# The AutoModem™ Family

*Incorporating:—*
*21/23, 12/12, 24/24, 123 & 1234*
*Intelligent RS232 Auto Dial/Auto Answer Modems.*

## User & Reference Manual

### VERSION 1

*July 1987*

© *NetComm (Australia) Pty. Limited, 1987*

# NETCOMM (AUSTRALIA) PTY LIMITED

## The AutoModem Family

Intelligent Auto Dial & Answer
RS232 Direct Connect Modem

AutoModem 21/23
AutoModem 12/12
AutoModem 24/24
AutoModem 123
AutoModem 1234

*User & Reference Manual*

Version 1.0, July 1987

## WARRANTY REGISTRATION CARD

TO: **NetComm (Australia) Pty Limited**
P.O. Box 284,
PYMBLE N.S.W. 2073
AUSTRALIA

| | |
|---|---|
| Tel. | (02) 888-5533 |
| Minerva | 07:DNC002 |
| VIATEL | 288855330 |
| Telex | AA27488 MODEMS |
| Fax | (02) 887-2839 |

PRODUCT   *The NetComm AutoModem Family*

MODEL _____ SERIAL NO _____

NAME _____

TITLE _____

COMPANY _____

ADDRESS _____

_____

_____

POST CODE _____ STATE _____

COUNTRY _____ PHONE _____

KEYLINK/VIATEL/OTHER _____

_____

SIGNED _____ DATE _____

PURCHASED FROM _____

ADDRESS _____

_____

DATE OF PURCHASE _____

(Keep a copy of this plus the terms on the reverse for your records.)

# TABLE OF CONTENTS

## INTRODUCTION

## CHAPTER 1. WHAT THE AUTOMODEM FAMILY DOES

## CHAPTER 2. INSTALLING AND TESTING THE AUTOMODEM

## CHAPTER 3. USING THE AUTOMODEM FAMILY

## APPENDIX A. AutoModem Command Reference

## APPENDIX B. Troubleshooting Guide

## APPENDIX C. Summary of "AT" Commands

# *Introduction*

## *READ THIS FIRST*

Congratulations on your purchase of an AutoModem. You will find your AutoModem will open the door to a whole new world of communications for you.

In this manual you will learn how to install and use your AutoModem. Together with a communications software package, the AutoModem Family lets you communicate with nearly any other micro, mini, and mainframe computer.

## *What You Need to Know to Use This Manual*

To use this manual, you should know how to use the keyboard and screen of your computer or terminal to which you will connect your AutoModem. If you do not know how to use your computer or terminal please read the appropriate user manual first.

## *What This Manual Tells You*

This manual is a complete guide to the AutoModem Family. It is organised in two major sections. The first section - Chapters 1 to 3 - is a basic guide to using the modem for non-technical users. The second section - the Appendices and particularly Appendix A - is a complete description of the modem for users who require more information.

The manual contains all the information you'll need to get your modem running.

**Chapter 1** "What the AutoModem Family Does"; tells you what the modem does and what hardware and software you need to use it.

**Chapter 2** "Installing and Testing the AutoModem"; tells you step-by-step how to unpack, install, and set-up the AutoModem Family.

**Chapter 3** "Using the AutoModem Family"; describes the ideas and concepts behind the design of the AutoModem Family.

**The Appendices** provide further information and include technical specifications and hints on resolving communications link problems.

## What's in the Package

In your AutoModem package you should receive the items pictured in Figure I-1.



*Fig I.1*

These are:

An AutoModem and its associated Plug Pack power supply.

A telephone cable to connect your AutoModem to a standard Telecom wall socket.

This User and Reference Guide.

A Telecom TS.72 form and a Telecom notice about connecting privately owned equipment to the telephone system.

A Warranty Card

Contact your dealer if any items are missing.

## What Else Do You Need

As well as your modem you will need a connecting cable and a communications program.

### What The Symbols Mean

Throughout this manual, some terms may be used with which you are not familiar. These words are defined in the glossary.

Helpful hints and interesting sidelights appear in boxes, like this:

> *NOTE: You may want to read this note, but then again you may not.*

Warnings about potential problems and advice about how to avoid them appear in boxes like this:

> **WARNING:   Pay attention to what's in these boxes  --   or else!.**

You'll also find occasional notes in the margin that emphasize a point or refer to related information in another part of the manual.

*Read the marginal notes for quick reference*

## Comments and Suggestions

If you have any suggestions for changes or improvements in the current product, or suggestions for a new product, just drop us a line. Your comments are always welcome.

NetComm (Australia) Pty Limited
P O Box 284
PYMBLE  NSW  2073
AUSTRALIA
Telephone =  (02) 888-5533      Telex = AA 27488 *MODEMS*
Fax =  (02) 887-2839             Viatel =  288855330
Minerva =  07: DNC002

## Acknowledgments

Various companies products are referred to in this manual.  In particular:-

® **"Hayes"** is a Registered Name of Hayes Microcomputer Products Inc, U.S.A.
**"The NetComm Program"** is a Registered Trademark of NetComm (Australia) Pty. Limited.  **"NetComm"** is a Registered Name of NetComm (Australia) Pty. Limited.

# Chapter 1

## WHAT THE AUTOMODEM FAMILY DOES

In this chapter you will learn what your AutoModem does and what other equipment and software you will need to use it.

### Communicate with Many Computers

Your AutoModem lets you communicate with other personal computers. It is also ideal for communicating with host computers and Bulletin Board services.

This means that you get the use of several computers for the price of one. The AutoModem Family provides the ability to connect to various other mainframe and mini computers, data bases, information services, electronic mail services and lots more.

### Intelligent Modem

Your AutoModem is an intelligent modem, which means that it can both dial and answer your telephone. What makes your modem intelligent is its built-in microprocessor which controls operation of the modem and facilitates communications between your computer and the computer that you are calling, with a minimum amount of effort from you.

Your AutoModem takes care of the dialling, answering and disconnection of the phone line for you in conjunction with your communications software.

### "AT" Commands = Auto Dial & Answer

Your AutoModem is particularly designed to be used with the enormous range of communications packages which use the 'AT' industry standard command set (pioneered by Hayes®) to control the modem.

Naturally, you can easily use packages which are not designed for the 'AT' commands; you can send the required commands directly to the modem.

### Asynchronous

Your AutoModem only operates asynchronously. The modem can connect to bulletin board systems, electronic mail, telex, videotex and other computers which use asynchronous communications, at speeds from 300 to 2400bps, depending on the model.

## What You Need

Here's what you need to use an AutoModem

An AutoModem, its plug pack plus the telephone cord that comes with the modem.

A computer or terminal.

A Data Cable to connect your computer or terminal to the Modem.

A normal Telecom voice grade telephone line, preferably not via a switchboard or PABX etc. Some old and very new switchboards may cause minor troubles. Check with your dealer or Telecom if you are unsure

A suitable communications software package for your computer. The NetComm Program is available for use with a variety of Personal Computers, including IBM, Apple and Commodore.

If you want to print any data that you have received, you will need a printer. Check which models and interfaces are supported by your communications software package(s).

### Data Cable

When you bought your modem, you should have purchased the data cable that fits your particular computer as well.

> **WARNING; You can damage your modem or your computer, or both, by connecting them together incorrectly. Use the data cable that is made specifically for connecting your computer to a modem. Check with your dealer if in doubt.**

## Software and Your AutoModem

Most modern communications software, like The NetComm Program, is capable of controlling the modem for you and so you will normally not need to know a great deal about how the modem operates. If you are interested in the technical details of the modem or your software is not capable of controlling the modem, you may want to read Appendix A which describes the operation of the modem in quite some detail.

You should install your communications software to be able to control your AutoModem. Since we don't know what communications software you will actually use, you may need to refer to the manual for that software to find out exactly how to do this.   In most cases you can tell your

communications software that you are using a "Hayes 1200" or "Hayes 2400" type of modem.

Most communications software will allow you to control your communications by dialogs, menu selections or multiple choice lists. Once you have selected what you want, the software will then control your AutoModem for you.

You may need to be familiar with some new terms described in the "Language of Data Communications" section below to allow you to make intelligent selections from the menus in your communications software.

### Keeping You Informed

Your AutoModem will, after connecting to a remote modem, respond with a CONNECT message that tells you the speed of the connection. Some up-to-date data communications programs will automatically select the same speed that the modem has found for connection. Read Appendix A about the 'Response Codes' and especially the extended Response Code set (the "ATX1" command). The modem uses an internal speaker to further let you know what is going on.

## Important Features

### Modem and Telephone

Your AutoModem is the link between your computer or terminal and the telephone socket. It replaces your telephone. You can still have a telephone, of course, by using a suitable double adaptor plug in the Telecom wall socket.

### Saveable Options

The AutoModem has also been designed to remove the frustration of configuring it to your particular requirements each time you use it.

There are many options which have been set to sensible values in the factory. If you need to update these, then you need only issue a command from your computer.

Once your AutoModem has been configured to your requirements, the "&W" command will store your selections so that when you next turn on the modem it will automatically be set the way you require it. Your configuration is stored in the AutoModem in an area known as the "non-volatile RAM" (Random Access Memory). This non-volatile RAM will store details even when the modem's power is turned OFF.

### Local Error Testing

The AutoModem is capable of a local test. If you are concerned about performance this test will assist you to isolate the problem area.

### Speed Rate Converter;  Buffered

If your AutoModem supports V23 mode and you select that mode, the AutoModem selects 1200/75 bps, i.e. 1200 outbound (to you from the host) and 75 inbound. Now, if your computer or terminal is then configured at 1200/1200, the AutoModem automatically converts data originating from your computer or terminal from 1200 bps to 75 bps (about as fast as you type) and buffers your data up to about 40 characters.

### Telecom  Approved

The AutoModem Family is fully approved by Telecom Australia.  The Authorisation Number is shown on the underside of the modem.

---

## The Language of Data Communications

There are a lot of special terms that are used when talking about data communications.

You do not need to know most of these but the following are a few hints with which you should be familiar.

You don't really need to understand exactly what they mean in great detail but you do need to be able to recognise them and be able to compare the capabilities of your AutoModem with what a remote computer system needs, thus ensuring that you can successfully communicate with it. Read the section "Data Communications for Beginners" below.

### * Modem

A modem, like your AutoModem, allows your computer to send data over the telephone system. The remote computer needs one too.

### * Modem speeds

The rate at which a modem can transfer information over the telephone system with another modem is often called the "modem speed".  The speed of a modem is usually expressed in "bits per second" or "bps". This is also sometimes referred to as the "baud rate" of the modem. While not strictly accurate from a technical point of view, many people use the terms "bps" and "baud" to mean the same thing.

---

The speeds at which the various members of the AutoModem Family can communicate are:

| | |
|---|---|
| CCITT V21 | the Australian standard for 300bps modems |
| CCITT V23 | the Australian standard for 1200/75 bps modems |
| CCITT V22 | the Australian standard for 1200bps modems |
| CCITT V22bis | the Australian and US standard for 2400bps modems |
| Bell 103 | the US standard for 300bps modems |
| Bell 212A | the US standard for 1200bps modems |
| Bell 2400 | this is V22bis with a fallback to Bell 212 instead of V22 |

### * Modem  Standards

For your AutoModem to be able to communicate with another modem, both modems must be able to understand what the other is communicating. In other words both modems must be using the same modem data communications standard.  Your AutoModem supports different standards and so is able to communicate with other modems that also support one or more of those standards. The standards which your AutoModem supports are:

| Model | V21 | V23 | V22 | V22bis | Bell 103 | Bell 212A | Bell 2400 |
|---|---|---|---|---|---|---|---|
| AutoModem 21/23 | x | x | | | x | | |
| AutoModem 12/12 | | | x | | x | x | |
| AutoModem 24/24 | | | x | x | x | x | x |
| AutoModem 123 | x | x | x | | x | x | |
| AutoModem 1234 | x | x | x | x | x | x | x |

### * Data Format

As well as having modems using the same communications standard on both ends of a telephone line, you also need to make sure that the computers at both ends are able to understand each other.  To do this they must both be set to the same data format.  A data format is often expressed in terms like "8 data bits, 1 stop bit, no parity" or "7 data bits, 1 stop bit, even parity".

### * Originate and Answer Modes

For modems of the same data communications standard to be able to communicate with each other, one modem must be in "originate" mode while the other must be in "answer" mode.  When you dial into a remote computer system you will almost always have your AutoModem in "originate" mode. If you are using your AutoModem to automatically answer the phone for other modems it will be in "answer" mode.

## Data Communications For Beginners

Here is a brief summary of key data communications concepts that you should understand.

### Equipment

Data Communications is the exchange of information between two or more locations. Typically, one of the locations is a computer and the other locations are computer terminals.
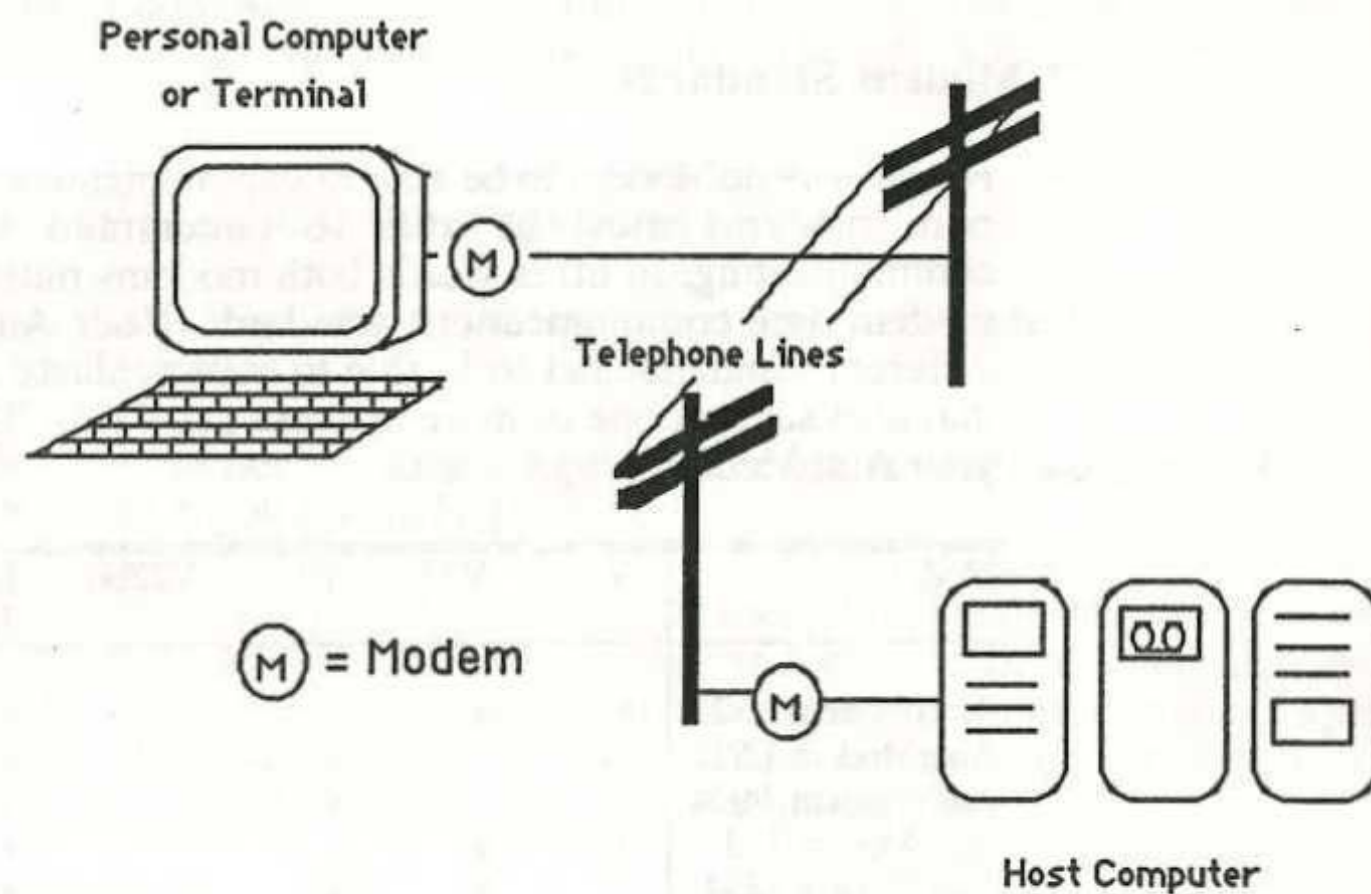


*Figure 1.1. Connection to a Host.*

(From here on we'll call it the "terminal", whether it's a computer, or a non-intelligent terminal).

There are two ways to connect computers for communication:

1. "Hard Wire" (sometimes called Direct Connect) -- where the computer and the terminal are in relatively close proximity (within 15 metres). With a hard wire connection the computers are connected by a cable.

2. Remote, telephone or modem connection -- where the computers are connected via a telephone line. A modem is needed for this type of connection so that the digital data can be transmitted over the telephone lines. ·

When connection is via a modem,

The modem converts the digital data that comes to it from the computer into analog (sound) signals that can travel over the telephone line, and converts the analog signals that come to it from the telephone lines into digital data that can be received by the computer.

Telephone lines carry the data, in the form of analog (sound) signals, from one modem to another. The telephone lines may be standard (switched), leased, or privately owned. Telephone lines may also be used to dial into "digital packet" data networks such as AUSTPAC and MIDAS.

### Protocols

There are several sets of rules for how to communicate with the host. Each set of rules is called a protocol. The protocol determines how data is sent across the communciations line between two locations. The terminal is able to communicate with the host by emulating (imitating) the protocol used by terminals normally connected to the host.

The signal coming from the terminal then looks like the signal from any other terminal.

Asynchronous protocols generally transmit the data as it is entered from the keyboard. "Bits" are wrapped around the data to tell the modem to start (prepare) for the character to come, and to stop (and wait) for the next.

Some protocols communicate interactively, others transfer files. When you use an interactive protocol, each character is transmitted as you type it or when you press <RETURN> or <ENTER>.

When you use file transfer protocols, you must prepare the data in advance and save it in files on disk, then transmit them in a batch to the host.

You can use file transfer protocols to send one or a series of files from one personal computer to another. The data in each file must still be prepared in advance by your word processor, spreadsheet or database program.

## Important Telecom Information

Telecom Australia require you to be aware of the following:-

### Telecom Advice Regarding Location and Connection of Modems In Dangerous Situations

"The apparatus described in this Authorisation can only be located and connected to Telecom plant in normal commercial and domestic situations. Where location and connection is required in a dangerous situation (eg. High voltage power station) and the electrical safety protection limits of line isolation may be exceeded, separate approval must be sought from Telecom in each instance.

### Telecom Compliance Regarding Repetitive Calling Facilities

Telecom requires customers who have equipment which has repertory dialing facilities to be aware of their requirements when using this equipment. The following section is a reprint from Telecom Specification 1056, Issue 3.

### Definition

Repertory Dialler - A storage device which allows a telephone customer to store one or more telephone addresses (telephone numbers), and at any subsequent time to manually select a stored address (or addresses) which will then be automatically transmitted to the exchange line to originate calls on the Switched Telephone Network.

Repetitive calling facilities shall comply with the following:

(i)The facilities shall be manually initiated, and provision shall be made for the facility, once actuated, to be cancelled before the sequence of calls has been completed.

(ii) the maximum number of calls in any automatic redialling sequence or sequential calling sequence where no manual action is required between calls shall be as follows.

(a) Repertory diallers which do not incorporate service tone detectors - Three calls (the original plus two automatically initiated retries).

(b) Repertory diallers which incorporate service tone detectors which will ensure that the line will be released after the receipt or otherwise of a service tone indicating the call will not be successful - Five calls (the original plus four automatically initiated retries).

(iii) At the end of any unsuccessful call, there shall be an "Off Line" period of 60 + 10 seconds before the line is automatically looped to initiate another call to the same number.

(iv) There shall be an "Off Line" period of at lease 2 seconds between two calls addressed to different numbers.

(v) An automatic redialling sequence in progress shall be automatically cancelled by:-

(a) A successful call (indicated by an answer from a called party) made from a repertory dialler which incorporates service tone detectors, or

(b) Any manual action of the caller which could cause a sequence in progress to be interrupted, e.g. using the associated telephone for normal caller to take control of a call established from the repertory dialler.

(vi) It shall be possible for the caller to use the repertory dialler to make single calls to any number stored in it without automatically actuating any repetitive calling facilities with which the number called is associated".

# Chapter 2
## INSTALLING AND TESTING THE AUTOMODEM

The AutoModem Family is designed for use with any computer or terminal that has an RS-232 serial interface.

The installation procedure for the AutoModem Family is generally similar for all computers.

*NOTE: Before you try to connect your modem or turn it on, take a minute to look over it and become familiar with it.*

### The Front Panel

Figure 2-1 shows a front view of an AutoModem.  Notice the indicator lights on the front of your modem.  They let you know what the AutoModem is doing.  There is a speaker inside which also keeps you informed on the progress of a call.

### Different Models

As mentioned there are different models in this family.  Generally all models have a similar front and back panel.

The operation and control of the modem is generally the same - the only exceptions are where certain commands and features are oriented to one particular model.  Where commands and features are specific, this manual will tell you.
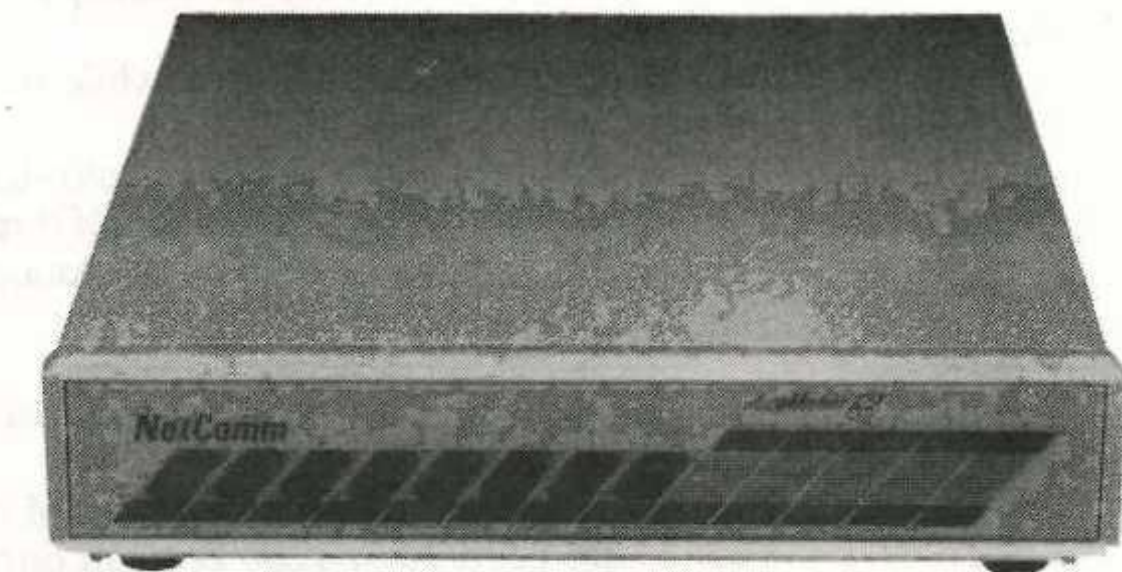


*FIG 2-1   The Front View.*

## What The Lights Mean

As you can see, there are eight (8) indicator lights on the front of your AutoModem. They indicate the state of the Modem, and they mean the following:

**TD**      **Transmit Data:**

The modem is transmitting data. This indicator flashes as data is sent.

**RD**      **Receive Data:**

The modem is receiving data. Each flash of the indicator represents data being received.

**OH**      **Off Hook:**

When on, the modem has lifted up the handset' and is using the phone connection. Don't try to use the handset at the same time - you will corrupt the data.

**CD**      **Carrier Detect:**

The modem has recognised a carrier signal on the line and has connected to it.

**HS**      **High Speed: (except 21/23 model)**

This indicator is read in conjunction with the 22/22+light.

If the 22/22+ light is ON while the:

i)  HS light is ON then the AutoModem is in V22 bis or Bell 2400 mode, ie: 2400bps
ii) HS light is OFF then the AutoModem is in V22 mode or Bell 212A mode, ie: 1200bps

If the 22/22+ light is OFF while the:

i)  HS light is ON then the AutoModem is in V23 mode, ie: 1200/75 or 1200 bps half duplex.
ii) HS light is OFF then the AutoModem is in V21 or Bell 103 mode, ie: 300 bps.

**HS**   .   **High Speed: (21/23 model only)**

i)  HS light is ON then the AutoModem is in V23 mode, ie: 1200/75 or 1200 bps half duplex.
ii) HS light is OFF then the AutoModem is in V21 or Bell 103 mode, ie: 300 bps.

**AA**      **Auto Answer (except 21/23)**

This light, if on, shows the modem is waiting idle, but will answer the phone if it rings. See the Section in Appendix A titled "Auto Answer Process". This light flashes for the Self Test, see "Testing your Installation".

> NOTE:  The AA light will be off if ATS0=0

**RI**      **Ring Indicate (21/23 model)**

This light is normally off and flashes when the phone line is ringing.

**TR**      **Terminal Ready**

This light indicates that the computer or terminal is ready. (DTR is raised.) The modem will raise DSR to the terminal when a connection to a remote modem has been established.

> NOTE:  RD and TD may be on even if the power to the modem is off

**22+**     **Mode: (except 21/23 model)**

Refer to "HÍ" light description for details.

The "22+" light is only called "22" on the 123 model.

**MR**      **Modem Ready: (21/23 model only)**

This light is called "MR" on the 21/23 AutoModem; this means "Modem Ready".

## The Rear Panel

Now turn your modem around and look at the back. This is where the action is:

Two modular telephone jacks
RS-232 Data Cable Connector - This is the standard DB25 format.
DIP Switches
Power Cable Connector and the ON/OFF Switch

> *NOTE: The volume control for the speaker in your AutoModem is located underneath. You can change the volume with a small screwdriver. Turn clockwise or counterclockwise to increase or decrease the volume.*



*Fig 2-2. The Rear End*

## The Dip Switches

> *NOTE: This section is for advanced users. Skip it if you aren't sure and come back to it later.*

DIP means Dual In-Line Package. These are also called Piano Switches.

The eight position DIP switch allows you to override certain aspects of the modem's ability. This means when you turn it off and on again, the DIP switches dictate certain settings must remain.

> *NOTE: The DIP switches ALWAYS override the software status of the Modem.*

There are four switches used and they are preset in the factory. The factory (standard or default) settings are shown '*' thus below:

The four switches control and support attributes of your computer or terminal when it is attached to the modem.

| Switch Number | Name | Setting | Meaning |
|---|---|---|---|
| 1 | DCD Override | Up | Modem supplies DCD on connection. |
|   |   | Down * | DCD permanently on. |
| 2 | RTS/CTS Loop | Up * | CTS always from modem. |
|   |   | Down | CTS in response to RTS only. |
| 3 | DTR Override | Up * | Terminal must supply DTR. |
|   |   | Down | DTR permanently on (supplied by modem). |
| 4 | DTR/DSR Loop | Up | DSR always supplied by modem. |
|   |   | Down * | DSR is raised in response to DTR being raised. |

## Installing The Modem

Setting up your AutoModem and connecting it to your computer or terminal is easy. The following list summarises the installation process described in some detail below.

1. You should notify Telecom that you are connecting a modem to their lines. You may need to order a dedicated telephone line. Please read the section called "Telephone Connection" below.

2. Connect the modem to your computer or terminal with the connect cable. See the section "Data Cable" in Chapter 1.

3. Connect the power supply and switch power on (switch up).

4. Double-check your completed installation.

5. Run a test to see that the modem is working properly. Read the section "Testing your Modem" below.

6. Then go on-line to your host or service.

### Electrical Connections

You need to make three electrical connections to finish installing your modem:

Telephone connection to your modem.
RS-232 connection to your computer and terminal.
Power connection.

> **WARNING: As always ensure that both the modem and the computer are switched off before connecting them together.**

### RS-232 Connection

Plug the data cable into the back of the modem. Connect the other end of the cable to your computer or terminal using its RS-232 serial port connector. See the section called "Computer Connection" below.

### Power Connection

The AutoModem is supplied with a special transformer that operates from any 240 V, 50 Hz AC power source. The name plate on the modem plug pack indicates the voltage, wattage and amperage ratings.

1. Find the plug pack, with power cable attached, that was supplied with your modem.

2. Flip the modem on-off switch down to the OFF (or 0) position.

3. Plug the connector end into your modem.

4. Plug the power module end into an electrical outlet.
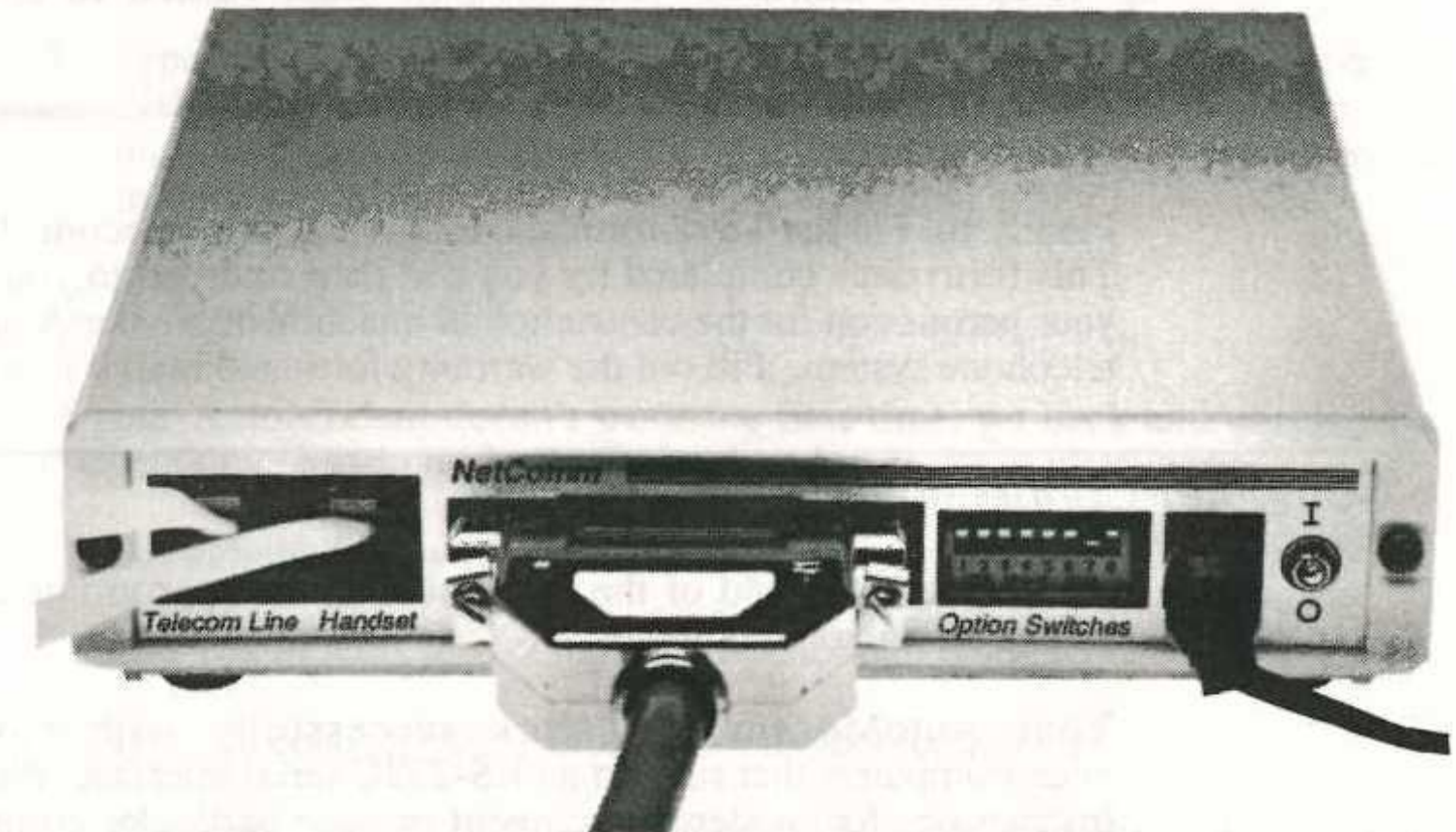


Fig 2-3. AutoModem with Connections Made.

### Telephone Connection

Plug the telephone connection cable into the modem as you perform the installation. Use the small modular jack (the RJ11 plug). You can connect the line connection cable to either of the two modular jack sockets on the back of the modem.

When the modem is correctly connected to the cable insert the Telecom 605 plug into the Telecom wall outlet you have selected.

> NOTE: We sttrongly advise that you install a direct outside line for your AutoModem.

Including a telephone in the circuit is optional. If you are using a phone line exclusively for modem communication, you may operate without a telephone connected. To use a telephone handset you must either obtain a double adaptor from Telecom or NetComm or obtain a phone that can connect to the extra socket on the rear of the modem.

A telephone will still work as it did before you attached your modem, except that the AutoModem is also able to answer the phone when you receive a call.

WARNING: When the modem is on-line, you cannot use the telephone handset. The modem must return to command mode or hang up first.

Finally fill out the TS72 form and lodge it at any Telecom Business Office. This form once completed by you and then returned to you by Telecom is your permission for the connection or attachment of your AutoModem to the telephone system. Fill out the warranty form and mail it in too.

## Computer Connections

Attach the loose end of the data cable to the appropriate serial interface connector on your computer.

Your AutoModem will work successfully with most brands of microcomputers that support an RS-232C serial interface. Please consult the instructions for modem attachment in your particular computer's owner's manual. Should you still not have sufficient information, check with the dealer from whom you purchased your computer.

## Testing Your Installation

Your AutoModem responds to software commands typed by you or sent by your data communications program. The easiest and best way to test your installation is to run a simple self-test procedure for the AutoModem.

NOTE: Read the manual that was supplied with your communications program to become familiar with some of the terms used in this section. If you are unsure about the performance of this procedure, ask your dealer for assistance.

To run the self-test, do the following:

1. Turn on your Computer and load the data communications program of your choice.

2. Enter Terminal Mode. Don't select Auto Dial (just yet!).

3. Type the modem command "AT Bn&T1" (where n is the number of the mode you want to test, from the range 0 to 11), then press <RETURN>. The letters "AT Bn&T1" should appear on the screen of your computer as you type them.

The message CONNECT will be displayed on your screen.

4. When you see CONNECT on the screen, type in a short message - anything you want. The letters should appear on the screen as you type them.

5. Type in "+++", wait a while then type, "AT&T0" followed by <RETURN>. This will tell the AutoModem to finish its self-test. The modem responds with "OK". You are now ready to begin normal modem operation.

## If It Doesn't Work

If your AutoModem doesn't work the first time, go back and check your connections. Most problems can be traced to errors in installation.

Go through the following checklist step-by-step:

Did you turn on your computer, monitor and modem?

Did you connect your AutoModem to your computer?

Did you connect your modem telephone cable to the Telecom wall socket?

Did you configure your communications program correctly?

If the answers to all these questions are 'yes', and your installation still doesn't work, consult your local dealer. Also check Appendix B "Troubleshooting".

## Turning Up The Sound

Sometimes you may need to adjust the volume of the speaker mounted inside your AutoModem. This is accomplished by adjusting a potentiometer which is accesible through the underside of the modem. Carefully turn the modem upside down. Use a small flat bladed screwdriver and insert it gently in the hole which should be clearly visible on the bottom of the modem.

Turn the screwdriver clockwise to increase the speaker volume; counterclockwise to decrease the volume.

# Chapter 3
## *USING THE AUTOMODEM FAMILY*

This section reviews the design concepts and describes the various commands you can use. These let you take advantage of all of the features and functions of the AutoModem Family.

---

*NOTE: Almost any communications program that controls a modem using the industry standard "AT" command set (popularised in the USA by Hayes®) can utilise the features of the AutoModem Family automatically. You need not take any action until the connection is dialled, established and (in some cases) until you have automatically logged on to the host. This is certainly the case for the NetComm Program .*

---

## Getting On Line And Staying There

Your AutoModem is intelligent, it is microprocessor driven. It has its own internal program which recognises certain command codes that you send it from the keyboard or by program.  Using these codes it can set itself up and commence operation, based on the information you supply.

Your AutoModem implements a superset of the Hayes ® "AT" command format. Full details of the commands are given in Appendix A. A reference card showing a summary of the commands is supplied with this manual. Copy of the reference card is bound in the manual as Appendix C.

### Software Versus Direct Commands

There are however two ways to control the way your modem works: by selecting commands from the menus provided by your software, or by learning the set of commands understood by your modem.

When you buy a sophisticated software program like The NetComm Program, you're paying for the convenience of being able to select what you'd like to do from easy-to-use dialogs.  The program interprets your wishes and issues many of the commands for you, serving as an intermediary between you and the modem.

## You're Not Alone

If you're like most users, you'll rely on your software to take care of virtually everything you'll ever want to do with your modem. If this is the case and you don't want to learn all the various direct commands, you can skip the rest of this chapter.

If, however, you want to take full advantage of the capabilities of your modem, you'll need to learn a few simple commands, as introduced below in this chapter and detailed in Appendix A.

With the right command, you can take advantage of several modem features:

*Automatic Dialling.* To call another computer, you can always dial the phone manually and then order your modem to establish communications. The auto dial feature lets you give all dialling instructions directly from your computer program or keyboard.

*Automatic Redial.* If the line you are calling is busy, you can try again simply by typing the command "A/". (The "AT" prefix is not needed). "A/" tells the modem to repeat the last command issued. This means that to use "A/" redial, you should not give any other "AT" or software commands between dialling attempts, or the modem will repeat the last command, which was probably not a dial command.

*Dial Cancellation.* If you want to cancel an auto dial call before it is answered, you can do so by pressing any key on the keyboard. The modem hangs up and sends a NO CARRIER message to your screen. (If you cancel a call accidentally, use the auto redial command A/ to try again).

## Design Concepts

### Non-Volatile Ram

In order to simplify its operation the AutoModem has the ability to store details of its setup. These details can be retained even when the AutoModem has been turned off. They are stored in a part of the AutoModem called "non-volatile RAM" (Random Access Memory).

After initial setup, every time the modem is powered on, or the reset command is issued, the configuration of the modem is restored from non-volatile RAM.

The "&W" command (see Appendix A) is used to store the current configuration of the AutoModem That configuration remains until the next "&W" command is issued and it is overwritten with new configuration information.

## Command Control

Your AutoModem has two levels of operation - the local command state and the on-line state. When you turn on the Modem, it automatically "powers up" in the local command state. Certain commands given by you or your communications program flip the AutoModem between local command and on-line states.

Local command state allows the selection of options like echo, monitoring the speaker, and other control parameters. These are all described in detail below.

On-line state is achieved by issuing a "dial" command ("ATD...."), in which case the modem goes on-line but as configured by earlier local commands. There are other commands to allow the modem to go on-line, for example, answer ("ATA").

All commands to the modem must be preceded by the command prefix, which consists of the letters "AT". (The only two exceptions are the "+++" and "A/" commands, see below). The "AT" prefix stands for "Attention!" and prepares the modem to accept your instruction.

Most modems need to be set up in one of two modes, Originate mode, when the modem originates a call and Answer mode, when it accepts an incoming call.

The AutoModem, however, automatically selects Originate when it dials and automatically selects Answer when you issue the Answer command. Answer is also the default mode.

Normally when it is switched on it will automatically answer when the phone rings.

> NOTE: *If you're calling a dumb originate only modem, you can set the AutoModem to reverse mode after you initiate the connection. See the "R" command in Appendix A.*

To assist in controlling the AutoModem, it outputs response messages or codes to show what state it is in. These may be numeric or verbal for you or a program to inspect and act upon. (They may also be suppressed.)

Whilst on-line the AutoModem cannot execute commands, it must be set back to local command mode first. This is done by entering the "escape sequence" and also occurs if the modem loses the phone connection. Figure 3-1 shows the paths between local command and on-line modes.
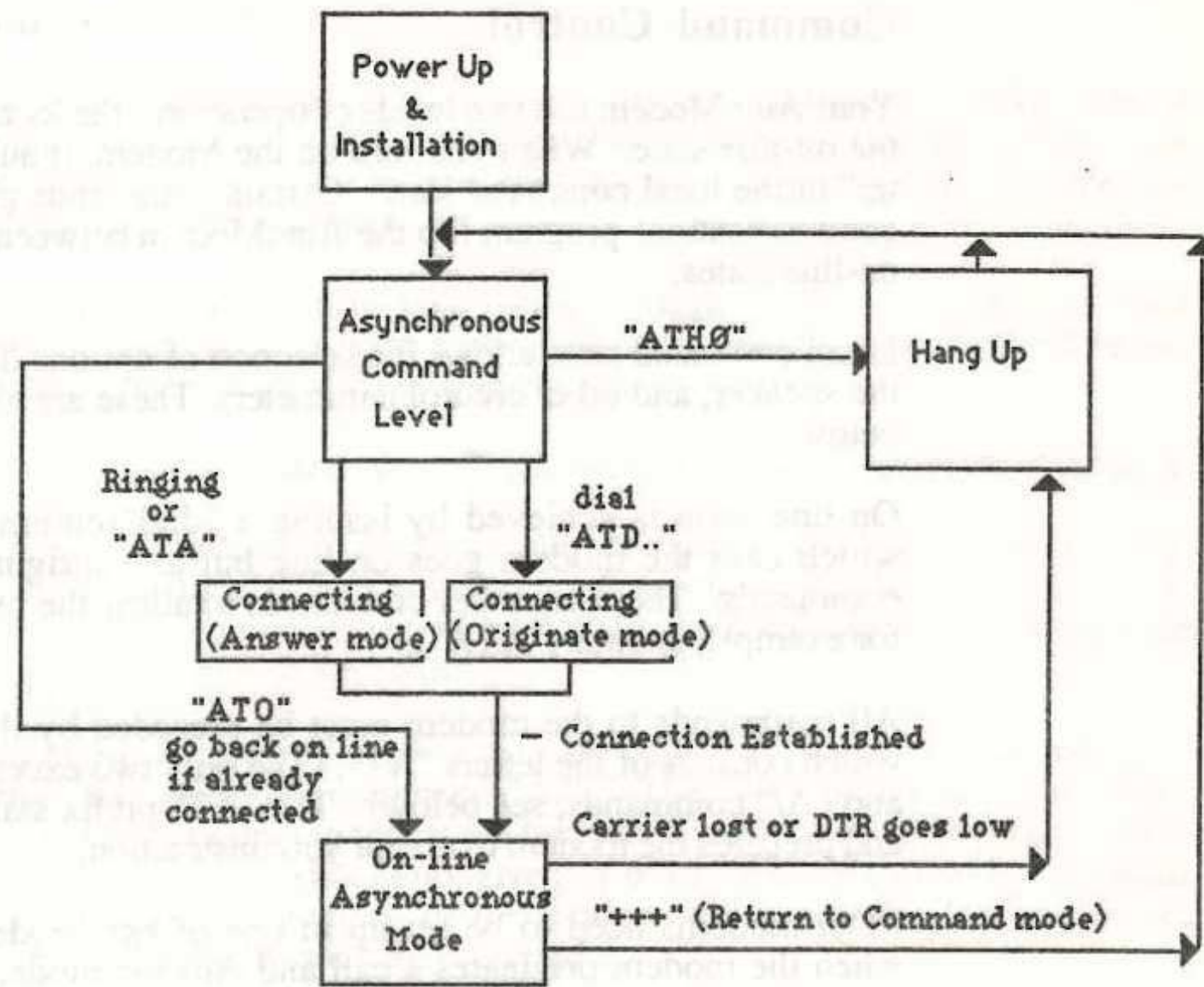
Figure 3-1. Command State Paths

## Modem Commands

An AutoModem command consists of a series of characters that control your modem in one way or another. The modem commands used to control your AutoModem can be grouped into:

*General Commands* -- how to control the state of your modem and some of its characteristics.

*Dial Commands* -- how to get the modem to dial and connect for you.

*Answer Commands* -- allow you to control the answering performance of your modem.

> *NOTE; To escape from On-Line mode wait one second, then type the escape sequence "+++", and wait one second.*

Modem commands are organised into a line of letters and numbers called a command string. The order in which the command string is typed determines the order in which the modem obeys the command. The modem won't execute a command string until you press <RETURN> (except for the Redial command and escape sequence).

## Command Prefix

You may generally enter commands in any order, but the letters "AT" must appear at the start of every command string and a Carriage Return must terminate the string. It is possible to enter several consecutive commands in one command string, preceded by "AT" and followed by <RETURN>. Example command strings are shown below.

> *NOTE: Unless otherwise noted "Carriage Return", "Return" and "Enter" all mean the same thing.*

## Typing Modem Commands

As mentioned above, the modem powers up in local or command mode automatically when it is turned on. You can tell when your modem is in the Command Mode when you see the response message "OK" or "NO CARRIER" displayed.

The letters "AT" are used to start a new command string. Command letters and numbers should be typed together without spaces in between. Commands may be mixed in any order, provided the Answer, Dial and Reset commands are the last in the command string.

Use <BACKSPACE> to move back and correct any errors. <CR> is used to complete the command.

> *NOTE: From here on "<CR>" will be used to indicate you should press the Carriage Return or Enter Key.*

Once the command has been entered it is stored in a buffer of 40 characters. It is then processed serially from that buffer. If you try to type in more than 40 characters the buffer will overflow and you will get the message ERROR. The "AT", Carriage Return and any spaces are not included in the count of 40 characters.

> **IMPORTANT:  The letters "AT" must be typed correctly --
> do not backspace, or the command may be ignored.**

Here is a simple overview of some of the commands:-

| When You Want To | Type | This Means |
|---|---|---|
| Enter any command | AT | Attention! |
| Enter a command while on line | +++ | Escapes to Command mode |
| Originate a call | ATD(number) | Dial (number) |
| Use Tone (DTMF) dialling | ATDT(number) | Dial Tone |
| Use pulse dialling | ATDP(number) | Dial Pulse |
| Call an "originate only" modem | ATD(number)R | Reverse |
| Return to command mode after number is dialled | ATD(number); | Return to command mode |
| Answer a call | ATA | Answer |
| Return to on line communications | ATO | On line |
| End the call | ATH | Hang up |
| Redial the last number called | A/ | Repeat my last command |
| Turn on the audio monitor (speaker) | ATM1 ATM0 | Monitor on Monitor off |

## Modem Commands at a Glance

Below you'll find a list of commands, grouped by function; refer to Appendix A for a more complete description. Unless you are an advanced user you will probably never need these commands, and you can skip ahead to the next section, "What You Can Do With Your Modem".

### Commands to Control Modem Features

| Command | What It Controls | Default |
|---|---|---|
| M | Modem Speaker | M1 (on) |
| Z | Command Reset | |
| S0 | Auto Answer | S0=1 (on) |
| E | Command Mode Echo | E1 (on) |

### Commands to Control Result Code Messages

| Command | What It Controls | Default |
|---|---|---|
| Q | Stop/Don't Stop Messages | Q0 (don't stop) |
| X | Show Some/All Messages | X1 (some) |
| V | Show Word/Code Messages | V1 (words) |

### Commands to Redefine Keys

| Command | What It Designates | Default | |
|---|---|---|---|
| S2 | Escape Character | S2=43 | (+) |
| S3 | Return Character | S3=13 | (<Return>) |
| S4 | Line Feed Character | S4=10 | (<NL>) |
| S5 | Backspace Character | S5=8 | (<BS>) |

### Commands to Control Timing

| Command | What It Controls | Default/Units | |
|---|---|---|---|
| S6 | Wait Before Dialling | S6=2 | (seconds) |
| S7 | Wait for Carrier | S7=30 | (seconds) |
| S8 | Length of Pause | S8=2 | (seconds) |
| S9 | Required Carrier Tone Length | S9=12 | (tenth secs) |
| S10 | Wait Before Hang Up | S10=14 | (tenth secs) |
| S12 | Required Delay Before After Escape Code | S12=50 | (50ths/sec) |

### Commands for Special Circumstances

| Command | What It Controls | Default |
|---|---|---|
| B | Bell/CCITT mode | See Appendix A |
| I | Identification | |

## Matching Modes And Speeds

When power is applied to the AutoModem, the speed chosen defaults to the value previously stored in the non-volatile memory.  The rates that may be stored depend on the AutoModem model you are using.  "AT" commands may be issued at any of these speeds. Each time the AutoModem receives a new "AT" command line, the communications rate at which this command line is issued replaces the current default rate.  When the AutoModem is on-hook (that is the line is "hung up") the active communications rate will always reflect the rate at which the most recent AT command was issued, or the speed of the last connection.

When the AutoModem is originating a call or answering a call it must be set to the speed of your AutoModem to match that of the remote modem.

---

**WARNING**  It is your responsibility (or your program's) to ensure that you set the speed of the serial port to match that of the remote modem.

---

# APPENDICES

Appendices

## APPENDIX A.   Table of Contents

# Appendix A

## AUTOMODEM COMMAND REFERENCE

This section details each of the modem commands and it's various formats, parameters, defaults, etc.  The commands are presented in four sections; General commands, Dialling commands, Answer commands and finally more General commands (plus the various "S" registers).

There are also some command examples.

### General Commands; Swapping Modes;  Resetting the  Modem

General commands are used to determine how the modem and computer communicate.  Certain commands and options only apply to specific modes of operation.

### Escape Sequence "+++"

The Escape Sequence puts the AutoModem back to local command mode from on-line.  Its format is fixed but the parameters may vary.  The format is a Time Delay followed by a character entered 3 times, followed by another Time Delay.  The Default Time Delay is one second, while the default character is "+" (the 'plus' sign).

To enter the Escape sequence, using the default values, enter the following:

> Wait at least 1 second (after the last character was entered).
> Type in "+++"
> Wait at least 1 second (before trying to transmit another character).

You will know that you're back in local command mode when you see the modem respond "OK".  The telephone line at this stage is not released; this only happens when the Hang Up command ("ATH0" - see below) is issued, or if the DTR signal is dropped by your Computer or terminal on it's modem interface.

The Time Delay either side of the Escape Characters is a protection mechanism to avoid the case where the three escape characters could be part of a message.

---

**WARNING:  When in answer mode, it is recommended that the escape sequence be disabled or set to a value other than that used by the originator.  See the section "Available Special Registers" later in this Appendix, Registers 2 and 12.**

---

## On-Line Command "O"

To return the AutoModem to on-line mode from local command mode issue the "O" command (letter O). The format is:

O            to go back on line.

> *NOTE: All AT commands except "A/" and "+++" must be terminated with a carriage return. The symbol used in this manual for a carriage return is <CR>.*

## Hang Up Command "H"

This command causes the AutoModem to hang up the telephone line. It is issued from the local command state after the escape sequence ("+++") has been issued. Use:-

H0 or H      Hang up the telephone line (go "on hook").

H1           Pick up the telephone line (go "off hook").

## Identification Command "I"

This command is used to display the product identity and version number. The format is:

I            to view product identity.

In numeric response mode ("V0") the modem responds with "123". This response is expected by some software applications.

In verbal response mode ("V1") the full product identity is displayed. This information is often required when requesting customer support.

## Reset Command "Z"

The Reset Command is issued to return the AutoModem to a known state. It resets all of the registers and parameter values to the values which have been stored in non-volatile memory. Use:

Z            to reset parameters to stored defaults.

## Monitor Echo Command "E"

When the modem is in local command mode this command can display the characters you type on the keyboard onto your screen: Use:

E0 or E      turns OFF the command echo.

E1           turns ON the command echo.

## Transmission Mode "B"

The "B" command is used to determine the appropriate mode for the speed selected.

> *NOTE: Ninety percent of users will only use B0, B1 or B2. Only users who need fixed mode operation will need to consider B3 to B9*

If you select a "B" value, and then start dialling at a particular speed (i.e.you or your software issue "AT" commands at 300, 1200 or 2400) the modem automatically adopts the mode shown in the table below. For example:-

B0 + originate speed of 1200 =    V23 mode
B2 + originate speed of  300 =    V21 mode
B1 + originate speed of 1200 =    Bell 212 mode
B2 + originate speed of 1200 =    V22 mode

| Command | Standard | 300 | 1200 | 2400 |
|---------|----------|-----|------|------|
| B0 | CCITT | V21 | V23 | V22bis[1] |
| B1 | Bell | 103 | 212 | 2400 |
| B2 | CCITT | V21 | V22[2] | V22bis[1] |
| B3 | CCITT | V21 | | |
| B4 | Bell | 103 | | |
| B5 | CCITT | | V23 | |
| B6 | CCITT | | V22 | |
| B7 | Bell | | 212 | |
| B8 | CCITT | | | V22bis |
| B9 | Bell | | | 2400 |

[1] means autorange on originate for V22bis, V22, Bell 2400, Bell 212, Bell 103.

[2] means autorange on originate for V22, Bell 212, Bell 103.

NOTE: The following models only support the modes shown below

| Model | Mode |
|-------|------|
| 21/23 | V21, V23, Bell 103 |
| 12/12 | V22, Bell 103, Bell 212 |
| 24/24 | V22, V22bis, Bell 103, Bell 212, Bell 2400 |
| 123 | V21, V23, V22, Bell 103, Bell 212 |
| 1234 | V21, V23, V22, V22bis, Bell 103, Bell 212, Bell 2400 |

## Monitor Speaker Command "M"

This command controls the monitor speaker:

M0          turns the speaker OFF.

M1          turns the speaker ON when going Off-Hook while dialling
            or answering. The speaker turns off when the modem
            recognises a return carrier tone from another modem. This
            is the default command.

M2          turns the monitor speaker ON when going Off-Hook while
            dialling or answering and remains on until the line is
            disconnected.

## Response Code Command "V"

A Response Code is the message the AutoModem displays on your screen
to prompt you to type commands or data, to report whether the telephone
line is connected or disconnected, or to report an error. Each message has a
number and/or a string attached to the code.

V0 or       displays numeric responses.
V

V1          displays verbal (text) responses.

See the section "Response Codes" below.

## Quiet Command "Q"

This command either displays modem response messages on your screen,
or suppresses them:

Q0          sends modem response messages to your monitor screen.
or Q        (Quiet OFF.)

Q1          stops the modem from sending response messages to your
            screen. (Quiet ON).

## Self-Test Command "&T"

There are two forms of the "&T" command. These control the Local
Loopback test. This test is designed to give confidence that the modem is
working satisfactorily.

&T0 or      halts any test currently in progress.
&T

&T1         starts a Local Analog Loopback test. This is carried out in
            accordance with CCITT standard V54, L3.

## Dialling Commands

All Dial Commands are preceded by "D", which causes the modem to
interpret all numbers appearing after the "D" as a telephone number that it
must dial. Certain characters act as further commands to modify the dial
process, <CR> completes the dial command.

REMEMBER: if you use the Dial Command by itself you must precede it
with "AT".

The AutoModem will automatically originate a telephone call in response to
the dial command. The extra commands which are used to modify the
dialling process are:

","         Pause. Causes the AutoModem to pause for a pre-
            determined time (usually two seconds - see S Register 8)
            during the dialling sequence. Useful in waiting for an
            outside line after dialling through a PABX.

"T"         Use Tone Dialling.

"P"         Use Pulse Dialling.

"R"         Reverse mode. Puts the AutoModem into "answer" mode
            after firstly dialling an originate only modem. Must be the
            last character in the dial string before the <CR>.

";"         Return to command state after dialling the telephone number.
            Don't go online. Useful, for example, when in tone dialling
            mode to enter information like customer ID or password to
            banking services etc.

NOTE: *You must terminate the dial command with a Carriage Return to cause the AutoModem to correctly wait for a carrier signal. You can cancel the dial process by pressing any key at any time before connection on-line. The AutoModem automatically returns to local command state after a predetermined delay (usually 30 seconds - see Register S7) when no connection can be made.*

## Dial a Number "Dnnn"

The format of the phone number is "nnn" where "nnn" is a string of characters, some of which may be valid AutoModem Dial Commands intermingled with the digits of the phone number, eg:-

ATD1234567<CR>

that is, Attention, Dial the telephone number "1234567" then wait for carrier tone from the remote modem. If no carrier is detected the AutoModem releases the telephone line and outputs a NO CARRIER response code. If a carrier tone is detected, the CONNECT response code is output and the AutoModem goes to on-line mode.

## Pause ","

The comma is used to insert a pause (the normal pause is 2 seconds) during the dialling of a telephone number. This is most commonly used in dialling through a PABX to allow a pause whilst getting an outside line, eg:-

ATD9,1234567<CR>

that is, Attention, Dial 9, pause 2 seconds, Dial "1234567".

## Tone and Pulse Dialling "T" or "P"

The AutoModem is capable of DTMF (Tone) and Pulse (Decadic) dialling, even intermingled within the same dial command, eg:-

ATDP9,T1234567<CR>

that is, Attention, Pulse Dial "9"; Pause, Tone dial "1234567"

## Originating a Call in Answer Mode "R"

The AutoModem normally dials in originate mode. The "R" command allows the modem to dial someone with an originate-only modem and after dialling it leaves the AutoModem in answer mode, eg:-

ATD1234567R<CR>

that is, Attention, Dial "1234567" switch the AutoModem to answer mode (Reverse) and wait for the other end to transmit the originate carrier tone.

## Repeat "A/"

The repeat command, repeats the last "AT" command (surprise!). Generally it is used to redial the last telephone number dialled. "A/" is used in place of "AT" and no <CR> is required, eg:-

A/

## Return to Command State ";"

The AutoModem can be forced to re-enter the local command state after dialling (without hanging up) by finishing the dial command with a semi-colon. This is useful, for example, when calling a phone order service or bank service.

After a connection is made, you may be required to use Touch-Tones to enter additional information (eg: customer ID, password). This is commonly used throughout the USA. For example:-

| | | |
|---|---|---|
| Type: | ATD1234567;<CR> | (dial telephone number and return for command) |
| Response: | OK | |
| Type: | ATDT45678;<CR> | (transmit ID number and return for command) |
| Response: | OK | |
| Type: | ATD1234;<CR> | (transmit password and return for command) |
| Response: | OK | |
| Type: | ATD4760;<CR> | (enter transaction and return for command) |
| Response: | OK | |
| Type: | ATH0<CR> | (Hang up) |
| Response: | OK | |

NOTE: Characters not in the above command set are ignored during the dial command; that is, no error message is generated. This allows punctuation (for example with space) in the telephone number for easy reading.

eg: ATDT9,123-4567, <CR>

## Setting The "S" Registers

Timing parameters in the dialling sequence are controlled by values assigned to special registers in the AutoModem. The function of each of these registers (S0 through S12) and their default values are listed in the table "Available Special Registers" later in this appendix. They control such parameters as length of time before dialling starts, to wait for carrier, for the escape guard time, dial pause, etc.

Use the "S" Command to change the values assigned to these registers. For example, if you normally have difficulty getting a dial tone, that is if the AutoModem begins to dial before the dial tone appears, then increase the value of the S6 register, eg:

ATS6=3<CR>  (Wait 3 seconds before dialling)

NOTE: Not all S registers form 0 to 12 are used

## Command Format

"T", "P" and "R" should be used from within the dial command. Other commands should be placed before the "D" command. If the command is terminated with a semi-colon, then additional commands may follow but must be terminated with <CR>, eg:-

AT M2 V1 DT 1234567<CR>

The previous example instructs the AutoModem to:

M2      keep the speaker on
V1      send word response codes
DT      Tone Dial 1234567

## Answering Calls Automatically

The AutoModem is automatically in Answer mode and unless it is:

a) dialling, or
b) performing a local test, or
c) switched off, or
d) programmed not to answer.

it will "answer the phone" if a call is received.

The section below describes the commands that alter the way the AutoModem answers incoming calls and goes on-line. Use these commands, for example, when you wish to dial into your computer from a remote location.

## Controlling Auto Answer

The S0 register controls the number of rings, if any, that must occur before the AutoModem answers a call. The register may range in value from 0 - 255.

S0=0        Do not answer telephone
S0=1        Answer on Ring 1
S0=2        Answer on Ring 2, etc

When the register is set to 0, the auto-answer option is not in effect. You may set the AutoModem so that it will answer on the first ring, the sixth ring, and so on. Often the telephone system will terminate an unanswered call after a minute or so.

As long as the power to the modem remains on, the AutoModem answers the telephone call on the ring corresponding to the current value of the S0 register. When power to the AutoModem is turned off and then on again, or a "Z" (reset) command is given, the AutoModem resets the value of the S0 register to the value stored in non-volatile memory.

## Auto-Answer Process

When the telephone rings, the AutoModem counts the rings and then answers (see S0 register). The AutoModem then sends a carrier signal to the originating (calling) modem and waits for the other modem to send its carrier signal.

If no carrier signal is received from the originating modem within a specified time (usually 30 seconds), the AutoModem hangs up, sends a NO CARRIER response and returns to the local command state.

If the carrier signal is received then the AutoModem sends a CONNECT response code and goes on-line.

### The Answer Command "A"

The Answer Command forces the AutoModem to answer the telephone without waiting for a ring, that is, answer immediately, eg:

ATA<CR>

The AutoModem immediately answers a call (ie: "lifts" the handset "off hook") and waits for a carrier signal; it will not execute any command entered in the command line after "A".  Additional commands must be placed before the "A" command.

> NOTE: Use "ATD <CR>" to answer the phone in originate mode.

### Answering Range

The AutoModem will answer calls at one preset communications standard. The standard that the AutoModem will answer at is selected by a "B" command.

The AutoModem can be preset to answer at the following speeds and standards, depending on the model.

| Model | V21 | V23 | V22 | V22bis | Bell 103 | Bell 212A | Bell 2000 |
|---|---|---|---|---|---|---|---|
| AutoModem 21/23 | x | x | | | x | | |
| AutoModem 12/12 | | | x | | x | x | |
| AutoModem 24/24 | | | x | x | x | x | x |
| AutoModem 123 | x | x | x | | x | x | |
| AutoModem 1234 | x | x | x | x | x | x | x |

The setting selected by the "B" command dictates the speed ranges. Where more than one speed is available in a range, ie. B0, B1 and B2, the "B" command and the speed of the last command issued will govern the answering standard.

For example, with command "B0" the modem will answer at V21 standard only if the last command issued was at 300bps.  It would answer at V23 standard if the last command issued was at 1200bps etc.

| Command | Standard | 300 | 1200 | 2400 |
|---|---|---|---|---|
| B0 | CCITT | V21 | V23 | V22bis[1] |
| B1 | Bell | 103 | 212 | 2400 |
| B2 | CCITT | V21 | V22[2] | V22bis[1] |
| B3 | CCITT | V21 | | |
| B4 | Bell | 103 | | |
| B5 | CCITT | | V23 | |
| B6 | CCITT | | V22 | |
| B7 | Bell | | 212 | |
| B8 | CCITT | | | V22bis |
| B9 | Bell | | | 2400 |

[1] means autorange on originate for V22bis, V22, Bell 2400, Bell 212, Bell 103.

[2] means autorange on originate for V22, Bell 212, Bell 103.

> NOTE: The following models only support the modes shown below

| Model | Mode |
|---|---|
| 21/23 | V21, V23, Bell 103 |
| 12/12 | V22, Bell 103, Bell 212 |
| 24/24 | V22, V22bis, Bell 103, Bell 212, Bell 2400 |
| 123 | V21, V23, V22, Bell 103, Bell 212 |
| 1234 | V21, V23, V22, V22bis, Bell 103, Bell 212, Bell 2400 |

The value of the "B" command may be stored in Non-Volatile RAM, thus allowing the modem to always power up in the correct answer mode. Issue the command:

AT&W <CR>

when you have selected the mode you require. (This saves that particular mode setting.) See the Section titled "Write Current Parameters" later in this appendix.

## More General Commands

### Setting the Registers; More "S" Registers

In addition to the S0 register, you have the option of adjusting the values of each register; the default values are summarised in the table, "Available Special Registers" later in this appendix.

### Write to "S" Registers    "S="

This command allows any of the "S" registers to be modified.  The particular function of each register is described later in this appendix.

Sn=p      n = register number from 0 to 12
          p = register value from 0 to 255

For example:  ATS4 = 10<CR>
Response:     OK

### Read "S" Registers    "S?"

This command allows the "S" registers to be read. The particular function of each register is described later in this appendix.

Sn?       n = register number from 0 to 12

For example:  ATS0?<CR>
Response:     002   ie: register S0
              OK    has a value of 2.

---

*NOTE: not all S registers for 0 to 12 are used*

---

## Extended Response Code Command    "X"

This command is used to signal the result of an AutoModem Dial or Answer command, after a connection has been established.

X0 or     Send the message CONNECT once a
X         connection has been made.

X1    ·   The AutoModem sends the message:

          CONNECT        = 300 bps
          CONNECT 1200   = 1200 bps or 1200/75
          CONNECT 2400   = 2400 bps

### Carrier Detect Command    "&C"

This command gives the AutoModem control over the Carrier Detect signal (DCD) it issues.

&C0 or    Carrier Detect is always on.
&C

&C1       Carrier Detect follows the state of the data
          carrier from the remote modem.

### Data Terminal Ready Command    "&D"

This command allows the AutoModem to override the state of the Data Terminal Ready (DTR) signal it receives.

&D0 or    The Modem ignores the computer's signal and acts as
&D        if the DTR signal is always high.

&D1       The AutoModem will operate normally following the
             computer's setting of DTR.
          The Modem will not Answer or Dial
          unless DTR is raised

### Read Factory Default Parameters Command    "&F"

This command reads in the factory default values of the "S" registers. The format is:

&F        read factory defaults.

The factory defaults are highlighted on the Quick Reference Card and at the end of this Appendix.  See the section titled "Default Settings"

---

*NOTE:  The &F command should be followed by an "&W" command if you want to write the factory default parameters into non-volatile memory. i.e. "AT&F&W".*

---

### Write Current Parameters to Non-Volatile Memory Command    "&W"

The &W command stores the current parameters in non-volatile memory.

The saved parameters are restored after issuing the "Z" command or powering the AutoModem on. The format is:

&W        store current parameters.

## CTS Signal.

The Clear to Send serial interface signal (CTS) is permanently raised by the AutoModem, except on models which support the videotex mode of CCITT V23 (ie: 1200/75 bps operation) and that mode is selected.

When the modem is configured for V23 mode only (ie: 1200/75 bps) the CTS signal is raised, except when the output buffer is full. When this output buffer (approximately 40 characters) fills, CTS is lowered until the buffer is partially emptied. Once additional space is available in the output buffer CTS is raised again. Data should not be sent from the PC to the modem while CTS is low.

Programs which are not capable of checking the status of this signal may lose data while the buffer is full.

## Response Codes

The modem Response Codes, output to the computer or terminal by the modem to show acknowledgement of commands, are listed below.

| Code (Digit) | Code (Characters) | Description |
| --- | --- | --- |
| 0 | OK | Command line accepted and executed. |
| 1 | CONNECT | Carrier detected at 300 bps |
| 2 | RING | Ringing signal detected. |
| 3 | NO CARRIER | Carrier lost or not detected. |
| 4 | ERROR | Command line longer than 40 characters. |
| 5 | CONNECT 1200 | Carrier detected at 1200/75 bps if V23 selected, or at 1200 bps if V22 or Bell 212 is selected |
| 6-9 | | Not used |
| 10 | CONNECT 2400 | Carrier detected at 2400 bps |

## Available Special Registers

| Register | Saveable | Value | Default | Function |
| --- | --- | --- | --- | --- |
| 0 | Y | 0-255 | 01 | Answer incoming call at "n"th ring. (0 = do not answer). |
| 2 | Y | 0-127 | 43 | Decimal Value for Escape Code or Sequence. (A value of 255 will disable Escape Code sequence recognition). |
| 3 | Y | 0-127 | 13 | Decimal Value for Carriage Return. |
| 4 | Y | 0-127 | 10 | Decimal Value for Line Feed Character. |
| 5 | Y | 0-127 | 08 | Decimal Value for Backspace Character. |
| 6 | Y | 1-30 | 02 | Wait time for dial tone, in seconds. |
| 7 | Y | 1-60 | 30 | Time, in seconds, to wait for carrier. |
| 8 | Y | 0-30 | 02 | Length of dial pause, in seconds. |
| 9 | Y | 1-255 | 12 | Carrier detect response time (1/10 second). |
| 10 | Y | 1-255 | 14 | Carrier loss response time. Delay time after loss of carrier before hang up. Carrier loss to hang up delay is (S10-S9) in 1/10 second. |
| 12 | Y | 3-255 | 50 | Escape sequence delay time, 1/50th of a second. |

NOTE: If you set "S10=255" the modem will not hang up the connection if carrier is lost. You must subsequently use "ATH0<CR>", or drop DTR.

## Sample Commands

Here are some sample commands. Look at them first then try them from your keyboard. (Terminate each command with <CR>.)

**ATS0=6<CR>.** This command string sets the S0 register to answer a telephone call on the sixth ring. This is how you give yourself a chance to answer before the modem when the phone rings.

**ATDP9, 1234567<CR>.** Attention, Dial the following number, using Pulse and pause after digit 9 (eg: going through a PABX).

**ATE1M0V0<CR>.** Attention, Echo all commands, turn the speaker off and return response codes as digits.

**ATQ0E1DT0,00111,714 7340221<CR>.** This command string tells the modem to display all modem response codes and modem command characters on your screen and then dial an overseas (USA) telephone number using Tone dialling.

**ATS7=20S0=1V1M2DT9,,P01955<CR>.** This command sets the carrier wait register S7 to wait 20 seconds for a carrier before hanging up. Then it tells the modem to answer the telephone on the first ring, display response codes as verbal messages on your screen, and leave the monitor speaker turned on during data transmission. The modem uses Tone dialling to dial a PABX "outside line" access code then switches to Pulse dialling for the national VIATEL service.

---

*NOTE: Register Commands and General Commands may be mixed in any order between the AT characters and the D character that follows. The letter D always marks the start of the telephone number. In the above example the modem uses tone dialling to dial 9 , which is the number often used by private telephone exchange systems like PBX's to access the public telephone system (get the outside dial tone).*

*Two consecutive commas in a command string cause the modem to wait four seconds (two per comma) for an outside telephone connection.*

---

## Default Settings

The factory default settings for the AutoModem can be re-established in the modem with the "&F" command.

The first modems to use the "AT" command set did not have any non-volatile memory. Their default operation was established by switch settings. When an "ATZ" command was issued to the modem the default parameters were established from the settings of the command switches. The present generation of "AT" command set modems, including the AutoModem covered by this manual, can be instructed to store the equivalent of "switch" settings (and many other parameters) in non-volatile memory.

The "&F" command resets the AutoModem's parameters to a known state, i.e. the factory default settings. The "&F" command by itself will only reset the parameters for the modem until you change parameters individually or issue an "ATZ" command. To make the modem remember the factory default settings for re-establishing with the "ATZ" command you should also issue an "&W" command.

Because the "&F" command establishes a known set of parameters in the AutoModem it is a good starting point for establishing your own individual set of preferred parameters, which may be stored in the modem with the "&W"command.

The factory default settings established by the &F command are:

| | |
|---|---|
| B0 | Transmission mode |
| E1 | Echo commands |
| M1 | Speaker on during dialling |
| Q0 | Send responses |
| V1 | Send verbal responses |
| X0 | Basic response codes |
| &C1 | DCD determined from remote modem |
| S0=01 | Auto answer (on 1st ring) |
| S2=43 | Escape code is "+++" |
| S3=13 | Carriage return |
| S4=10 | Line feed |
| S5=08 | Backspace |
| S6=02 | Wait 2 seconds for dial tone |
| S7=30 | Wait 30 seconds for carrier detect |
| S8=02 | Dial pause for 2 seconds |
| S9=12 | Carrier detect response is 1.2 s |
| S10=14 | Carrier loss response is 1.4 s |
| S12=50 | Escape sequence delay is 1 s |

(other S registers are not used)

Other conditions established by &F are:

7 bits plus even parity
1200 baud initial serial interface speed
off line
pulse dialling

# *Appendix B*

## *Troubleshooting Guide*

A good approach when trying to solve any problems with the operation of your modem is to start with the simple and obvious things. You should unplug any cables and reconnect them.

There are several steps you can take that will assist you in solving any

1.   What is the real problem?

     Identify the problem by looking at the symptons.

2.   Determine what is working correctly.

     Your modem is only one part of your communications system. You should try to determine if any parts of the system are working correctly. You should also try to determine the last thing you can do that does what you expect before you strike the problem.

3.   Try methodical changes.

     Change any variables in your operation of the modem, such as the speed, data format, phone number etc. and see whether that makes any difference.

4.   Double check.

     Once you think you have narrowed down the problem, you should double check your theory by testing to see if the problem is repeatable.

5.   Fix it.

     Once you are sure of the nature of the problem you may well have discovered the solution as well.

---

> **IMPORTANT: This is not a repair procedure. Modems requiring adjustments not covered below should be returned to your dealer for service.**

---

Sending and receiving data requires more than a modem. Your computer is part of a system that includes a telephone line and another computer system. You can solve some operating problems by checking your programs and adjusting your modem - you cannot solve problems caused by the telephone line or the other computer system.

## The Quick Fix List

Most of the problems with your modem will occur during installation. You can solve most problems by checking the following things:

Recheck each cable, even though you may be sure that they are plugged in properly. Do not try to clean jacks or connectors.

1.  Check to see that the cable connected to the modem is securely connected at both ends.

    Is the telephone cable (the one that came with the modem) - connected to the modem and the telephone wall socket?

2.  Check to see that the program and the remote computer system have each selected the same speed (bps or baud), data bit selection (either 7 or 8 bits) and parity.

3.  Check the following:

    Does the modem accept any commands?

    Does it respond to the "ATI" command?

    Does it display messages?

    Does it send or receive data?

    Does the problem repeat, or does it seem to come and go irregularly?

    Can the modem continue to process commands?

    What happens to the command, message or data that fails to work correctly?

    What is the last correct action just before something goes wrong?

    What is the last screen message displayed?

Check over what you've learned about the problem. Do you have a modem problem - or is it really a problem with something else? You will solve most problems by checking all the cables, and by checking the program.

---

## Detailed Check List

Any of these things could be causing the problem; the telecommunications line, the hardware, the session details setup, the quality of the phone line.

### Telecommunication Line Checklist

If you're using a direct outside switched (dial-up) telephone line, check these things to find out if the problem is in the telecommunications line (that is, at the host, host modem or on the telephone line):

Is the host down? Is the host modem working? Is the port on the host available? The usual indication of a problem is a ringing phone with no answer.

Is the modem set up for Bell or CCITT standards? In Australia it should be CCITT. Have you set up the modem compatible with the host modem? Ask the systems programmer or on-site support person. Are you calling the correct phone number for the host? (Call the number and listen for the characteristic tone signal. If a person answers, maybe you've got the wrong number!)

After you've installed your modem, can you still make a voice phone call from your attached handset (if any)?

If you're using automatic dialling, check to make sure that it's the correct number. Check that a dial tone is present first.

> **WARNING: Some PABX's and most Telecom Commander systems can cause serious operational problems. Call Telecom and ask them to provide a direct switched line or a modem piggyback socket.**

### Hardware Checklist

Run the appropriate loopback test to check that the Modem is functioning correctly. The following tests apply to the "AT" compatible modems and most of the NetComm Modems.

Load up your communications program and enter terminal mode (without dialling and connecting to a host)

Type "AT&T1<CR>" ie: Analog Loopback mode.

You should have the message CONNECT displayed. If the CONNECT message is not displayed then the AutoModem Family is not functioning correctly. Check that the installation procedure has been followed and the serial port is configured correctly.

Once the CONNECT message is displayed, type a few lines of characters until you are happy the data you're keying in is being returned (echoed) correctly. You will see the characters displayed on the screen. Your typed data may sometimes appear in duplicate if you have set up your communciations program as half-duplex. Don't worry, this is quite normal.

Wait 1 second, type in "+++" (ie: 3 plus's) and wait 1 more second, which should return the message OK.

Then type "AT&T0<CR>" to terminate the test.

## Communications Package.

Check these things to find out if you have a problem in the way you have set up your communications software:

## Screen Corruption.

If the characters appearing on your screen are unreadable and corrupted it may be due to incorrect setting on your communications software. If most or all of the characters are corrupted you should check the following:

> Is your communication software set to the same speed as the data service which you are calling?

> Is the data format in your communications software set to the same data format (parity, stop bits etc.) as the data service you are calling?

If the corruption appears only occasionally it may be due to noise on the telephone line.

## Phone Line Quality Checklist

If you're using a switched (dial) telephone line, lift the handset and listen if the phone line is noisy.

Some phone line problems that affect high speed modems may be imperceptible to the human ear. The symptoms of such phone line problems are lots of errors and poor communication with a variety of hosts. If you encounter these problems, hang up and dial again. If these problems persist, then contact Telecom to solve them.

---

# Appendix C

## AutoModem Family - Summary of "AT" Commands

Vers 1.00  7/87

* = Factory and Default Settings

| COMMAND | CODE | PARAMETERS | | |
|---|---|---|---|---|
| Escape Sequence | +++ | Pause 1 second before and after | | |
| On-Line | O | 0 = Go back on-line; | | |
| Reset | Z | Restore from Non-Volatile RAM | | |
| Echo | E | 0 = Off | | |
| | | 1 = On* | | |
| Bell | B | 300 | 1200 | 2400 |
| | | 0 =  V21 | V23 | V22bis |
| | | 1 =  103 | 212 | 2400 |
| | | 2 =  V21 | V22 | V22bis |
| | | 3 =  V21 | | |
| | | 4 =  103 | | |
| | | 5 = | V23 | |
| | | 6 = | V22 | |
| | | 7 = | 212 | |
| | | 8 = | | V22bis |
| | | 9 = | | 2400 |
| Monitor Speaker | M | 0 = Off | | |
| | | 1 = On during dial/answer; off on connection* | | |
| | | 2 = On always | | |
| Response Code | V | 0 = Display numeric | | |
| | | 1 = display verbal responses* | | |
| Quiet | Q | 0 = Send responses* | | |
| | | 1 = responses off | | |
| Dial | D | Followed by 0-9 , T P R ; | | |
| Redial Last Number | A/ | Repeats last AT command | | |
| Set Registers | Sn= | n = 0-12 = Special Registers | | |
| Answer | A | Answer call | | |
| Read Registers | Sn? | n = 0-12 = Special Registers (see over) | | |
| Extended Responses | X | 0 = Issue basic responses 1 to 4 * | | |
| | | 1 = Issue extended responses 1 to 10 | | |
| Carrier Detect | &C | 0 = Always on | | |
| | | 1 = determined from remote modem* | | |

| DTR | &D | 0 = Always high; |
| | | 1 = Determined from remote host. * |
| Hang Up | H | 0 = Hang up |
| | | 1 = Go off-hook |
| Read Factory Defaults | &F | No parameters |
| Write to | &W | No parameters |
| Identify | I | No parameters |

## RESPONSE CODES

| 0 | OK | Command accepted & executed |
| 1 | CONNECT | Carrier detected & connection established |
| 2 | RING | Ringing signal detected |
| 3 | NO CARRIER | Carrier lost or not detected |
| 4 | ERROR | Command > 40 chars timeout |
| 5 | CONNECT 1200 | Carrier detected at 1200/75 or 1200 bps |
| 6-9 | | Not Used |
| 10 | CONNECT 2400 | Carrier detected at 2400 bps |

## SPECIAL REGISTERS

| REGISTER | RANGE | DEFAULT | FUNCTION |
|----------|-------|---------|----------|
| 0 | 0-255 | 01 | Ring to answer on |
| 2 | 0-127 | 43 | Escape Code character (255 disables) |
| 3 | 0-127 | 13 | Value for <CR> Carriage Return |
| 4 | 0-127 | 10 | Value for Line Feed |
| 5 | 0-127 | 08 | Value for Back space |
| 6 | 1-30 | 02 | Wait time for dial tone (Sec.) |
| 7 | 1-60 | 30 | Wait time for carrier (Sec.) |
| 8 | 0-30 | 02 | Pause Length (Sec.) |
| 9 | 1-255 | 12 | Carrier Detect Response Time (100mS) |
| 10 | 1-255 | 14 | Carrier Loss Response Time (100mS) |
| 12 | 3-255 | 50 | Escape sequence time delay (20mS) |