Caller ID:

#CID? Displays current Caller ID mode (0-2).

#CID=Ø Disables Caller ID.

#CID=1 Enables Caller ID in a readable format.

#CID=2 Enables Caller ID as ASCII printable characters in hex format.

#CID=? Returns Caller ID Modes supported.

How to use Caller ID with Telecommunications Software

As with any **AT** data commands, you can issue the Caller ID commands from your telecommunications software terminal mode, or include them in your software's initialization string. Other software that supports Caller ID will probably issue these commands automatically.

The following steps explain how to use telecommunications software to take advantage of Caller ID.

1 Read the "Can You Use Caller ID?" section in this chapter.

2 Start your telecommunications software and make sure it is in terminal mode.

3 Configure your modem for Caller ID by typing the following commands in your software's terminal mode. As an alternative, you can include the commands in your telecom software's init string. [CR] represents a carriage return.

   a. Enable the modem's Caller ID feature.

   AT #CID=1 [CR]

   b. Make sure no other devices (such as your modem, answering machine, or fax machine) answer before the second ring. You do not need to have your modem in auto answer mode for Caller ID to work. For example, you can set your modem to answer on the third or later ring, as shown below. (The phone company sends the Caller ID information between the first and second ring of an incoming call.)

   AT SØ=3 [CR]

   c. If your modem has NVRAM, you can skip Step 3 by issuing the following command to save the above commands in your modem's nonvolatile memory.

   AT &WØ [CR]

4 Now the modem is ready to receive an incoming call. When a call comes in, the telecom software's terminal mode screen reflects the modem's activity.

   It looks similar to the following:

   RING
   DATE = 0321
   TIME = 1405
   NMBR = 5039672400
   NAME = ANYCOMPANY
   RING

   Here is an explanation of the display:

   - The first **RING** result code appears when the modem receives the first ring signal (equivalent to a telephone ringing once).

   - The next four lines represent the Caller ID information, which the phone company sends between the first and second ring of an incoming call.

   The actual information displayed varies depending on your phone company. For example, the date and time may be displayed in different locations, and the name might not be included. Also, some extraneous characters might be included. For

example, in parts of Canada, in place of single spaces the number "30" is displayed. This is due to the use of a different Caller ID format.

5 If you recognize the phone number or name displayed in Step 4, you may be able to determine if the call is voice or data.

6 Now do one of the following:

- If the call is from a person (a "voice call"), pick up the telephone handset and answer the call yourself.
- If the call is from another modem (a "data call"), let your modem answer the call automatically. If the modem answers the call, you then see a **CONNECT** result code (or whatever message your software displays upon receiving a **CONNECT** Result Code).

DISTINCTIVE RING

What is Distinctive Ring?

Distinctive Ring is a service offered by most U.S. telephone companies under a variety of names. When you sign up for Distinctive Ring service, you get multiple phone numbers that all ring on your one telephone line. The only difference is the ring pattern. For more information on this service, contact your local telephone company. Not all modems support the Distinctive Ring feature. To determine if your modem supports Distinctive Ring, see "Feature List".

Setting up Distinctive Ring

1 Determine which ring patterns you want your modem to recognize. Your modem recognizes three ring patterns. You can set your modem to answer calls with one, two or all three patterns. Most people use only two patterns, but all three are described here.

The command used by your modem to configure Distinctive Ring is **AT-SDR**. The default setting is **-SDR=Ø** for a normal ring pattern (and Ring response in a terminal program). This is a single ringing tone which lasts for about two seconds followed by about four seconds of silence before the next ringing tone. The commands **AT&F** or **AT&F1** also set the modem to **-SDR=Ø**. (The settings **-SDR=Ø** and **-SDR=1** are functionally the same, resulting in a Ring and Ring 1 response respectively in a terminal program).

Issue the command **AT-SDR=2** to tell your modem to recognize a double ring pattern where there is a short ring tone (0.8 seconds) followed by a very short period of silence (0.4 seconds) followed by another short ring tone (0.8 seconds). (This results in a Ring 2 response in a terminal program.) The modem will ignore the single ring pattern.

Issue the command **AT-SDR=4** to tell your modem to recognize a triple ring pattern (results in a Ring 3 response in terminal program).

By adding together the decimal values for the patterns you want your modem to recognize, you can set **-SDR** to any of the following values: 0, 1, 2, 3, 4, 5, 6 or 7.

For example, if you want your modem to recognize a normal ring pattern (2-second ring, 4-second silence, 2-second ring, etc.) AND a triple ring pattern (0.4-second ring, 0.2-second silence, 0.4-second ring, 0.2-second silence, 0.8-second ring, 0.4-second silence, etc.), you would add the appropriate values from the table below:

	AT-SDR=
Single ring (normal)	1 or Ø
Two short rings	2
Two short and one long ring (triple)	4

In the example above, you would add the value for regular ringing (1) and two short/one long ring (4), to get a result of 5. So to get your desired result, you would add **AT-SDR=5** to your modem software.

2 Configure your modem with the new command. Add the **AT-SDR=5** command to the modem initialization string of the software that you have configured to answer calls. The modem will pick up on one ring or three rings, but not on two rings.

For example, if you are using FAXcilitate fax software on a Mac OS computer, and you want to have your modem recognize only the double ring pattern, then you need to modify the modem init string to include **AT-SDR=2VE**.

7 High-Speed Communication

This section addresses some of the issues that you should be aware of as you work with modems that communicate at speeds of 33,600 bps and above.

This section discusses the following topics:

56K Modem Technology and V.90

Since early 1997, all major modem manufacturers have been offering modems that can deliver data at up to a theoretical limit of 56kbps, about twice the speed of widely used 28.8-kpbs modems. But without any technology standard, modems from different manufacturers could not necessarily communicate with each other. V.90 is the new "determined" standard whichallows for increased compatibility among high speed modems and between modems and Internet Service Providers.

Current analog modems allow for a maximum data connection of 33,600 bps between two modems or a single modem and an Internet Service Provider (ISP). The maximum theoretical transmission rate across the Public Switched Telephone Network (PSTN) is roughly 35,000 bps.

This normal data transmission rate described by Shannon's Law calculates the fastest speeds at which data can flow across the twisted pair of copper wires between two analog sites. Your ISP is connected to the phone company Central Office which converts the signals from analog to digital upon receipt. This digital signal is transmitted through the PSTN to the Central Office located near you. Then it is converted once again from digital to analog and delivered to your home or office.

Recently, phone companies have begun to deliver a digital line (in the form of a T-1, equivalent to 48 voice lines) from their Central Office to the ISP. By upgrading ISP dial-up modems with a digital connection to a T-1 line, one less analog to digital conversion is made between the ISP and their Central office. This reduces the amount of error

introduced into the transmission, and provides for data rates up to 56,000 bps delivered to homes and offices from an ISP over standard copper twisted-pair lines.

56 Kbps Asymmetric Data Rates

Your 56K modem uses asymmetric data rates; the send and receive speeds differ. While your modem is capable of *receiving* at a rate of 56,000 bps, the send rate is 33,600 bps or lower.

56 Kbps Requirements

For you to achieve 56 Kbps performance from your modem, your ISP must have these items in place:

- a connection to *their* phone company using a digital link (i.e., a T-1 line)
- a modem rack which uses K56 flex technology (as listed by Rockwell).

33,600 bps Connections

Your modem supports 33,600 bps connections with modems from many different manufacturers. However, it may be unrealistic to expect that you will always be able to achieve full 33,600 bps data speeds every time you connect with another 33.6 Kbps modem. Line conditions, serial port speed and other factors impact actual connection speeds.

Unlike earlier modems, 33,600 bps modems are designed to modify their actual transmission speeds during a data connection; so a minor difference in the phone line can have a significant impact on the connection. For example, during one attempt to make a connection, you might connect at only 24,000 bps while a later call on the same lines and to the same modem may result in a 33,600 bps connection.

One reason for such variable results is that speeds of 33,600 bps are higher than normal analog phone lines were designed to handle. Data communications of 33,600 bps are best achieved when the phone lines between the two modems are of high quality and are free of limiting factors such as line noise.

Another factor to keep in mind when you are attempting high speed communication is the modem on the other end of your connection. While all 33.6 Kbps modems use the same core technology, not all of them may be as capable as yours. If you are unable to achieve the top data speeds, it may be that the modem to which you are connecting is adjusting the speed down because it is unable to communicate at top speed.

The slowdown may also be because the computer at the other end of the connection is not capable of the highest speeds.

Problem issues such as serial port speed, slow downloads, multitasking, and line noise are discussed in Solving Problems.

Asymmetric Data Rates

A connection where the carrier rates can be different in each direction is referred to as “Asymmetric.” Many K56flex and V.34 modems have the ability to use the “best match”

carrier rate in each direction. Thus the modem can use the highest possible stable carrier rate in each direction, rather than using the lower stable rate for both directions. Each modem is responsible for negotiating for the fastest speed at which it can receive data, given current line conditions.

Your modem provides for the use of asymmetric data rates, so the send and receive speeds may be different. If the conditions in one direction do not match those in the other direction, your modem will adjust its operation to achieve the best rate in each direction. The modem will attempt to establish the fastest stable carrier rate(s) possible for the current phone line conditions. Without asymmetric rates, problems with the modem or the line quality on either side will affect the performance in *both* directions.

Selecting a Modulation to Control High Speed Connections

If your modem uses the V.34 or K56flex protocol, you can display and control the modulation your modem uses to negotiate a connection by entering the **AT+MS** command.

Displaying Supported Values

A variation of the **AT+MS** command allows you to display supported values and selected values. Issue **AT+MS=?[CR]** to display the values supported by your modem. The modem displays a list of values in the following order:

[supported <mod> values], [supported <automode> values],
[supported <minimum rate> values], [supported <maximum rate> values]

The modem response might look like this:

+MS: (V21, V22, V22B, V23C, V32, V32B, V34, K56, B103, B212), (Ø, 1), (300 - 56000), (300 - 56000) (Ø, 1)

Setting Values with the AT+MS Command

The **AT+MS** command allows you to select a specific modulation, enable or disable automode, and specify the highest and lowest connection rates for your modem.

The command format for **AT+MS** is:

AT+MS = <mod>,<automode>,<min rate>,<max rate> [CR]

For example, to set your modem to operate as a V.32bis modem, enter:

AT+MS = V32b,1,9600,14400[CR]

You can leave a parameter at its current value by leaving that parameter's place blank and entering a comma to separate the parameters or by entering a carriage return ([**CR**]) if it is the last parameter.

For example, to change the selected modulation from the setting shown above (**AT+MS=V32b,1,9600,14400**) to a Default mode of full V34, VFC, V32bis, V22bis, Bell 212, and Bell 103, enter:

AT+MS=V34,,300,[CR]

Displaying Selected Values

You can use **AT+MS?** to display the values you selected with the **AT+MS** command. The modem displays the selected values in the following order:

<mod>,<automode>,<min rate>,<max rate>

For example, if you enter **AT+MS?[CR]**, your modem might display **+MS: K56,1,300,56000,0,0**.

This display means that the values currently selected on your modem are V.34 with automode enabled. The minimum rate is set at 300 bps, and the maximum rate is set at 56,000 bps.

The <mod> Parameter

To specify a preferred modulation, enter the "Verbose" modulation setting from the <mod> column of the following table.

<mod> Numeric	<mod> Verbose	Protocol	Possible Rates (bps)[1]
0	V21	V.21	300
1	V22	V.22	1200
2	V22B	V.22bis	2400 or 1200
3	V23C	V.23	1200[2]
9	V32	V.32	9600 or 4800
10	V32B	V.32bis	14400, 12000, 9600, 7200, or 4800
11	V34	V.34	33600, 31200, 28800, 26400, 24000, 19200, 16800, 14400, 12000, 9600, 7200, 4800, or 2400
12	V90	V.90	56000, 54667, 54000, 53333, 52000, 50667, 50000, 49333, 48000, 46667, 46000, 45333, 44000, 42667, 42000, 41333, 40000, 38667, 38000, 37333, 36000, 34667, 34000, 33600, 33333, 32000, 31200, 30667, 29333, 28000 (Default)
56	K56	K56flex	56000, 54000, 52000, 50000, 48000, 46000, 44000, 42000, 40000, 38000, 36000, 34000, 32000
64	B103	Bell 103	300
69	B212	Bell 212	1200

<mod> Numeric	<mod> Verbose	Protocol	Possible Rates (bps)[1]

[1]See optional <automode>, <minimum rate>, and <maximum rate> parameters.

[2]For V.23, originating modes transmit at 75 bps and receive at 1200 bps; answering modes transmit at 1200 bps and receive at 75 bps. The rate is always specified as 1200 bps.

The modem accepts either numeric or verbose selections, but reports only in the verbose mode.

The <automode> Parameter

The <automode> (automatic modulation negotiation) parameter is an optional numeric value that enables or disables automatic modulation negotiation. There are modulations for which automatic negotiation is not available, such as Bell 212.

The default value, 1, enables automode. This allows the modem to "fall back" to other protocols within the specified <minimum rate> and <maximum rate> range for which standard automode procedures exist. For example, failed V.34 connection attempts can automode to other protocols, but a Bell 103 connection attempt cannot automode to V.23.

The following table displays the available automode options:

<automode>	Option Selected	Notes
0	Automode disabled	
1	Automode enabled using V.8 or V.32bis Annex A	Default

Setting <automode>

If you set <automode> to 1, and you are using the default settings, your modem attempts to connect at the highest possible rate and protocol using either V.8 or V.32bis Annex A. If your modem cannot make a connection at that speed, it automatically negotiates the rate downward until a connection is made. For example, if you issue the command AT+MS=V32B,1,1200,14400 the modem starts negotiating the rate downward from V.32bis 14400 bps if a connection is not made.

If you set <automode> to zero, and if a V.32bis connection cannot be made, the modem will not try a V.22bis connection. For example, if you give the command AT+MS= V32,0,1200,4800 the modem will try all speeds of V.32, but will not try the next lower protocol (i.e. V.22bis 2400 bps.)

The <minimum rate> Parameter

The <minimum rate> is an optional number that specifies the lowest rate at which the modem may establish a connection. The default is 300 bps.

The <maximum rate> Parameter

The <maximum rate> is an optional number that specifies the highest rate at which the modem may establish a connection. The default is 56,00 bps.

NOTE – Minimum and maximum rates are based on the <mod> parameter. If you issue **+MS=V32,1,300,33600** the maximum rate at which you can actually connect is 9600, as shown in the "Possible Rates" column in the previous <mod> Parameter table.

The <x-law> Parameter

The <x-law> is an optional number which specifies the codec type. The options are:
Ø = u -Law
1 = A-Law
Note that **ATZ** will reset the <x_Law> selection to Ø (u-Law).

The <rb-signaling> Parameter

The <rb_signaling> is an optional number which enables or disables "robbed bit" signaling generation in a server modem or enables or disables robbed bit signaling detection in a client modem. The options are:

Ø = Robbed bit signaling generation (server modem) or detection (client modem) disabled (default)
1 = Robbed bit signaling generation (server modem) or detection (client modem) enabled

Note that **ATZ** will reset the <rb_signaling> selection to Ø (disabled).

Factors that Affect the AT+MS Stored Settings

The **AT+MS** command has one active setting and one stored setting. It is possible to inadvertently change the stored setting of **AT+MS.** If **AT+MS's** maximum speed is changed, it remains at the lower rate until you reset it.

If you drop your DTE rate to a slow rate, as long as you do not issue an **AT&W** at the slower setting, you need only to issue an **ATZ** after increasing the DTE rate again to reset the maximum speed.

Hardware Flow Control

Hardware Handshaking Cable for Flow Control on External Modems

To communicate at high speeds using external modems, it is CRITICAL that you use a cable with "RTS/CTS Hardware Handshaking" (such as the one supplied with your modem). With error correction and data compression, the modem can send data to the computer faster than the computer can accept it. When this happens, the computer tells the modem to slow down. Similarly, if data is not sent correctly to the modem and needs to be resent, the modem needs to be able to tell the computer to wait. This is called "flow control" or "handshaking" and helps to prevent data from being lost.

How to Get a Hardware Handshaking Cable

If your modem didn't come with a cable or you've lost your cable, your local dealer should be able to provide you with one that supports hardware handshaking. When you ask for a new cable, be careful to specify that it needs to support hardware handshaking. If your modem came with a cable, it supports hardware handshaking.

Using Hardware or Software Flow Control

Enable hardware (RTS/CTS) flow control rather than software (XON/XOFF) flow control because the results are generally faster and more reliable.

To enable hardware flow control:

1 Use a hardware handshaking cable.

2 Use your software to turn ON hardware (RTS/CTS) flow control. This should automatically turn OFF software (XON/XOFF) flow control, but you may need to use your software to manually turn off software (XON/XOFF) flow control.

3 Issue the **&K3** command to turn ON hardware flow control in the modem.(This is the default; both **&FØ** and **&F1** include **&K3**.)

4 Issue the **&W** command to save the setting.

8 VOICE FEATURES

This section applies only to products with voice capabilities. It includes the following topics:

VOICE COMMANDS

The following AT commands are used to control your modem's voice capabilities. As with other AT commands, three command forms are available. You can use these forms to:

- View the range for the command's parameters (**AT+[cmd]=?**)
- View the current settings (**AT+[cmd]?**)
- Change the current settings (**AT+[cmd]**=<parameters>)

#CLS Data, Fax or Voice/Audio Select

The **AT#CLS=***x* command selects data, fax, or voice/audio. The *x* parameter selects the mode.

x	Mode/Notes
Ø	Data mode. Similar to +FCLASS=Ø. Also used during a disconnect or inactivity timeout to ensure that the modem is in a known state despite disorderly DTE behavior.
1	Class 1 fax mode. Similar to +FCLASS=1. Instructs the modem to be a Class 1 faxmodem. Once this is set, the +FAE or the +FAA command can be used to force Class 1 adaptive answers.
2	Class 2 fax mode. Instructs the modem to be a Class 2 faxmodem. Once this is set, the +FAA command can be used to force Class 2 adaptive answers.
8	Voice/Audio mode. This is the main setting the DTE uses to effect directed or adaptive answer or originate sequences involving voice modes. All telephone calls initialized by #CLS=8 result (after answer or successful call progress) in the modem entering Online Voice Command Mode.

#VLS Voice Line Select

The #VLS command selects which devices are routed through the modem.

AT Command	Notes
#VLS?	Returns the current setting of the #VLS command as an ASCII decimal value in result code format.
#VLS=?	Requests a report of the device types available.
#VLS=Ø	(Default.) Telephone line with telephone handset.
#VLS=5	Headset.
#VLS=6	Speakerphone.

#VRN Ringback Never Came Timer

The #VRN command is used when originating a voice/audio call (AT#CLS=8) to set the "Ringback Never Came" timer value, i.e., an amount of time (in units of 100 ms) measured from the completion of dialing. If ringback is not detected within this period, the modem assumes the remote has picked up the line and switches to Online Voice Command Mode.

The format for #VRN is: **AT#VRN=*n***

AT Command	Notes
#VRN?	Returns the current setting of the #VRN command as an ASCII decimal value in result code format.
#VRN=Ø	Turns off the Ringback Never Came Timer. After dialing, the modem sends VCON and immediately enters Online Voice Command Mode.
#VRN=*n*	Where *n* defines the time period without ringback after dialing in 100 ms units.

Half Duplex/Full Duplex Audio

You can use your modem as a speakerphone if you have speakerphone support, and you have installed speakers and a microphone. This allows you to conduct hands free two-way dialing and speaking. Using your headset, you can dial and converse without taking your hands from the keyboard. Using speakerphone, you can place a call and listen to its progress without lifting the telephone handset and holding it to your ear -- useful for long waits on Hold. To determine if you have speakerphone support, see "Feature List".

Voice Messaging

You can use your modem as an answering machine after you install the voice software that was shipped with your modem. Depending upon your modem model, you can record and play back messages using the telephone handset or using the microphone and speakers. Refer to the **AT#VLS** command.

NOTE – For the highest sound quality, you should select powered speakers with a high input impedance to use with your modem. The source impedance should be greater than 1K ohms, and the output rated at .8VRMs. If a speaker with lower source impedance is used, the modem's ability to connect with other modems may be compromised.

Speakerphone and Telephone Answering Device Features

Your modem also supports use of a Telephone Answering Device (TAD). Refer to the **AT#VLS** command, and consult your TAD manual for specific instructions.

9 Fax Features

This section discusses the following topics:

ITU Standards for Group 3

The International Telecommunications Union (ITU) is an international standards committee. Their world wide communication standards (also known as protocols) make it possible for devices such as fax machines and faxmodems to communicate with each other.

Group 3 specifies image resolution, complex data compression, and other features such as connection rates. The majority of fax devices in use today support Group 3.

Group 3 includes three ITU-T protocols that allow fax communication at specific connection rates: V.17, V.29, and V.27ter. V.17 defines communication at various speeds up to a maximum of 14,400 bps. V.29 defines speeds up to 9600 bps, and V.27ter defines speeds up to 4800 bps. Most fax machines today communicate at 9600 bps, technological advances and the proliferation of faxmodems supporting V.17 has made 14,400 bps fax connections more common.

A connection begins when your modem answers a call from another modem, and ends when either modem disconnects. Because of negotiation, the process of making a connection might take several seconds after dialing. High Speed Communication describes the negotiation process.

Class 1 Fax Standards

Your modem supports Class 1 which is the command set used by fax software to control a modem. The fax commands are invisible to you when you use fax software, and most software automatically determines which class to use.

Fonts for Faxing

To ensure the best quality fax output, it is important to use both screen and printer fonts, and, if applicable, to also use Adobe Type Manager (ATM)® or TrueType®. A common problem is selecting a font that is built into your printer for which you have a Screen font, but not a Printer font. The type looks fine on your screen, but will be faxed in block letters because it uses the Screen font to create each character. The solution is to use a font with both Printer and Screen fonts, or to obtain the printer font you need.

Resources for Fax Programmers

Available fax software should provide all the fax functions most users need. However, if you are an advanced programmer and want to write fax software, you can obtain information about fax commands by searching International Telecommunications Union (ITU-T) and/or Telecommunications Industry Association (TIA) web sites, or from the following source.

ITU and TIA publications can be purchased from:

Global Engineering Documents
2805 McGraw Ave.
Irvine, CA 92714

The telephone number is (714) 261-1455. Additional phone numbers are: 1-(800) 624-3974 in the U.S. and 1 (800) 854-7179 outside the U.S.

The PC-specific fax driver and utilities (for both DOS and Windows) are available for license by faxing a request to Developer Relations at Thought Communications, Inc. The fax number is: (408) 452-1011. Request the *Fax Application Programming Interface (FAPI)*.

10 VIDEO FEATURES

This section applies only to products with video standard capabilities. It includes the following topics:

V.80 STANDARD

V.80 is the ITU standard that defines the control of data from the modem. The section on 8-bit commands defines a way for an asynchronous DTE (such as your PC) to control a synchronous bit stream (such as video) on the modulating carrier (such as a standard phone line). Thus, the V.80 standard makes video phone communication possible over standard phone lines by directing the modem how to convert video phone data from synchronous to asynchronous mode for transmission across analog telephone lines.

In addition to video phone capability, the V.80 standard also provides the **AT+ES** Error Control Selection. Refer to the **AT+** commands section of the AT Commands list for additional information on **+ES** commands.

VIDEO COMMUNICATION STANDARD

As with previous ITU standards, V.80 is an enormously complex protocol document, containing many subsections and definitions. The video communication standards are specifically identified as H.323 and H.324.

11 Solving Problems

This section discusses the following topics:

This section is designed to help you solve the common problems you might encounter with your modem. Additional information is available in the Technical Support Wizard on Diamond's web site. To get to the searchable Technical Support Wizard, go to http://www.diamondmm.com and select the Support Wizard under "Support."

To use the information in this section, follow these steps:

1. Try the suggestions in "Check Your Equipment and Configuration."
2. Scan the text in the section that pertains to your situation until you find a problem description similar to yours.
3. Try using the possible solutions. It is most helpful to keep notes on what you try and what result you get.
4. If the problem persists, scan the other sections. Certain solutions can be indicated by a number of different problems; and similarly, many problems have more than one solution. Try each solution that fits your situation before calling Technical Support.
5. If you do not find a satisfactory resolution, you may need to contact Technical Support. Refer to your notes when you send email or call.

Check Your Equipment and Configuration

For external modems, check that the power supply is installed and connected. Try completely disconnecting and then reconnecting the modem.

If reinstalling your modem does not solve the problem, issue **AT&FØ&W** to the modem in a terminal program to return the modem to one of the factory default configurations (as discussed in *Communication Standards*). This may solve problems caused while trying to reconfigure the modem.

Is the Modem Recognized by the Operating System?

Windows 95 Issues

Problem: Modem was installed, but Win 95 did not announce that it had found new hardware.

Solution: Check that your modem is installed in the proper slot, or install it into a different slot. Clean the Device Manager and restart Win95.

Problem: Your modem does not configure properly or does not work consistently.

Solution: All serial devices need to be reconfigured. To clean your Device Manager:

1 In Windows 95, click Start, choose Settings and select Control Panel. Double click the System icon and go to the Device Manager.

2 Click on Modems in Device Manager. Remove all modems listed by selecting one, clicking on Remove, then repeating for each modem until they are all removed. When you remove an item, Windows 95 provides a warning. Click OK when the warning appears.

3 Click on Ports in Device Manager. Remove all the COM ports except those which are enabled. To remove a COM port, select it and click Remove. If you are not sure which ports are enabled, leave COM1 and COM2 present.

4 In Device Manager, if you have an item called Unknown Devices or Other Devices, remove all entries in this section by selecting one, clicking Remove, then repeating until they are all gone. When you remove an item, Windows 95 provides a warning. Click OK when the warning appears.

5 Return to the Control Panel and select Modems. Remove any modems which may be defined. If you get the Add New Hardware Wizard, click Cancel and go to the next step.

6 Select Start and choose Shutdown. Turn off your computer.

7 Turn your computer back on. Windows 95 should automatically detect the ”new” hardware and reconfigure any serial devices. Your modem configures properly.

8 Windows 95 should then prompt for a driver. Select Driver from Hardware Manufacturer and insert the Install Disk provided with the modem. Windows 95 loads the proper driver for the modem.

Problem: In some situations, Windows 95 may fail to detect enabled COM ports and assigns your modem to a COM port that is in use by the system. In this case everything appears fine

in Device Manager but in Control Panel: Modems: Diagnostics: More Info, communication is not established with your modem.

Solution: Check your communications driver by clicking on the Driver button while in the Diagnostics screen of the Modem Control Panel. It should read "The communications driver is comm.drv". If it reads otherwise, such as rhsicomm.drv or twcomm.drv, find the "comm.drv=" line at the top of your C:\WINDOWS\SYSTEM.INI file and change it to read "comm.drv=comm.drv". Save, Exit, and Reboot.

The following steps can be used to determine your port address and reinstall your modem. However, it is recommended that you contact Technical Support before using Debug.

1 Select Start and chose Shutdown. Turn off your computer.

2 Remove your modem from the computer.

3 Turn your computer back on. When the words Starting Windows 95 appear, press the F8 key.

4 From the Startup Menu select Safe Mode Command Prompt Only.

5 *(Note: Do not use Debug Mode without Technical Assistance.)* At the DOS prompt type DEBUG [CR].

6 At the dash type D40:0L8 [CR]. A line of information appears. Record all the numbers.

0040:0000 F8 03 F8 02 00 00 00 00

To interpret the returned numbers, start with those after the four consecutive zeros. The ports are identified by the following Addresses:

Port	Address
1	F8 03
2	F8 02
3	E8 03
4	E8 02

7 Type Q[CR] to return to DOS.

8 Turn off the computer and install your modem.

9 Turn your computer on. Click Start, choose Settings and select Control Panel.

10 Click Add New Hardware. Make the following selections after double clicking the Add New Hardware Wizard:

- Click Next.
- Check No and click Next.
- Select Ports and click Next.
- The Manufacturer is Standard Port Types and the Model is Communications Port. Click Next.

- An I/O Range displays. If the I/O range does not match what Debug showed, note the address and then click Next.
- Click Finish.
- When you are asked to shut down, select No.

11 If a port in the previous step did not get the proper address, reset the address in Device Manager.

- From the Control Panel, select System, select Device Manager and click on Ports. Double click the specific port, select Resources and uncheck Use automatic settings. Change the resources being used. The Basic Configuration may need to be changed in order to be able to change the resources.

12 Once the appropriate number of ports have been added, remove any modems defined in Device Manager, shut down Windows 95 and turn off your computer. Restart the computer. Your modem configures properly.

Problem: Your modem still does not work after completing the above steps.

Solution: The resources may need to be changed manually.

1 In Windows 95, select Start, choose Settings and select Control Panel. Select the System icon and go to the Device Manager.

2 Click on Modem.

3 Click on Ports. Double click the specific port, select Resources and uncheck Use automatic settings. IRQ settings to try are 10, 11, 12 or 15. The Basic Configuration may need to be changed in order to change the assigned IRQ.

IRQ 5 and IRQ 10 are frequently used by soundcards, IRQ 15 is used by CD-ROMs or network cards, and IRQ 12 by PS/2 style mice. Several different Basic Configurations may need to be tested before getting an appropriate configuration.

Problem: Software cannot access your modem on COM 5.

Solution: Refer to the earlier solution under “Your modem does not configure properly or does not work consistently”. Software designed for Windows version prior to Windows 95 may only support COM ports 1-4.

If there are four COM ports in the system or three COM ports and a video card based on the S3 chipset (which uses the 02E8, COM 4, address), then there is nothing you can do to avoid having your modem configure to COM 5, except disable a COM port so your modem can reconfigure to a lower COM port.

Problem: Your modem does not work on COM 1.

Solution: In this situation, COM 1 has been disabled but your modem still does not work or does not work properly. Even when you disable the port in the BIOS setup, Win95 may still assume it is a port which wants to use the default IRQ 4 and 3F8h settings and not allowing your modem to use those resources.

1 In Windows 95, click Start, select Settings and choose Control Panel. Double click the System icon and select Device Manager.

2 Select Ports.

3 Select COM 1 and click on Properties.

4 Uncheck the checkbox for Original Configuration and click OK.

5 Select Start and choose Shut down. Turn off your computer.

6 Turn on your computer.

Check your changes in Device Manager. COM 1 now has a red X indicating Windows 95 does not reserve resources for the device, leaving IRQ 4 available for your modem

Problem: Installing multiple Plug and Play modems

Solution: You can install multiple Plug and Play modems in one computer and use the standard COM ports 1-4 and none of Windows 95 virtual COM 5-9 ports.

If you have multiple Plug and Play devices in one machine, unchecking the Use Automatic Settings box in Device Manager by itself does not take the modem out of Automatic Settings mode. The modem must be moved to a different basic configuration before the Use Automatic Settings will stay unchecked. Take the modem to a higher numbered basic configuration that leaves the modem at the same I/O range and IRQ, and then add the second modem.

The following procedure works when a computer has no Plug and Play devices and COM 2 was disabled with a serial mouse on COM 1.

1 Install the first Plug and Play modem and boot your computer.

2 Windows 95 finds your modem and prompts for the driver from manufacturer's disk. Insert the Plug and Play Utility disk and Windows installs the appropriate driver.

3 Click Start, select Settings and choose Control Panel. Double click the System icon and choose Device Manager.

4 Make sure only the mouse COM port is listed under Ports.

5 Click on the plus sign (+) next to Modem.

6 Double click on the Plug and Play modem (or Plug and Play modem #2, etc.).

7 Click on the Resources tab to check the IO Address and IRQ.

Assuming COM 1 as the only port active in the computer, your modems should be assigned the following I/O ranges:

Modem #	I/O Range
1	02F8-02FF
2	03E8-03EF

Modem #	I/O Range
3	02E8-02EF

8 Uncheck the Use automatic settings box.

9 Click Start, select Settings and choose Control Panel. Double click the Modems icon and select Diagnostics. Select COM 2 and click on More Info.

10 Verify that your modem responds, shut down your computer and add the next modem.

Repeat steps until all modems are configured and work properly.

Is the Modem Responding in the Modem Program?

Problem: Your software is not working properly.

Solution: Verify that the correct COM port and modem choice was selected. Then test the modem in a terminal program, Hyperterminal, or MoreInfo in the Win95 Modem Diagnostic. If these work, or the modem works in other software, refer to your software manual for assistance.

Problem: Your computer is not sending data to your modem, as determined with the SD or RD light on external modems.

Solution: The modem and computer are not connected properly. Check the connections, and make sure the RS-232C cable is plugged into the correct computer port.

or
Make sure that the data is going to the correct serial port. Your computer may have other serial ports for your printer, mouse, etc.; some software requires you identify the serial port you're using. *Or* your computer's serial port is not working properly. Contact your local computer dealer for assistance.

Problem: You have installed your internal modem but it does not respond at all or it seems to work intermittently.

Solution: With PCs, suspect COM port and IRQ conflicts.

Problem: What you type does not appear on the screen.

Solution: Enable command echo by issuing the **ATE1** command. Alternately, you may be able to turn on Local Echo in your software.

Problem: Two letters appear on the screen for every one you type while in the command state.

Solution: Disable command echo by issuing the **ATE** command. You can also solve this problem by using your telecommunications software to change your computer setting to full duplex operation.

Problem: You type **AT** followed by a carriage return and the modem does not acknowledge it with the **OK.** result code.

Solution: You are not in the command state. Enter the escape code (**+++**) to switch from online state to command state.

or
Your computer is set to a rate other than 300, 1200, 2400, 9600, 19,200, 38,400, 57,600, or 115,200. Use your software to change your computer rate to one of these rates.

or Result Codes may be disabled. Issue the **ATQ** command.

or your computer's serial port is not working properly (external modems only). Contact your local computer dealer for assistance.

Problem: You type **AT** followed by a carriage return and the modem returns a Ø.

Solution: Your modem is set to use numeric result codes instead of verbose result codes. Use **ATZ** or issue **AT&F**. If this solution does not solve your problem, contact Technical Support for assistance.

Is the Modem Connecting to the Device on the Other End?

Refer to your *Getting Started* manual, along with **Communication Standards** in this Reference Manual for information on modem connections.

Compatibility With Other Modems

Your modem has been tested with most major brands of modems, and all of these modems work properly with the protocols your modem supports. If you cannot make a connection and you suspect the remote modem might be the source of the problem, consider the following:

- The remote modem might need a firmware upgrade if it was purchased some time ago. Several pioneers in the high-speed modem business have released upgrades to fix compatibility problems with early units.
- If the remote modem is a 2400 bps modem that does not support error correction/data compression, it may not allow enough time for the negotiation process. Try turning off correction/compression by issuing the **&UØ** command.

Problem: If you get a NO DIAL TONE result code or you cannot get your modem to dial, one of the following may be the situation:

Solution: Your telephone line is plugged into the wrong jack. Make sure that your telephone line is plugged into LINE and your (optional) telephone is plugged into PHONE.

or
You have too many devices on the line. Try unplugging other phone devices connected to your phone line. You might also try adding an **X** to the end of your initialization string.

or
Your Digital or PBX does not support modems. Your PBX system must be equipped with standard analog lines for your modem.

or
Try adding an **X** to the end of your initialization string.

or
The modem uses the inside two wires on the phone cable. If you have a multiline phone system, your modem will not get the dial tone signal over the outside two wires.

or
If you have a voicemail system that gives you a stuttering dial tone to indicate new messages, then the modem should be set to ignore dial tone. Include several commas before the phone number to help the modem dial properly.

or
Your modem may have suffered damage from a recent power surge or an electrical storm. Contact Technical Support.

Problem: You are having trouble making a Reliable connection.

Solution: One of the following may be the solution:

Your modem is not set to make a Reliable connection. Issue **AT&F** or issue **AT\N7.** **Communication Standards** and **Result Codes** provide more information.

or
The remote modem does not support MNP or V.42. A Reliable connection is not possible in this case.

or
The remote modem supports MNP or V.42, but it is not in Reliable mode. Have the remote modem operator change to Reliable mode.

or
The remote modem supports MNP or V.42 and either gets confused by the length of time your modem takes to "negotiate" the connection or confuses negotiation characters with the remote computer's log-in sequence. In this case, issue **AT\N** (Normal) to disable error correction and data compression, and then dial again.

or

The telephone line quality is so poor and noisy that it interferes with the negotiation process. A variety of factors can cause line noise. You can try to make a Normal connection.

Problem: Your modem is not recognizing busy signals, or your modem is interpreting other signals from the remote location as busy signals

Solution: Be sure your modem is set to recognize dial tone and busy signal by adding an **X2** to the end of your initialization string. Contact Technical Support for assistance.

Problem: You have connected to a remote modem but your computer has frozen up or all you see on your screen are garbage characters.

Solution: You have made a Direct connection, but your computer and modem are using different rates. Use your software to change the computer rate so it matches the connection rate given in the CONNECT result code.

or

Your computer and the remote modem are set to different data bits (word length), parity, and number of stop bits. The most common are 8 data bits (8-bit word length), no parity, and 1 stop bit (8, none, 1). Change these settings in your software.

or

Your computer and the remote modem are set to different terminal types. Change these settings in your software.

or

Your computer's serial port is not working properly. Contact your local computer dealer for assistance.

or

You have selected hardware or software flow control on the modem (using **AT&K3** or **AT&K4**), but not in your software. Both your hardware and software must be set to use the same type of flow control. If your software does not allow you turn flow control on and off, it either handles flow control automatically, or it does not support flow control. In this case, obtain software that supports flow control, or disable flow control by issuing the **AT** command.

Problem: You can connect but then can't communicate with the remote modem.

or

You can connect but then the modems disconnect for no apparent reason. *Or* you can connect but then the modem speed drops unexpectedly.

Solution: Your modem is designed to communicate at high speeds, but many factors contribute to the actual speeds you achieve during communication sessions. Line noise, slow downloading, and multitasking can be contributing factors.

Line Noise

Line noise is frequently a source of problems with high speed modem connections. The following discussion provides an overview of potential problems with suggestions for troubleshooting.

Line noise is not a common cause of problems during fax calls. If it is, one of the following may occur:

- Your modem is able to connect, but fax transmissions are flawed (unreadable faxes, missing sections).
- Your modem connects but then disconnects unexpectedly.

If you think you are having fax line noise problems, try getting a clearer connection by redialing. If that doesn't help, wait a while and try redialing again. This should solve the problem. If necessary, and if your fax software allows it, you can also try using your fax software to set your fax transmission rate lower.

With data calls, line noise can cause numerous problems. In general, the faster you communicate, the better your phone lines need to be. When you get up to 33,600 bps, it is critical that you have clear lines from end to end. Line noise can cause the following problems when trying to make 9600 bps or higher data connections:

- No connection
- Connection, but only "garbage" characters appear on the screen
- Connection, but no communication
- Connection, then disconnection for no apparent reason
- Connection, but modem speed drops
- Transmit speed significantly different from Receive speed

If you think you are having data line noise problems, try redialing. When you redial, the phone company will probably route your call through a different circuit, which could result in a clearer connection. If that doesn't help, wait a while and try redialing again. This should solve the problem. If not, you can also use your telecom software to set your transmission rate lower. Refer to the "Rate Renegotiation" discussion in **High Speed Communication** for information on setting your transmission rate.

Slow Downloads

If you download files from a BBS or online service, you should expect a theoretical CPS (character per second) rate about 1/10th of your connection rate (i.e., 33,600 bps = 3360 cps) because it takes about 10 bits to transmit each character.

There are many causes for slow transfer speeds. Your computer or software may not keep up. Slow disk drives on either end can slow it down. The remote server may be slow. The Internet between the remote server and the one you are dialing into may be slow. The server you have dialed into may be slow. The remote system may have many users on it, which slows it down. (You may find your best download speeds on many services are late at night when fewer users are on the service.) And some services are

notorious for slow downloads in general. A download of 600 - 800 cps on a CompuServe 14,400 bps line is a normal occurrence.

Multitasking

Multitasking computers allow you to do many different things while other operations take place in the background. Although you don't see them in progress, background operations can be complex and can sometimes demand too much of your computer's attention to allow high speed communications. High speed transmissions are more reliable in a single-user situation with as few applications as possible in use.

To Uninstall Your Modem

Problem: You are uninstalling your modem, and want to remove the files that were installed with it.

Solution: Delete the modem using the Modem Control Panel.

A

FEATURE LIST

This page describes features supported by various modem models. If you know the SUP# of your modem, find that number in the left column, and use the information in that row to determine what features your modem supports.

To find out what your modem's SUP number is, type ATi92 [ENTER] from a terminal program. More specifically if you are using a **Macintosh**;

1 Install the Communicate Lite software from the CD-ROM that came with your modem.

2 Open Communicate Lite.

3 Open a New or existing session.

4 In the session window, type ATi92 [ENTER]. This is your modem's SUP number.

If you are using **Windows 95/98 or Windows NT 4.0**;

1 Click Start, select Programs, Accessories, HyperTerminal. (If you don't have HyperTerminal, you can install it from your Windows CD-ROM.)

2 Open the application HYPERTRM (or you may see HyperTerminal).

3 When you are asked to enter a name, type TEST, and click OK.

4 When you are asked for a phone number, type 1234 (it doesn't matter what this number is). Click OK.

5 When the Connect screen appears, click Cancel.

6 Now you will see a blank screen with a cursor. Type ATZ [ENTER]. You should see OK. (If you don't get any response, select File, Properties, and make sure your modem or COM port is selected by the *Connect using* field.

7 Type ATi92 [ENTER] and you should see SUPxxxx. Write this down. This number is your modem's model.

8 Exit HyperTerminal (it's OK to close the connection, and you don't need to save the session).

Model Name	SUP	Data/ fax	Voice	Sp	K56flex	V.90	NVRAM	Caller ID*	Dist. Ring*
SupraExpress 56i Voice V.90	2490	X	X	X	X	X		X	

Model Name	SUP	Data/ fax	Voice	Sp	K56flex	V.90	NVRAM	Caller ID*	Dist. Ring*
SupraExpress 56i Sp V.90	2480	X	X	X	X	X		X	
SupraExpress 56e Mac Voice V.90	2430	X	X		X	X		X	
SupraExpress 56e Voice V.90	2420	X	X		X	X		X	
SupraExpress 56e PC	2130	X			X (does one or the other , not both)				
SupraExpress 56i Voice	2120	X	X		X			X	X
	2121	X	X		X			X	X
	2122	X	X		X			X	X
	2123	X	X		X			X	X
	2124	X	X		X			X	X
	2125	X	X		X			X	X
SupraExpress 56e Sp Mac	2110	X	X	X	X				
	2111	X	X	X	X				
SupraExpress 56e Mac	2100	X			X				
	2101	X			X				
SupraExpress 56e PC	2090	X			X				
	2091	X			X				
	2092	X			X				
SupraExpress 56i Sp	2080	X	X	X	X				
	2081	X	X	X	X				
	2082	X	X	X	X				
	2083	X	X	X	X				
	2084	X	X	X	X				
	2085	X	X	X	X				

Model Name	SUP	Data/ fax	Voice	Sp	K56flex	V.90	NVRAM	Caller ID*	Dist. Ring*
SupraExpress 56i	2070	X			X (does one or the other , not both)				
	2071	X			X				
	2072	X			X				
	2073	X			X				
	2074	X			X				
SupraExpress 56e Sp	2050	X	X	X	X				
	2051	X	X	X	X				

*Caller ID and Distinctive Ring availability may vary. Check the Express 56K manual on our web site at http://www.diamondmm.com/products/manuals/manual-index.html for an updated Feature List.

Model Name	SUP	Class 1 fax	Class 2 Fax
SupraExpress 56i Voice V.90	2490	X	
SupraExpress 56i Sp V.90	2480	X	
SupraExpress 56e Mac Voice V.90	2430	X	
SupraExpress 56e Voice V.90	2420	X	
SupraExpress 56e PC	2130	X	
SupraExpress 56i Voice	2120	X	
	2121	X	
	2122	X	
	2123	X	
	2124	X	
	2125	X	
SupraExpress 56e Sp Mac	2110	X	
	2111	X	
SupraExpress 56e Mac	2100	X	
	2101	X	

Model Name	SUP	Class 1 fax	Class 2 Fax
SupraExpress 56e PC	2090	X	
	2091	X	
	2092	X	
SupraExpress 56i Sp	2080	X	
	2081	X	
	2082	X	
	2083	X	
	2084	X	
	2085	X	
SupraExpress 56i	2070	X	
	2071	X	
	2072	X	
	2073	X	
	2074	X	
SupraExpress 56e Sp	2050	X	
	2051	X	

B

AT COMMANDS

These commands are based on firmware version 2.081-XX.

DIRECT COMMANDS

The following commands are issued exactly as shown below. They are not preceded by **AT**.

A/ Re-execute Last Command
Re-execute the last command issued, either by you or by your software.

+++ Escape Code
Escape Code per setting in Register S2. Default is ANSI character 43, the "+" symbol. Must be preceded and followed by a brief period of no transmission (i.e., a 2-second pause).

[CR]Carriage Return
Terminate connection attempt in progress during the dialing or protocol negotiation process.

AT COMMANDS

The following commands are preceded by the letters AT. The first command, for example, is issued as ATA **[CR].**

A Answer Phone Line

B BELL/ITU Protocol Compatibility
BØ Selects ITU protocol and V.22 at 1200 bps.
B1 Selects Bell 212A at 1200 bps.

D Dial Command Modifier
Dials any mixed string of dialing commands. (See Dialing.) If a number is blacklisted or delayed, this command displays BLACKLISTED or DELAYED rather than dialing. This may also happen if the S1 Register has not yet cleared.

E Command Echo
Controls the echo of characters sent to your modem from your computer when modem is in command state.
EØ Turns off echo. If you see two characters for every one you type (i.e., **AT** looks like **AATT**), issue **ATE**.

E1 Turn on echo (default). If your computer does not display the characters you type, issue **ATE1**.

H Hook Control

HØ On-hook (hangs up).

H1 Off-hook (picks up phone line) for the time period set in Register S7. (In US country code setting, the off-hook time is unlimited.)

I Report Identification Codes

IØ Reports maximum data carrier rate.

I1 Programmed ROM checksum used in test.

I2 Tests checksum on the firmware ROM.

I3 Reports ROM code revision number.

I6 Reports country code for country PSTN signals are configured for.

I7 Reports DSP model and version code.

I92 Reports SUP ID number of the modem.

L Speaker Volume

LØ Sets speaker volume Low

L2 Sets volume Medium

L2 Sets Volume High

L: Total Volume Gain Adjustment

L:00 Lowest gain

L:31 Highest gain

M Speaker Control

Ø Always off

2 Turns speaker On during handshaking and off while receiving carrier

2 Always on

2 Turns speaker On during negotiation only

O Going Online

Ø Returns to online state.

2 Requests a retrain sequence and returns to online.

P Set dialing Mode to PULSE

Forces pulse dialing.

Q Enable/Disable Result Codes

Ø Result Codes enabled (default).

2 Result Codes disabled.

2 Enabled when originating; disabled when answering.

Sr? Read S Registers

Reports the value in S register r.

Sr=n Write S Registers

Writes value n into S register r.

Sr.b=n Write to S Register bit b

Writes value *n* (0 or 1) to bit b of S register r.

SCr? Read SC Register

Reports value in SC register r.

SCr=n Write to SC Register

Writes value *n* into SC register R.

T Set Dialing Mode to Tone

V Verbose/Numeric Result Codes

VØ Numeric Result Codes.

VC Verbose Result Codes (default).

W Error Correction Result Codes

CØ CONNECT XXXX (DTE - computer rate)(default).

CC Report error correction mode.

CC CONNECT XXXX (DCE - transmit rate).

X Dialing Mode/CONNECT Result Codes

CØ Blind dial (ignore dial tone and busy signal) and send **CONNECT** (no rate) when connected.

CC Blind dial; send Result Codes set by **Wn** and **S95**.

CC Wait for dial tone before dialing; do not detect busy signal; send Result Codes set by **Wn** and S95 when connected.

CC Follow busy signal but ignore dial tone; send codes set by Wn and S95 when connected.

CC Send codes set by Wn and S95 when connected. Send **BUSY** code if busy signal detected; send **NO DIALTONE** code if dial tone is not received (default).

Y Long Space Disconnect

YØ Disable long space disconnect before on-hook (default).

YI Enable long space disconnect before on-hook.

Z Soft Reset and Load Stored Profile n

ZØ Reset modem and load default profile.

&C Data-Carrier-Detect (DCD) Signal Control

CCØ DCD signal always on.

&C1 DCD follows carrier. (ON when carrier from remote modem is present.)

&D Modem Reaction to DTR on-to-off

Modem reaction to DTR on-to-off transition greater than S25 setting. Modem WILL dial when DTR is ON or goes from an OFF to ON state.

	a	b	c (Settings of **&Qn**)
&DØ=	N	2	1
&D1=	3	3	1
&D2=	1	1	1
&D3=	4	4	1

List of modem reactions:

N=No Action
1=Hang up if off-hook and autoanswer is disabled.
2=Hang up if off-hook and autoanswer is not disabled.
3=Switch to asynchronous command state.
4=Perform soft reset (like ATZ, profile is set by &Y).

List of **&Q** states:

a. &QØ, &Q5, &Q6
b. &Q1, &Q4
c. &Q2, &Q3

&F Load Factory Default Configuration

&FØ Restore factory configuration (default for PCs); with hardware flow control, error correction and data compression active.

&F1 Restore factory configuration (default for MACs), with hardware flow control, error correction and data compression active.

Note: For Direct Connect Mode, use **AT \N1 &KØ &Q6 &D2**.

&G Guard Tone Selection

Set automatically based on ATi6 setting.

&GØ Do not generate guard tones (US default).

&G1 Generate 550Hz guard tone (not supported).

&G2 Generate 1800Hz guard tone (World Wide support models only).

&K Serial Port Flow Control

&KØ None

&K3 Enable bidirectional hardware (RTS/CTS) flow control (default with **&FØ** and **&F1**).

&K4 Enable software (XON/XOFF) flow control.

&K5 Enable transparent software flow control.

&K6 Software (XON/XOFF) and hardware (RTS/CTS) flow control.

&P Pulse Dialing Make/Break Ratio

(Valid only as per country code.)

&PØ 39%/61% make/break ratio at 10PPS (US and Canada default)

&P1 33%/67% make/break ratio at 10PPS (UK and Hong Kong)

&P2 39%/61% make/break ratio at 20PPS

&P3 33%/67% make/break ratio at 20PPS (Japan)

&V Active Profile Settings

Current settings for certain AT Commands and S Registers are displayed.

&V1 Connection Stats

Reports	Possible Results - Notes
Termination Reason	LINK DISCONNECT
Last TX rate	28800 BPS
Highest TX rate	28800 BPS
Last RX rate	6400 BPS
Highest RX rate	26400 BPS
Protocol	LAPM
Compression	V42Bis
Line Quality	018
RX Level	025
Highest Rx State	67
Highest Tx State	67
EQM Sum	0062
RBS Pattern	FF
Rate Drop	FF
Digital Pad	None
Local Rtrn Count	00
Remote Rtrn Count	00
flex fail	the modem failed to make a V.90 connection (yes, V.90)

\Kn Control break handling (during three states):

When the modem receives a break from the DTE:

\K0,2,4 Enter on-line command mode, no break sent to the remote modem.

\K1 Clear buffers and send break to remote modem.

\K3 Send break to remote modem immediately.

\K5 Send break to remote modem in sequence with transmitted data.

When modem receives \B in on-line command state:

\K0,1 Clear buffers and send break to remote modem.

\K2,3 Send break to remote modem immediately.

\K4,5 Send break to remote modem in sequence with transmitted data

When modem receives break from the remote modem:

\K0,1 Clear data buffers and send break to DTE.

\K2,3 Send a break immediately to DTE.

\K4,5 Send a break with received data to the DTE.

\N Operating Mode

\NØ Normal mode. Carrier and port rate may differ; No MNP or V42, forces &Q6.

\N1 Direct mode. Carrier rate "matches" port rate; No MNP or V42, forces &Q0.

\N2 Reliable mode. A V42 or MNP connection must be made or the modem will hang up; forces &Q5, S36=4, S48=7.

\N3 AutoReliable mode. (Default mode where all connections are supported; forces &Q5, S36=7, S48=7.)

\N4 LAPM mode. A V42 connection must be made or the modem will hang up; forces &Q5, S48=0.

\N5 MNP mode. An MNP connection must be made or the modem will hang up; forces &Q5, S36=4, S48=128.

\V Single Line Result Code

\VØ Disabled

\V1 Enabled (Provides DTE protocols used and asymmetric DCE rates)

%C Enable/Disable Data Compression

%CØ Data compression disabled.

%C1 MNP 5 enabled.

%C2 V.42bis (BTLZ) enabled.

%C3 MNP5and V.42bis enabled.

%E Auto Retrain Based on Line Quality

%EØ Disabled (default).

%E1 Enable auto retrain based on line quality.

%G Rate Renegotiation (Fall Back/Forward)

Based on line quality monitor readings. Fall Forward only if "good" quality for period set in S190.

%GØ Disabled.

%G1 Enabled: monitor line quality and automatically request a rate renegotiation if line conditions are bad (default).

%L Line Signal Level

Return a value which indicates received signal level.

*NC Display Country Codes and Configurations Supported

Modems support various country code settings. (**ATi6** reports currently configured setting.) This command returns ERROR on units without NVRAM (i.e., most SupraExpress modems).

NCn* Country Select. Sets country PSTN parameters to the code number specified. You must reset **ATZ** or power cycle the modem for change to take occur.

#CID Caller ID Mode

(Requires CallerID. See "Feature List" for a list of the features your modem supports.)

#CID? Display Caller ID Modes supported.

#CID=Ø Disable Caller ID (default). Command is stored in NVRAM, and is cleared by ATZn or AT&F or AT&F1.

#CID=1 Enable Formatted Caller ID mode. Command is stored in NVRAM, and is cleared by ATZn or AT&F or AT&F1.

#CID=2 Enable Raw (ASCII printable HEX number) mode. Command is stored in NVRAM, and is cleared by ATZn or AT&F or AT&F1.

#CLS Select Data, Fax, or Voice/Audio

#CLS? Returns the current setting (0,1, or 8) of the **#CLS** command as an ASCII decimal value in result code format.

#CLS=? Return the message, "0, 1, or 8".

#CLS=0 Data. Similar to setting **+FCLASS=0**, and instructs the modem to act like a data modem on subsequent answer or originate operations. When a disconnect or inactivity timeout in the non-autobaud mode is detected, the modem automatically sets the **#CLS** setting to 0 and hangs up. This ensures that the modem is always in a known state despite disorderly DTE behavior.

#CLS=1 Class 1 fax. Similar to setting **+FCLASS=1**, and instructs the modem to be a Class 1 fax modem. Once set, either the **+FAA** or the **+FAE** command can be used to force subsequent answers to be Class 1 adaptive answers.

#CLS=8 Voice/Audio Mode. This is the main setting the DTE uses to effect directed or adaptive answer or originate sequences involving voice modes. All telephone calls initialized by **#CLS=8** result (after answer or successful call progress) in the modem in Online Voice Command Mode.

#VLS Voice Line Select

Selects which devices are routed through the modem.

#VLS? Display the current setting of the **#VLS** command as an ASCII decimal

value in Result Code format.

#VLS=? Request a report of the device types available, from 0 to 4.

#VLS=Ø Telephone Line with telephone handset (default.).

#VLS=1 Transmit/Receive Device (other than telephone line).

#VLS=2 Transmit Only Device. Normally the onboard speaker.

#VLS=3 Receive Only Device. Normally the microphone.

#VLS=4 Telephone line with Speaker ON and handset.

#VLS=5 Telephone Emulation.

#VLS=6 Speakerphone.

#VLS=7 Mutes the Local Handset during phone conversation. Music on Hold.

#VLS=8 Records Handset conversation on phone line.

#VLS=9 Records/Plays back from handset through sound chip.

#VRN Ringback Never Came Timer

Used when originating a voice/audio call (**#CLS=8**) to set the "Ringback Never Came" timer value, i.e., an amount of time (in units of 100 ms) measured from completion of dialing. If ringback is not detected within this period, the modem assumes the remote has picked up the line and switches to Online Voice Command Mode.

#VRN? Displays the current setting of the #VRN command as an ASCII decimal value in Result Code format.

#VRN=? Returns the message, "0-255".

#VRN=0 Turns off the "ringback never came timer." After dialing, the modem sends VCON and immediately enters Online Voice Command Mode.

#VRN=*n* Where *n* defines the period without ringback after dialing in 100 ms units.

-SDR Distinctive Ring

(See "Feature List" to see if your modem supports this feature.)

Bits set high in this register enable the corresponding Distinctive Ring detection and Result Code. Bits disabled set normal ring detection only. Range = Ø-7, Default=Ø. (Saved in NVRAM via &W).

Bit Value	Decimal Value	Function
0	1	Enables single rings and reports these as RING 1 2.0s on, 4.0s off (normal ring).
1	2	Enables double rings and reports these as RING 2 0.8s on, 0.4s off, 0.8s on, 0.4s off.
2	4	Enables triple rings and reports these as RING 3 0.4s on, 0.2s off, 0.4s on, 0.2s off, 0.8s on, 4.0s off.

NOTE— Current code does not discriminate between short (0.4 second) and long (0.8

second) ring pulses. Two Bellcore standard ring patterns (RINGS 3 and 4) will be reported as RING3 (If RING 3 detection is active).

V.25TER AT COMMANDS

+ES Error Control Selection

+ES? Returns Current Setting

+ES=? Returns Command Range(s)

+ES =<orig_rqst>,<orig_fbk>, ans_fbk>

(Omitted values remain at the current setting.)

NOTE: **+ES=<orig_rqst>,<orig_fbk>, ans_fbk>** is similar to setting the **&Qn** (or **&Mn**), S36, and S48 registers. When **+ES?** is used S80.4 is set (1). When &tQn (or &tMn) is used S80.4 is reset (0). These values and S80 are saved in NVRM via **&Wn**.

The **orig_rqst** parameters are:

	orig_rqst
0	Direct mode.
1	Buffered mode.
2	Initiate V.42 without detection.
3	Initiate V.42 with detection.
4	Alternative protocol (MNP).
5	Initiate with Synchronous mode.
6	Initiate with V.80 Synchronous access mode (default).

The **orig_fbk** parameters are:

	orig_fbk
0	Error control optional (either LAPM or Alternative acceptable); if error control is not established, maintain DTE-DCE data rate and use buffered mode with flow control during non-error-control operation (default).
1	Error control optional (either LAPM or Alternative acceptable); if error control is not established, change DTE-DCE data rate to match line rate and use Direct mode.
2	Error control required; if error control is not established, disconnect.
3	LAPM required; acceptable); if no LAPM, disconnect.
4	MNP required; if no MNP, disconnect.

The **ans_fbk** parameter specifies the acceptable fallback mode. The **ans_fbk** parameters are:

	ans_fbk
0	Direct mode.
1	EC (error correction) disabled; buffered mode.
3	EC optional; if no EC use Direct mode.
4	Error control required; if no EC disconnect.
5	Error control optional (only LAPM acceptable); if error control is not established, disconnect.
6	MNP error control required; if no MNP, disconnect.
7	Synchronous mode.
8	V.80 Synchronous access mode. NOTE: For V.80 connections, the normal setting is +ES=6, 0, 8.

+ESA Synchronous Access Mode Configuration

+ESA?Returns Current Setting

+ESA=?Returns Command Range(s)

The format for AT+ESA = **<trans_idle>, <framed_idle>, <framed_un_ov>, <hd_auto>, <crc_type>, <nrzi_en>, <syn1>, <syn2>**

The **trans_idle** parameter specifies the bit sequence transmitted by the DCE when a transmit data buffer underrun condition occurs while operating in Transparent sub-Mode.

The **trans_idle** parameters are:

	trans_idle
0	In Transparent sub-Mode, the DCE transmits SYN1 on idle. DCE receiver does not seek synchronization sequence (default).
1	In Transparent sub-Mode, the DCE transmits SYN1 on idle. DCE receiver seek SYN1 as a synchronization sequence.

The **framed_idle** parameter specifies the bit sequence transmitted by the DCE when a transmit data buffer underrun condition occurs immediately after a flag. This is while operating in Framed sub-Mode.

The **framed_idle** parameters are:

	framed_idle
0	In Framed sub-Mode, the DCE transmits HDLC flags on idle.
1	In Framed sub-Mode, the DCE transmits marks (one bits) on idle.

The **framed_un_ov** parameter specifies the actions undertaken by the DCE when a transmit data buffer underrun or overrun condition occurs immediately after a non-flag octet. This is while operating in Framed sub-Mode.

The **framed_un_ov** parameters are:

	framed_un_ov
0	In Framed sub-Mode, DCE transmits HDLC abort when underrun during a frame (default.)
1	In Framed sub-Mode, DCE transmits HDLC flag when underrun during a frame.

The **hd_auto** parameter specifies whether or not, in V.34 half-duplex operation, additional procedures besides those specified in section 12/V.34 shall be performed by the DCE when switching from primary channel to secondary channel operation and vice versa.

The **hd_auto** parameter is:

	hd_auto
0	Half duplex V.34 carriers are not supported. Value must be 0.

The **crc_type** parameter specifies the CRC polynomial used while operating in Framed sub-Mode.

The **crc_type** parameter is:

	crc_type
0	CRC generation and checking disabled (default).

The **nrzi_en** parameter specifies if Non Return to Zero Inverted (NRZI) encoding is to be used by the DCE for transmit and receive data.

The **nrzi_en** parameters are:

	nrzi_en
0	NRZI encoding and decoding disabled (default).
1	NRZI encoding and decoding enabled.

The **syn1** parameter (0-255) specifies the octet value(s) to be used while performing character-oriented framing. <**syn1>=n** specifies the 8 bit transparent subMode synchronization sequence and idle transmission value. The default setting for **syn1** is 255.

The **syn2** parameter specifies the octet value(s) to be used while performing character-oriented framing. <**syn2>=0** specifies the16 bit synchronization sequences are not supported. The value must be 0.

The **+ESA** settings are saved in NVRAM by the **&W** command.

+ITF Transmitter Flow Control

This command allows the DTE to determine the input buffer size in the DCE for data on circuit 103 from the DTE, to control the thresholds used for flow control of such data, and to control how often the DCE reports to the DTE the number of octets in this buffer.

This parameter is ignored in Direct and Synchronous Modes where flow control is not used. The Off and On parameters are applicable in Synchronous Access, Frame Tunneling, Buffered V.14, and error control modes. The Report Period parameter is applicable only in Synchronous Access mode.

The command format for **AT+ITF** is:

+ITF? Returns current setting.

+ITF=?Returns command range(s).

AT+ITF=<off>,<on>,<report_period>

<on threshold>	0-255, default is 255
<off threshold>	0-255, default is 64
<report period>	not supported, reports 0

+MS Select Modulation/Rate

+MS?Returns Current Setting
+MS=?Returns Command Range(s)

The command format for **AT+MS** is:
AT+MS = <mod>,<automode>,<minimum rate>,<maximum rate> [Enter]

(Omitted values remain at the current setting.)

<mod> specifies the PREFERRED modulation as per the list below. Either verbose or numeric <mod> selections can be used, but verbose settings are reported.

<mod> Numeric	Protocol	Possible Rates (bps)[1]
0	V.21	300
1	V.22	1200
2	V.22bis	2400 or 1200
3	V.23	1200[2]
9	V.32	9600 or 4800
10	V.32bis	14400, 12000, 9600, 7200, or 4800

<mod> Numeric	Protocol	Possible Rates (bps)[1]
11	V.34	33600, 31200, 28800, 26400, 24000, 19200, 16800, 14400, 12000, 9600, 7200, 4800, or 2400
12	V.90	56000, 54667, 54000, 53333, 52000, 50667, 50000, 49333, 48000, 46667, 46000, 45333, 44000, 42667, 42000, 41333, 40000, 38667, 38000, 37333, 36000, 34667, 34000, 33600, 33333, 32000, 31200, 30667, 29333, 28000 (Default)
56	K56flex	56000, 54000, 52000, 50000, 48000, 46000, 44000, 42000, 40000, 38000, 36000, 34000, 32000
64	Bell 103	300
69	Bell 212	1200

[1]See optional <automode>, <minimum rate>, and <maximum rate> parameters.

[2]For V.23, originating modes transmit at 75 bps and receive at 1200 bps; answering modes transmit at 1200 bps and receive at 75 bps. The rate is always specified as 1200 bps.

FAX AT COMMANDS

The following Fax AT Commands are used with Diamond modems:

+FCLASS Fax Class 1

The formats for **AT+FCLASS** are:

+FCLASS?Returns current setting.

+FCLASS=?Returns command range(s).

+FTS Stop Transmission and Wait

Transmission is halted followed by a wait for the specified time.

+FTS=<TIME> - Wait for the time (in 10 ms increments) specified by <TIME> (0 - 2.55 s).

+FRS Receive Silence

This command completes execution when silence is detected from the remote modem for the specified amount of time. Processing of the command is aborted, without error, if a character is received from the DTE while attempting to detect the period of silence.

+FRS=<TIME> - Wait for the time (in 10 ms increments) specified by <TIME> (0 - 2.55 s).

+FTM Transmit Facsimile Data

A physical connection with the modulation type specified by <MOD> is first established. Data received from the DTE is then transmitted in facsimile

format.

+FTM=<MOD> - Transmit facsimile data using modulation <MOD>.

+FRM Receive Facsimile Data

A physical connection with the modulation type specified by <MOD> is attempted with the remote modem. If this succeeds, data subsequently received from the remote modem is sent to the DTE in facsimile format. If the physical connection fails, the "+FCERROR" result code is returned.

+FRM=<MOD> - Receive facsimile data using modulation <MOD>.

+FTH Transmit Facsimile Data HDLC

A physical connection with the modulation type specified by <MOD> is first established. Data received from the DTE is then transmitted in facsimile format using HDLC framing.

+FTH=<MOD> - Transmit facsimile data, HDLC format, using modulation <MOD>.

+FRH Receive Facsimile Data HDLC

A physical connection with the modulation type specified by <MOD> is attempted with the remote modem. If this succeeds, data subsequently received from the remote modem, using HDLC framing, is sent to the DTE in facsimile format. If the physical connection fails, the "+FCERROR" result code is returned.

+FRH=<MOD> - Receive facsimile data, HDLC format, using modulation <MOD>.

C

S REGISTERS

SØ Number of Rings to Auto Answer

(range = Ø-255; disabled = Ø; default = Ø)
The number of rings the modem waits for before it auto answers.

S1 Ring Counter

(range = Ø-255; default = Ø)
The number of telephone rings before the last answer. This register is reset to Ø if it detects no rings for eight seconds.

S2 Escape Code Character

(range = Ø-255; default = 43 "+")
The ASCII value of the escape code. Values greater than 127 cause the escape code to be disabled.

S3 Carriage Return Character

(range = Ø-127; default = 13)
The ASCII value of the carriage return control character, which serves as command line terminator and result code terminator.

S4 Line Feed Character

(range = Ø-127; default = 10)
The ASCII value of the line feed control character.

S5 Backspace Character

(range = Ø-32; default = 8)
The ASCII value of the backspace control character.

S6 Time to Wait before Blind Dial

(range = 2-255; default = 2; units = seconds)
The maximum time to wait for a dial tone after going off-hook before dialing a number. The W dial command modifier overrides S6. S6 does not apply when X2 or X4 is in effect. The default depends on your modem model.

S7 Time to Wait for Carrier

(range = 1-255; default = 50; units = seconds)
The maximum time the originating modem waits for a carrier from the remote modem before hanging up, or the time the modem waits when the W dial command modifier is used.

S8 Pause Time for Comma Dial Command Modifier

(range = 2-255; default = 2; units = second)

The length of the pause caused by a comma in the D dial command.

S9 Time to Wait Before Recognizing Carrier

(default = 6; units = 1/10 seconds)

The length of time after a carrier first appears that the modem waits to recognize carrier and turn on DCD. This delay allows the modem to ignore spurious signals that are the same frequency as the carrier. This value cannot be changed.

S10 Delay from Lost Carrier to Hang Up

(range = 1-255; default = 14; units = 1/10 second)

The time your modem waits for a carrier to return before disconnecting. A long enough time allows the remote modem's signal to momentarily disappear without making your modem disconnect. S10=255 causes your modem to assume carrier is always present.

S11 DTMF Tone Duration/Spacing

(range = 50-255; default = 95; units = 1/100 second)

The spacing between and duration of DTMF (dial) tones during tone calling. The spacing between tones is equal to the duration of each tone. The default depends on your modem model.

S12 Escape Prompt Delay (EPD)

(range = Ø-255; Ø disables timer; default = 50; units = 1/50 second).

The delay required before and after entering the escape code.

S29 Flash Dial Modifier Time

(range=Ø-255; default=70; units=10 ms; disable=Ø)

Sets the length of time in units of 10 ms, that the modem will go on-hook when it encounters the flash(!) dial modifier in the dial string. The time is a country code dependent parameter.

S30 Disconnect Inactivity Time

(range = Ø-255; default = Ø; unit 10 second; disable =Ø)

Sets length of time the modem will stay online before disconnecting when no data is sent or received. In Reliable mode, any data transfer resets timer. In Normal mode, only sent data resets timer.

D

Result Codes

This section addresses the following topics:

General

The modem responds to commands from the DTE and to activity on the line by signaling to the DTE in the form of result codes. The result codes that the modem can send are described below.

Two forms of each result code are available; long-form, an English-like "verbose" response, and a short-form, data-like numeric response (included in parentheses following the long-form). The long-form code is preceded and terminated by the sequence <CR> <LF>. The short-form is terminated by <CR>, only with no preceding sequence. If result messages are suppressed, nothing is returned to the DTE.

Result Code Commands

The following commands control result codes.

ATQ Enables result codes (default).

ATQ1 Disables result codes.

ATV Displays result codes as numbers.

ATV1 Displays result codes as words (default).

ATW Reports computer (DTE) rate only as CONNECT: (DTE) (default).

ATW1 Reports computer rate as CARRIER (DCE), PROTOCOL, CONNECT (DTE).

ATW2 Reports connection DCE rate only as CONNECT (DCE).

ATS95=32 Enables COMPRESSION XXXX result codes.

ATS95=Ø Disables COMPRESSION XXXX result codes.

MODEM RESULT CODES

Word Form	Numeric Form
OK	Ø
CONNECT	1
RING	2
NO CARRIER	3
ERROR	4
CONNECT 1200	5
NO DIALTONE	6
BUSY	7
NO ANSWER	8
DELAYED hh:mm:ss (Verbose hr, min, sec of delay)	24
BLACKLISTED	32
FAX	33
DATA	35
+F4	+FCERROR

E

RS-232C Pin Assignments

Pin	EIA	Abbrev.	Source	Description
1	AA	shield	n/a	protective ground
2	BA	TXD	DTE	transmit data
3	BB	RXD	DCE	receive data
4	CA	RTS	DTE	request to send
5	CB	CTS	DCE	clear to send
6	CC	DSR	DCE	data set ready
7	AB	GND	n/a	signal ground
8	CF	DCD	DCE	data carrier detect
12	CI	SI	DCE	data speed indicator
15	DB	TCLK	DCE	transmit clock (sync. only)
17	DD	RCLK	DCE	receive clock (sync. only)
20	CD	DTR	DTE	data terminal ready
22	CE	RI	DCE	ring indicator
23	CI	SI	DCE	data signal rate selector
24	DA	XTCLK	DTE	external transmit clock (sync. only)

F

FCC And IC

Federal Communications Commission (FCC)

The modem has been tested and found to comply with limits for a Class B computing device according to the specifications in FCC rules Part 15 and Part 68. Operation is subject to the following two conditions:

1 This device may not cause harmful interference, and

2 This device mus accept any interference received, including interference that may cause undesired operation.

As an owner /operator of a registered modem like this modem, you must comply with FCC rules:

- Before installing your modem, you must notify your telephone company that you are going to install an FCC registered device. When you contact them, you must provide the FCC registration number and ringer equivalence number (REN) for your modem; these numbers are located on the modem's FCC label.

  NOTICE – The Ring Equivalence Number (REN) assigned to each terminal device denotes an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination on an interface may consist of any combination of devices subject only to the requirement that the sum of the Ringer Equivalence Numbers of all the devices does not exceed 5.

- You cannot connect the modem to a party line or to a coin telephone line.

- You must only connect your modem to a standard modular telephone jack, type RJ-11.

If your modem needs repairs, you must arrange for the manufacturer to make them if you are to keep the modem's FCC registration valid.

If you need to return the product, first obtain a Return Merchandise Authorization (RMA) number from Technical Support (541-967-2450) or from Customer Service (1-800-468-5846).

Our mailing address is:

Diamond Multimedia Systems, Inc.
Communications Division

7101 Supra Drive SW
Albany, OR 97321 USA

This equipment, like other electronic equipment, generates and uses radio frequency energy. If not installed and used according to the instructions in this manual, this equipment may cause interference with your radio and television reception.

If you think this equipment is causing interference with your radio or television reception, try turning the equipment off and on. If the interference problems stop when the equipment is switched off, then the equipment is probably causing the interference. You may be able to correct the problem by doing one or more of the following:

- Adjust the position of the radio or TV antenna.
- Move the modem away from the radio or TV.
- Plug the modem in a different outlet than the radio/TV uses.

If necessary, consult your dealer or an experienced radio or television technician. You may find this booklet helpful: "How to Identify and Resolve Radio and TV Interference Problems" (Stock No. 004-000-00345-4), prepared by the FCC and available from the U.S. Government Printing Office, Washington, DC 20402. See individual modems for FCC ID and registration numbers.

FCC Regulations on Fax Branding

The Telephone Consumer Protection Act of 1991 makes it unlawful for any person to use a computer or other electronic device to send any message via a telephone fax machine unless the message clearly contains in a margin at the top or bottom of each transmitted page or on the first page of the transmission, the date and time it is sent and an identification of the individual, business or other entity sending the message and the telephone number of the sending machine of the individual, business, or other entity.

In order to program this information into your fax machine, you should:

1. Refer to the "Page Header" instructions provided with the Reference Manual for the FAX software provided with this unit.
2. Enter information to the program including: the date and time the message is sent, and your identification information.

Industry Canada (IC)

NOTICE – The Industry Canada label identifies certified equipment. This certification means that the equipment meets telecommunications network protective, operation and safety requirements as prescribed in the appropriate Terminal Equipment Technical Requirements document(s). The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment

must also be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be coordinated by a representative 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.

Users 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, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

G

GLOSSARY

Adaptive Answer

Adaptive Answer allows a modem to discriminate between incoming fax or data calls, and answer appropriately.

Analog Signals

Continuous, varying waveforms such as the voice tones carried over phone lines.

ANSI

American National Standards Institute.

ASCII

American Standards Committee on Information Interchange. A standard used by IBM and compatibles to represent numbers and characters in binary form.

Asymmetric Data Rates

In asymmetric transmissions, the send and receive speeds may be different. Having the ability to have differing send and receive speeds allows you to take advantage of the line conditions, giving the best performance possible.

Asynchronous

In asynchronous transmissions, the length of time between transmitted characters is not uniform. The receiving modem must be signaled with Start and Stop bits as to when the data bits of a character begin and when they end.

Audio Frequencies

The frequencies which the human ear can detect (usually in the range of 15 to 20,000 Hertz). Only those from 300 to 3,000 Hertz are transmitted through the phone.

Audio, Full Duplex

An audio mode in which data can be sent and received at the same time. This mode must be supported by the audio hardware you are using. If you have the option of using it, you will probably find that it is more like natural conversation than using half duplex.

Audio, Half Duplex

An audio mode in which data can travel only in one direction at a time. This mode is determined by the kind of audio hardware you are using.

Authoring Systems

Authoring systems are used to create multimedia applications. They combine existing presentation information (texts, images and sound) and control the flow of these during the multimedia show. The dialogue with the user is controlled with this software. The individual information must have already been created and saved with special programs.

AUTOEXEC.BAT

A batch file that directs the activities performed by the computer during system startup.

AutoReliable Mode

The mode in which the modem makes the best possible connection, either Reliable or Normal.

Basic Input Output System (BIOS)

Program code in your PC's ROM (Read-Only Memory) that provides the power-on self test and other operating functions for hardware such as disk drives, keyboard and monitor.

BLTZ

British Telecom Lempel-Ziv. Data compression protocol BTLZ connections require LAPM error correction.

Baud Rate

The number of signal events per second occurring on a communications channel. Although not technically accurate, baud rate is commonly used to mean bit rate.

BIOS

See Basic Input/Output System (BIOS).

Bits Per Second (bps)

The number of binary digits or bits transmitted per second. *See also* Bit Rate.

Bit Rate

The number of binary digits or bits transmitted per second.

Caller ID

Caller ID is a way for the recipient of a call to find out information about the caller. Between the first and second ring of an incoming call, the phone company sends information such as the phone number from which the call originated and a name (if any) associated with that number. A Caller ID box may also display the current date and time. Most phone companies offer this service.

Central Office (CO)

The place where your local phone company switches (or connects) all of your phone calls.

Class 1 (Fax)

A protocol for transmitting image data by a faxmodem and fax software. Class 1 fax

software uses the computer's processor for handling all the encoding and decoding of the fax image.

Class 2 (Fax)
A protocol for transmitting image data by a faxmodem and fax software. The Class 2 fax protocol allows for some of the image encoding and decoding to be done by the fax modem's processor, thus saving time on your computer.

CNG Tone
The 1100Hz "beeping" tone a fax machine or faxmodem emits when calling out. When the receiving fax detects this tone, it automatically connects. It is this tone which allows a call-switching device to recognize an incoming fax call and transfer the call to the fax machine or modem. Supra modems using "Silent Answer" can recognize the CNG tone to receive a fax.

Command State
Operating mode where your modem will accept AT commands. *Synonyms:* Terminal State, Local State. *See also* Online State.

Computer Rate
The rate at which a modem (DCE) and a computer (DTE) communicate. This is what changes when you set rate in your telecom software. *Synonyms:* Serial Port Rate, Modem-to-Computer Speed, DTE-DCE Rate, Communications Rate.

Config.sys
In MS-DOS, an ASCII text file in the root directory that contains configuration commands. MS-DOS consults this file at system startup.

Connection Rate
The rate at which modems communicate over a phone line. *Synonyms:* Transmission Speed, Line Speed, Carrier Rate, Modem-Modem Speed, DCE-DCE Rate.

CTS — Clear to Send Signal
See Hardware Handshaking.

Data Carrier Detect (DCD)
Signal from the modem or printer (DCE) to the DTE (your computer) to indicate that the modem is receiving a carrier signal from the modem at the remote end of the telephone circuit.

Data Compression
The process of reducing the size of data parcels to transmit more data in less time. *See also:* Error Correction/Data Compression Protocols.

Data Terminal Ready (DTR)
Data Terminal Ready. Control signal from the DTE (computer) to the DCE (modem or printer) to indicate that the DTE is on and ready. Also used for hardware flow control.

DCE
Data Communications Equipment. Your modem. *See also:* DTE.

Digital Signals
Discrete, uniform signals.

Direct Connection
Any standard modem connection, without error correction, data compression, or flow control. Computer rate must equal connection rate.

Distinctive Ring
Distinctive Ring is the ability to have multiple phone numbers on a single phone line. Each phone number has a unique ringing pattern. Most U.S. phone companies offer this service.

Driver
Part of a software program that interacts with a particular piece of equipment in your computer system (i.e. video boards, printers, and keyboards). Drivers are often loaded by your config.sys at system boot.

DTE
Data Terminal Equipment. Your computer or terminal. *See also* DCE.

DTR
See Data Terminal Ready.

Duplex
Indicates a communications channel capable of carrying signals in both directions.

Echo Cancellation
A technique that allows for the isolation and filtering unwanted signal energy caused by echoes from the main transmitted signal. Echoes are a serious problem on standard phone lines during high speed data transmission. Separate types of echo canceling are used in voice and data applications.

Error Correction
The process of verifying the accuracy of transmitted data and retransmitting data that did not transfer successfully.

Error Correction/Data Compression Protocols
Protocols that increase the amount of data that can be transferred (data compression) and/or improve the accuracy of transmissions (error correction). Some are MNP 2-5, V.42, V.42bis.

Fax Protocols
Protocols (defined by the international ITU standards committee) that serve as standards to let fax devices (faxmodems and fax machines) communicate at specific rates. Some are ITU V.17, V.29, and V.27ter.

Flash ROM
Allows you to upgrade your modem's ROM using software. Not all Supra modems have this feature.

Flow Control
A buffering system that optimizes throughput by allowing your computer and connection rates to be different.

Full Duplex
Transmission allowing simultaneous two-way communication.

Group 1, 2, and 3 Faxes
There are three internationally accepted specifications for fax equipment protocols. Most fax machines today are Group 3. Many older fax machines do not support Group 3 faxing -- these machines typically won't be able to send to a Group 3 machine (or modem).

Half Duplex
Transmission allowing communication in only one direction at a time.

Hardware Handshaking (RTS/CTS)
A method of flow control used between the modem and the computer in which it is installed. When ready to send data, the computer will send a Request to Send (RTS) signal, to which the modem will reply with a Clear to Send (CTS) signal when it is ready to receive. CTS/RTS prevents the computer from sending more data than the modem can handle.

Initialization
In modems, the establishment of an active configuration that, in whole or in part, supersedes the factory configuration. By using an initialization string, you can configure the modem to work well with your communications program. *See* initialization string.

Initialization string
(Also referred to as init. string.) In modems, a group of AT commands issued to the modem by a communications program at the beginning of a communication session, that establishes an active configuration. Initialization strings enable communications programs to work smoothly with a variety of modems, and often you can choose an initialization string appropriate for your modem from a list provided in your communications program. *See* initialization.

Interrupt Request (IRQ)
Signal used by a device, such as a mouse, to inform the CPU that it is present and functioning.

Internet Service Provider (ISP)
A company that provides end users access to the Internet.

ITU (also ITU-T)
International Telecommunications Union. An international organization that sets

standards for communications technology. In computers, ITU standards such as the widely used V.32bis protocol governs some high speed modem communications, enabling modems from different manufacturers to communicate with one another.

ITU V.42
The international standard protocols for error correction (MNP 2-4 and LAPM).

ITU V.42bis
The international standard protocols for error correction (MNP 2-4 and LAPM) and 4:1 data compression (BTLZ).

Jumper
A small plastic plug that fits over a pair of pins. When the plug straddles two pins it makes an electrical connection. The computer makes decisions based on whether the connection is made or not. A group of jumper pins is called a jumper block.

LAPM
Link Access Procedure for Modems. The error correction protocol preferred by the V.42bis modem protocol. BTLZ connections require LAPM error correction.

Local Echo
A modem feature that enables the modem to send copies of keyboard commands and transmitted data to the screen.

Local Modem
Your modem.

MNP
Microcom Networking Protocol. Protocols providing error correction (MNP 2-4, MNP 10) and 2:1 data compression (MNP 5).

Modem/Fax Modem
A modem (MODulator/DEModulator) is a device that can take computer data (a series of "1"s and "0"s) and convert it to tones that can be transmitted/received through a communications channel such as radio or telephone lines. Another modem at the other end can decode the tones back into the original data. Fax modems are modems that can also communicate with fax machines in addition to their data communications.

NVRAM
Nonvolatile random access memory. User-programmable memory whose data is retained if the device is turned off.

Negotiation
The process where your modem and the remote modem determine what type of connection to make. *Synonyms:* Detection, Detection Phase.

Normal Connection
Same as a Direct connection, but with the addition of flow control, which allows the computer and connection rates to be different. A Normal connection does not

support error correction or data compression.

Online State
Operating mode where your modem can communicate with the remote computer. *See also* Command State.

Plug and Play
Plug and Play automatically manages the communication between the system and the new device. Windows™ 95 takes over all necessary work from loading the correct drivers to the most optimal connection between hardware and software.

Physical Protocols
Descriptions of actual electronic signals used to communicate over phone lines. For example, ITU V.32bis,33.6, and V.pcm. *Synonym:* Transmission Protocols.

Pulse Dialing
A means of telling the Central Office the number to be reached. Pulse dialing can be recognized by clicks, instead of beeps, when dialing. Not all phone systems support touch tone dialing; pulse dialing is the alternative. All Supra modems can use tone or pulse dialing.

Reliable Connection
A connection that uses one of the error correction or data compression protocols available.

Remote Modem
The modem to which you connect.

RAM
Random Access Memory. *See also* NOVRAM.

ROM
Read Only Memory: the ”brains” of your modem.

REN (Ringer Equivalence Number)
A number indicating the amount or quantity of ringers (or products) which may be connected to a single phone line and still ring. The total of all RENs connected to a single line may not exceed the value of five (5) or some or all of the ringers may not work. In some cases the maximum REN may be lower. Check with your local phone company if you are interested in the exact maximum REN for your line. Most Supra modems have a REN of 0.3 (REN is also called the ”Load Number” in some cases).

RTS/CTS
Request to Send/Clear to Send. *See* Hardware Handshaking.

Silent Answer
Silent Answer allows your modem to ”listen in” on an incoming phone call and determine whether or not the incoming call is a voice call or a fax call. After the call is answered by you or your answering machine, the modem listens for CNG tones. If they are detected, the modem will take the call. If they are not detected, the modem

will ignore the call.

Synchronous
In synchronous transmission, blocks of data are sent at strictly timed intervals. The timing is uniform and no Start/Stop bits are required. Standard telephone lines carry a synchronous data stream.

Telephone Answering Device (TAD)

Terminal Stay Resident (TSR)
Programs that are run once then remain in memory in order to be activated by a sequence of key strokes or a hotkey. It is possible that a TSR may take up too much memory and cause conflicts with other programs.

Throughput
Effective transfer rate. Generally, on a 14,400 bps connection, data will transfer at a maximum of 14,400 bps, so max. throughput is 14,400 bps. But on a 14,400 bps V.42bis connection (V.42bis compresses the data to one-fourth its size) throughput can be four times that of the non-V.42bis 14,400 bps connection, or 57,600 bps.

Tone Dialing
Commonly known as touch tone, tone dialing is a means of telling phone company equipment the number to be reached by means of differing tones for each number. Tone telephones have a dialing keypad, though some keypad phones use pulse dialing. All Supra modems can use either tone or pulse dialing.

Trunk Line
The path connecting your phone system to the phone company's Central Office.

TSR
See Terminate and Stay Resident.

UART
Universal Asynchronous Receiver/Transmitter. UART chips control the serial port/s on personal computers. The UART is a device, usually a integrated circuit chip that performs the parallel-to-serial conversion of digital data that has been transmitted. The UART converts the incoming serial data from a modem into the parallel form which your computer handles. UART also does the opposite, converting the computer's parallel data into serial data suitable for asynchronous transmission on phone lines.

12

INDEX

Symbols

Numerics

A

B

C

D

E

F

G

H

I

J

L

M

N

O

P

R

S

T

V

W