CARDMODEM GSM

Modem User Guide

Revision A

February, 1997

NetComm®

YML300-3A

Contents

❑ Disclaimer

This manual has been validated and reviewed for accuracy. The included sets of instructions and descriptions were accurate for the GSM Modems at the time of this manual's production. However, succeeding modems and manuals are subject to change without notification. Therefore, NetComm, assumes no liability for damages incurred directly or indirectly from errors, omissions or discrepancies between the modem and the manual.

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A Modem Overview

This section is aimed at the novice user. It describes the principles of the modem's operation and its uses, and explains in simple terms some of the jargon and buzzwords surrounding the computer communications industry. Skip this section if you are already a modem user or are generally experienced in the use of PC's.

What is PCMCIA?

With the increasing portability of laptop and notebook PC's, the search for smaller and lighter tools for information processing has resulted in the innovative PCMCIA standard.

PCMCIA (Personal Computer Memory Card International Association) is a standards and trades association that consists of more than 500 member companies. PCMCIA has developed standards for personal computer cards (PC Cards).

❑ Physical and Electrical Specification.

The PCMCIA specification defines three physical sizes of cards : Type I, Type II, and Type III. All three types use the same 68 pin edge connector for attachment to the computer, and differ only in thickness. The thicknesses for Type I, Type II, and Type III are 3.3mm, 5.0mm, and 10.5mm respectively. The V.34 PCMCIA Modem is a Type II card and can be inserted into any Type II or Type III PCMCIA slot.

❑ Software Specification.

The PCMCIA 2.1 standard provides a "plug and play" capability in the portable computing environment. PCMCIA 2.1 defines the software interface to the PCMCIA device as well as the physical size and electrical specification.

This software is commonly called "Card & Socket Services" and allows the user to easily add and remove PC Cards as required without having to open up the PC. Most PCMCIA equipped PC's now come pre-configured with Card and Socket Services Software.

Where Card and Socket Services Software is not supplied as standard, the Modem Enabler program supplied with your modem should be used. The modem enabler program can also be used instead of Card and Socket Services to release more memory. Please refer to the Installation instructions for more details.

Your PC Card Modem

The PC Card Modem turns your computer into a very powerful yet easy to use communications tool. Using public telephone lines, it not only enables you to communicate with other computer users - your home and office for example - but also opens up a whole new world of business and leisure services - such facilities as:

- ❑ Electronic Mail - Services which bring the speed and convenience of electronic mail to the computer user.

- ❑ Viewdata - Both public and private viewdata systems are now commonplace and provide a wealth of business and commercial information.

- ❑ Databases - There are wide ranging databases available, both public and private, offering information about all aspects of industrial, commercial, legal, scientific and educational life.

- ❑ File Transfer - Many applications require the ability of a computer to communicate and transfer files to other computer systems.

- ❑ Fax - Your modem can send and receive faxes using the appropriate software.

- ❑ BBS Access - Using communications software allows the user to access Bulletin Boards.

- ❑ Remote Access - Using appropriate software, the user can remotely access their network via the telephone line.

What does a modem do?

Your modem provides an interface between the digital world inside your computer and the analogue world of the telephone network. Before we look at how your modem works, lets take a moment to see why its use is necessary to enable communication to take place, and take time to explain some of the terminology that you'll find in later chapters.

❑ Bits and bytes

Inside your computer information (generally referred to as *Data*) and commands are passed between various components such as the microprocessor, memory devices, keyboard etc., in digital form. That is, through the medium of electrical pulses that are either OFF or ON at any given time. These pulses have a constant amplitude - typically changing from 0 volts in an OFF state to 5 volts when the pulse is ON. You may also hear of these signals being described in terms of HIGH and LOW; ONE and ZERO; MARK and SPACE and so on. Each pulse, regardless of whether it is OFF or ON, is known as a BIT - a contraction of **BI**nary digi**T**.

A single BIT is not able to convey much in the way of information because it only has two states, OFF or ON, which in binary terms are taken to equal 0 and 1 respectively. So the computer normally acts on "groups" of 8 bits at a time, which increases the range of combinations to 256 (11111111 in binary). In computer terminology a group of 8 bits used in this way is called a BYTE.

❑ ASCII Code

When we transmit data through a modem, a different combination of bits is used to represent each character. Various encoding methods have been devised over the years but the standard now used is known as ASCII. The letter K for example has an ASCII code value of 75, which is 01001011 in 8 bit binary.

The ASCII code table only contains 128 characters, and could be executed by using a seven bit byte instead of eight: the most significant bit (the left-most digit) is always "0". Because the computer handles internal data on an 8 bit basis, however, the eighth bit is normally transmitted even though it is surplus in defining the ASCII character. For this reason, when you come to use your modem you will find that you are sometimes given an option of using 7 bit or 8 bit ASCII in certain communication modes.

❑ Serial and parallel data handling

Your computer is able to processes information presented to it in two distinctly different ways. It can accept bits in either a Serial or Parallel format.

❑ Serial data

Today's date is the 25th of July 1994. If you were to write this date by hand you would probably write a "2" followed by a "5" followed in turn by a "-" "0" "7" "-" "9" and "4"; this can be likened to a serial communication mode because you dealt with one character at a time. But since each character contains only one bit of information relevant to the date, the actual date can only be interpreted after all eight bits have been written.

When working in a serial mode your computer works in a similar way. Data is passed one bit at a time but the computer stores them temporarily until all 8 bits have been received whereupon it interprets the complete byte. It then clears the store in preparation to receive the next byte.

❑ Parallel data

If you were to borrow a book from the local library, the librarian would probably enter the date on the fly sheet using a date stamp. In this instance the same information, containing the same characters as those you wrote by hand, is conveyed in a single action. This is akin to parallel communication.

Internally, your computer works almost exclusively in a parallel mode. With the microprocessor, memory, keyboard etc., exchanging information through what is known as a DATA BUS. This is a group of eight electrical wires each carrying a data bit, which is accessible to all the computer's data handling devices. When data is exchanged via the data bus all eight lines are read simultaneously and an eight bit byte is processed in a single action.

Although your computer uses parallel data for its primary operation the data transmitted through the modem has to be serial in nature because the telephone line is a two wire system. However your computer has a built in facility, known as an RS232 interface, which converts parallel to serial data and vice versa.

❑ Telephony

Unlike a computer, the telephone network is designed to respond to the human voice, which produces audible tones varying in both amplitude (loudness) and frequency (pitch). And in order to carry these signals over long and sometimes complex routes the telephone transmission system contains a multitude of amplifiers, repeaters and filters which are designed to maximise the signal quality. Unfortunately these are not designed to handle digital signals - hence the need for a modem.

How does a modem work ?

A modem enables your computer to send data over the telephone network by converting the digital signals produced by your computer into audible tones suitable for telephony transmission. One tone is used to represent a digital high signal and another for a digital low.

Since communication is a two way process, a modem must also be able convert the audible tones received from the telephone line into digital signals that your computer can understand. In electronic terms the process of encoding the digital signals with audible tones is known as *MODulation*, and that of decoding the audible tones into digital signals as *DEModulation* - you can see that the name MODEM is a contraction of these two terms.

Hardware naming convention

In communications 'officialese' the computer is referred to as *Data Terminal Equipment (DTE)*. This is a term passed down from large computer installations where several terminals are connected to a mainframe computer. Your machine too can now hook-up to a mainframe through the modem. The Modem is referred to as the *Data Circuit-terminating Equipment* (DCE)- you'll come across these terms later in this manual. If you dial-up another computer, say for example you call the office from home, yours would be known as the *Originating* Data Terminal Equipment and the equipment in the office as the *Answering* Data Terminal Equipment. These definitions hold true even when you are receiving data from the office in response to your call. On the other hand if the office computer were to call you at home, then it would remain the Originating Data Terminal Equipment and yours would be the Answering Data Terminal Equipment throughout the communication.

At the moment these terms may seem unnecessary, but they are important when you have to select certain operating modes and data protocols - as you'll see later on.

Modem control

The modem is intelligent and contains a memory circuit which holds its command codes. Your modem, like most modems nowadays, uses a standard set of commands known as Hayes codes to control all aspects of its operation. You can control the modem by accessing these codes directly, or via the communications software used.

Direct access is available when you use your computer in *Dumb Terminal* mode, in which case you control the modem by entering the relevant Hayes code from the keyboard. Although this method of use requires a greater understanding than when using communications software, the dumb terminal mode offers a great deal of customisation and fine control over the modems parameters.

Communications software also controls the modem by issuing Hayes commands, but provides a friendly interface in the form of menu selections. This means that you, the operator, need have little understanding of the particular command structure since all you have to do is select the parameters you want to use in the menu option boxes. If you are new to data communications we recommend that you start off by using the software route before tackling the more complex world of dumb terminal operation.

Communication modes and protocols

We use the word *protocol* to imply a set of rules that determine the characteristics of the data signals being communicated. When two computers are communicating with each other they must both operate under a common protocol to correctly interpret the signals passed between them.

Various protocols are supported by your modem, these differ in such things as: transmission speed, data word length, method of error detection and so on. Protocol also affects the method by which two-way communication is controlled. Two methods are in common use; namely *Half Duplex* and *Full Duplex.*

❑ Half/full duplex

In half duplex mode, two-way communication is possible but only in one direction at a time. This means that certain control signals have to be passed between the modems to make sure that they understand when they are expected to send or receive data. These are known as *handshaking* signals and include such things as XON/ XOFF (to prevent one station from transmitting while the other is busy), and CTS/RTS (clear to send and ready to send). You will need to set these parameters to their relevant states when you configure the communications software before making a call.

On the other hand, in a full duplex mode the modems are able to communicate with each other simultaneously, just as two people can speak at the same time over the telephone.

If both computers send each other data simultaneously over a common transmission path in a full duplex mode, it would be impossible for them to differentiate between the transmitted data and the received data if both stations were using the same audible tones for their modulation. This problem is overcome by assigning one pair of tones to the originating Data Terminal Equipment and a different pair of tones to the answering Data Terminal Equipment; thus each is able to demodulate the tones transmitted by the other while ignoring the tones it transmits itself.

For this operation to be successful each modem must know what tones are being used by the other; so standards have been set.

Most of the world uses tone and transmission standards laid down by the ITU-T (formerly CCITT), a Geneva-based organisation, part of the International Telecommunications Union. These standards define the tones to be used by both the Originating and Answering Data Terminal Equipment for each of the approved communication modes.

❑ Echo

When configuring the modem you can be given the option of selecting Local or Remote echo when working in a full duplex mode. This determines the way in which characters are written to your terminal screen. When *local echo* is selected, your screen will directly display the characters

you type on your keyboard (in the same way as your computer normally operates); however, if *remote echo* is selected the characters you type are sent to the remote computer and are then returned to your screen. You therefore see exactly what is being received by the remote computer. If you find that nothing appears on your screen when you are communicating then it is likely that the remote computer is not echoing your characters. Selecting local echo should overcome this problem.

❑ Stop / Start bits

We have already said that data characters are transmitted using either a 7 or 8 bit byte. But other bits, known as *Start* and *Stop* bits, can be added to the data bits to enable the receiving modem to identify the beginning and end of each byte. Without these bits the data pulses would all run into one another and could lead to received errors. When configuring your modem you will need to select the number and polarity of start / stop bits according to the transmission mode in use. Start bits are somewhat archaic and are not generally required when using a transmission speed greater than 100 bps.

❑ Error detection

The simple form of error detection used with the standard communication modes available to this modem is known as *parity* checking, and is achieved by automatically inserting a *parity bit* into the transmitted data.

A parity bit is simply an extra bit that follows the character bits and has a polarity that makes the number of data highs add up to either an odd or even number depending on whether *odd* or *even parity* is appropriate to the selected protocol.

For example we have already seen that the letter K has the ASCII bit pattern 01001011, which has an even number of 1's (high bits). If the transmitted protocol demands "even parity" then the parity bit will be [0], leaving the total number of 1's equal to an even number. If however the protocol calls for "odd parity" then the parity bit will be transmitted as a [1] - making the total number of 1's contained in the pattern an odd number.

You can see that start, stop and parity bits add to the length of the data word; and if the letter K is transmitted using 8 bit ASCII with one stop bit and a parity bit then the character takes a total of 10 bits to transmit.

As a guide, text based E-mail services generally use 7 bit ASCII, 1 stop bit, and even parity; and Bulletin Board Services use 8 bit ASCII, 1 stop bit and no parity.

Another method of error detection supported by the modem is known as *MNP* - Microcom Networking Protocol. This protocol doesn't use start and stop bits, but instead groups the data bytes together and sends them as packets complete with a check field. When the modem receives the packet it checks that the check field is correct, and requests that the packet is retransmitted if an error is detected.

❑ Speed

Transmission speed is measured in bits per second *(bps)*. This is a measure of the number of data bits that are transmitted/received per second and, depending on the selected mode, the speed can vary from 75 to 33600 bps. The speed at which the characters are transmitted (CPS) depends on the word length (7 or 8 bits) and the selected parity and start/stop bit configuration. For example if you are using an 8 bit ASCII character with one stop bit and a parity bit (10 bits in all), then at a transmission speed of 300 bps you will transfer 30 characters per second.

❑ Baud

The baud rate is a measure of the number of times per second a signal on a communication channel varies or makes a transition between states. The term baud is often confused with bits per second (bps) and for speeds above 600bps, more than one bit is transmitted for each change of signal state. Thus when the modem is transmitting at V.22bis (2400bps), its' baud rate is 600 with four data bits being transmitted for each baud.

Standard Protocols

Like the standard tones used in the modem's modulation and demodulation processes, the transmission speed, parity checking, and number of stop/start bits has to be known by the answering computer in order for it to decode your data. All these parameters are defined by the ITU-T (formerly CCITT) in what are known as the "V" series specifications.

The following is a brief specification of the various data speeds.

- **V.21** - If you have selected this mode of operation you will be able to transfer data in both directions at the same time (full duplex) at a speed of 300 bps. One modem will need to operate as the "Originating" unit and the other as the "Answer".

This is necessary as the tones that the modems use are different for each mode of operation. This mode can handle any speed up to 300 bps including 75 and 100 bps.

- **V.22** - This is another full duplex mode of operation where data is transferred in both directions at 1200 bps. Once again one modem will operate in "Originate" mode and the other in "Answer" mode.

- **V.23** - In this mode you can transfer data in one direction at 1200bps and at 75bps in the other direction. This is a half duplex mode of operation.

- **V.22bis** - Another full duplex operating mode, where data is transferred in both directions at a rate of 2400 bps.

- **V.27ter** - An older fax speed, 4800bps with a fallback speed of 2400bps. Very rarely used nowadays

File Transfer

Files are passed between modems in blocks of data using transfer protocols such as XModem, YModem, ZModem, Kermit, etc. These determine the block length, type of error detection used and whether or not filenames have to be stipulated or are automatically transmitted with the data.

There are several variants of the XModem protocol, with YModem being a direct descendant of XModem. However, ZModem is the best 'general purpose' protocol, as it is a multiple file transfer protocol and therefore the most suitable for unattended operation.

In addition to the above protocols you can also send and receive straightforward, unchecked, ASCII files.

Terminal Emulation

It has already been mentioned that you can access mainframe computers via the modem; that was how we obtained the term Data Terminal Equipment. To make this connection easier communications software usually contains several 'Terminal Emulation' options. These are mini-programs that you can run to make your machine appear like the type of terminal normally connected to the mainframe.

By making your computer emulate a particular type of terminal the software sets up the correct control codes that are passed to the mainframe during dial-up and answering, and informs your terminal how to handle certain control characters.

WARNING

Please read the following warning before installing your NetComm CardModem GSM.

To prevent possible damage to the GSM from electrostatic discharge, insert the PCMCIA card into your computer BEFORE connecting the cellular phone cable.

This section contains general information relating to the connection and use of The NetComm CardModem GSM. Please read through the Installation Instructions thoroughly before attempting to connect and use the modem.

About your modem

The combination of your NetComm CardModem GSM and your Personal Computer makes a complete communications package which allows you to communicate with all types of services. It also enables you to both communicate with, and transfer files between, other computer users over the telephone network. The modem uses standard AT control codes which makes it compatible with the majority of on-line services.

Your NetComm CardModem GSM also turns your PC into a fax machine. Using Cooee Data/Fax software you can send and receive faxes directly from your PC.

Contents

Your modem package comprises of :-

- ❑ NetComm CardModem GSM
- ❑ Modem Adapter Cable
- ❑ Adobe Acrobat Reader
- ❑ Installation Guide
- ❑ User Manuals on diskette
- ❑ 2 Year International Warranty Card
- ❑ Cooee Data/fax Software
- ❑ Enternet Software

If any of these items are missing or damaged contact the dealer from whom the equipment was purchased immediately.

Installation

Your NetComm CardModem GSM is suitable for use in any personal computer equipped with a PC Card Type II or Type III slot. The NetComm CardModem GSM is compliant with the latest PC Card 2.1 standard.

The modem can be inserted directly into the PC Card slot by following the steps below :-.

a) Ensure that the NetComm CardModem GSM is face up when inserting it into the computer's PC Card slot.

Gently slide the modem card into the slot and continue until the connector on the edge of the modem card locates with the connector inside the computer's slot. This is designed to be a tight fit so a slight pressure may be required to locate the NetComm CardModem GSM correctly. **DO NOT** use excessive force as this may damage the NetComm CardModem GSM or the computer

b) Connect your Modem Adapter Cable to the NetComm CardModem GSM.

c) Plug the Modem Adapter Cable into the telephone socket.

Windows 95™ Installation:

If you are using your modem with Windows 95™ you will need to install a driver. Choose the "Driver from disk provided by hardware manufacturer" option and click on the OK button.

When prompted for a driver, insert the disk labelled "CardModem GSM Driver Diskette" and click 'OK'

Windows 3.1x/DOS Installation:

Most notebook computers benefit from having Card and Socket Services Software pre-installed. This software allows the user full "plug and play" for PC Card devices. Card and Socket Services software automatically configures your notebook's PC Card slot for a modem and allows the user to remove and insert the NetComm CardModem GSM device without having to power down the computer. If Card & Socket Services software has been supplied on disk but not pre-installed, then please call your computer manufacturer. If Card and Socket Services Software

has not been supplied with your computer, then the modem enabler program needs to be used. The modem enabler program can also be used instead of Card and Socket Services software if you need to save memory usage. Please ignore the following if Card and Socket Services software is being used.

Before using the modem enabler program, please ensure that Card and Socket Services software is **not** present on your computer.
Insert the disk into drive A:. From the DOS C:\ prompt, type **COPY A:MODEM*.*<CR>** This will copy the modem enabler files to your hard drive.

The modem enabler program must be run from DOS, and can also be added into your AUTOEXEC.BAT file.
Example commands :-
Modem Com2 This command sets the modem up for Com port 2.
Modem B Com2 This command sets the modem up for Com port 2 in PC Card slot B. Some computers have several PC Card slots identified as A, B etc.
Modem Com3 IRQ5 This command sets the modem up for Com port 3 with an IRQ of 5.
Modem Com1 /C0 This command sets the modem up for Com port 1 and forces the program to use memory location C0.
When the modem has been set up successfully, the modem enabler program will respond with the following message:- "**MODEM SETUP FOR COM X**" where X is the com port number.

For full instructions, on using the modem enabler, view the **README.TXT** file in the **A:\MODEM** directory. Alternatively, this file can be read by any word processing package and then printed.

Examples of some common error messages from the modem enabler program as follows :-
"**Modem not present**" the modem is either not seated in the slot correctly or the enabler programs being directed to the wrong slot. If Card and Socket Services are still present and the modem enabler program is used, the enabler program will not detect the modem.
"**invalid base memory**" use the command switch to change the base address e.g. If the command **MODEM COM2** results in this error message, try **MODEM COM2/C0**.
Complete details of error messages and their meanings can be found in the Readme.txt file.

Refer to the User Guide of your communications software package for details on configuration and modem operation.

OS2 Installation

Copy the A:\OS2\MODEM.SYS file to the system root directory, and add the following line to the config.sys :-

DEVICE=C:\MODEM.SYS INFO COM2
after the line
DEVICE=C:\OS2\PMDD.SYS
but before the line
DEVICE=C:\OS2\COM.SYS

If another Com port is required, then this can be specified using COMn (n=1,2,3 or 4).

Overcoming Problems

If you are having problems configuring your modem, refer to the Troubleshooting Guide Appendix A or contact your modem dealer or place of purchase.

About your Modem Adapter Cable

Your modem is supplied complete with a Modem Adapter Cable specifically for connection to the telephone network. One end of the adapter plugs into the modem and the other end into the telephone wall socket. Only use the Modem Adapter Cable provided with your modem otherwise the modem approval will be invalidated. Do not try to use any other interface device as this could be dangerous to the user and damage the modem. When not using the modem, the adapter can be disconnected from the modem and the wall socket.

Software Installation

Now that your CardModem GSM is configured you can install your communications software. Please refer to the Cooee Installation Guide for further instructions.

Note: There are two modem scripts provided with the Cooee software. The 'NetComm Card GSM' script is provided for use with a standard telephone line. The 'NetComm Card GSM - Mobile' script is provided for use with Cooee and your mobile phone.

Configuring your Modem Using AT Commands

This section is designed for advanced users who wish to take full advantage of the NetComm CardModem GSM's powerful AT Commands.

A full description of the available codes is given together with examples of their methods of use.

Command and data modes

There are two modes of modem operation; *Command mode* and *Data mode*. In Command mode, AT codes entered from the PC keyboard control the modem configuration and general operation - i.e. sets baud rates, dials numbers etc. In Data mode the modem sends and receives files, or sends data entered directly from the keyboard.

On power-up the modem is automatically placed in Command mode, and following a line dial or line seize command, or after automatically answering an incoming call, it switches to Data mode and all characters entered from the DTE are passed to the remote modem. Once in Data mode, the modem can be temporarily switched back to Command mode by using the escape command **+++.** The modem can then be returned to Data mode at any time by using the **AT0** command.

When a command is issued to the modem in Command mode, it analyzes the incoming bit stream from the DTE to ascertain the bit rate, word length and parity.

Commands can be issued by the DTE at 115200, 57600, 38400, 19200, 14400, 12000, 9600, 7200, 4800, 2400, 1200, 600 and 300 bps. The modem will automatically determine which is being used.

Command Syntax

All the modem commands are preceded with the ASCII characters **AT** (Attention Code) and terminated with a Carriage Return. Prior to terminating the command line, you can edit mistakes by using the Backspace key. This will delete the last character entered, but it will not delete the **AT** at the beginning of the line.

The **AT** command can be issued using either upper or lower case characters, but not a combination of the two. You are allowed to enter more than one command on a line between the **AT** and the Carriage Return. Spaces are ignored.

There are two commands that do not obey this rule: the **A/** command and the +++ command :-

A/ Causes the modem to re-execute the last command line. Note that it is not followed by a Carriage Return.

+++ Causes the modem to exit from data mode and enter command mode - the call is not automatically disconnected.

❑ Buffered Commands

Your modem is equipped with a 40 character buffer which will retain the last command issued. It is possible to re-execute the command in the buffer by the simple **A/** two character command. The buffer is cleared whenever an **AT** character pair is detected or when the modem is powered down. All subsequent command characters following the **AT** are entered in the buffer until a carriage return character is detected. All spaces used to make the command line more readable are stripped off but will continue to occupy buffer space.

Using your modem as a fax machine

Your modem is capable of sending and receiving faxes. Fax operation is controlled automatically by the software which is supplied with your modem.

Your modem can send and receive faxes at up to 14400bps. The fax feature is compatible with Group 3 fax machines and fully compliant with the. EIA 578 Class 1 and SP2388 Class 2 control standards.

Modem 'AT' Command Summary

This section reproduces an alphabetical list of Hayes **AT** commands and gives a brief description of each.

All command lines must begin with the AT character pair. Typing **AT** on its own will result in the **OK** message being returned by the modem.

ATA Answer

This command causes the modem to pick up the line and go to line in answer mode immediately. An incoming ring signal does not have to be detected by the modem. The modem will issue answer frequencies and attempt to train up to calling modem. If a connection is not established within the time period defined by S register 7, then the **NO CARRIER** message will be displayed.

A Answer immediately - force modem off-hook and into answer mode.

ATB Mode of operation

This command is used to put the modem into BELL mode or ITU-T (CCITT) mode. Bell modes are rarely used American modes of operation, usually at 300bps or 1200bps.

B0 Set to standard ITU-T (CCITT) protocols .
B1 Set Bell modes.

ATD Dial command and dial modifiers

ATD causes the modem to dial according to the suffixed modifier. eg. ATDT^12345 causes the modem to Tone dial 12345 in silent calling mode.

D# Dial Telephone number (#).

Dial string modifiers:

^ Changes the state of call tone
P Set to pulse dialling.
T Set to tone (DTMF) dialling
, Pause (S8) seconds before next digit.
W Wait for dial tone.

@ Wait for quiet answer.

& Wait for credit card dial tone before continuing with the dial string.

; Return to command mode after dialling.

S=n Dial number stored in location

*#ABCD Additional DTMF tone codes.

L Dial last number called.

ATE Command echo

The **ATE** command controls the echoing of commands to the DTE device when in command mode.

E0 Command characters not echoed to the DTE.

E1 Command characters echoed to the DTE.

ATH Hang up

The **ATH** command puts the modem into an on-hook or off-hook state. eg. when in command mode **ATH** would disconnect the call by hanging up the line.

H0 Set the modem on-hook (off-line).

H1 Set the modem off-hook (on-line).

ATI Interrogate modem

The **ATI** commands interrogate the modem and returns the relevant information.

I0 Request 3 digit product code.

I1 Request firmware checksum.

I2 Validate internal firmware checksum (OK response).

I3 Request software release code.

I4 Product identifier.

ATL Speaker volume

The **ATL** commands are used to set speaker volume where appropriate.

L0 Set lowest speaker volume

L1 Set low speaker volume

L2 Set medium speaker volume

L3 Set high speaker volume

ATM Speaker control

The **ATM** command controls when a speaker is active.

M0 Turn loudspeaker off at all times.

M1 Enable loudspeaker until carrier is detected.

M2 Enable loudspeaker whenever modem is off-hook.

M3 Enable loudspeaker after dialling and until carrier is detected.

ATN Automode detection (V34 Only)

The ATN command controls the automode detection.

N0 Automode detection is disabled (equivalent to setting the +MS<<automode>> subparameter to 0) A subsequent handshake will be conducted according to the value of S37 or, if S37 is set to 0, according to the most recent DTE speed.

N1 Automode detection is enabled. A subsequent handshake will be conducted according to the contents of S37 or, if S37 is 0, starting at V.34 2800bps.

ATO Modem on-line

The **ATO** command is to return a modem to data mode when it is on line and in command mode.

O0 Return modem to Data mode.

O1 Return modem to Data mode and initiate retrain sequence (only applies to V.22bis operation).

ATQ Quiet message control

This command is used to switch result codes from the modem to the DTE device on or off.

Q0 Enable response codes to the DTE.

Q1 Disable response codes to the DTE.

ATS Set S register

The **ATS** command is used to either read the value of an S register or set it to another value.

Sr? Return the contents of Register r to the DTE.

Sr=n Set the contents of Register r to n.

ATV Result code format

The **ATV** command determines the format of the result messages returned by the modem.

V0 Send numeric result code set.

V1 Send verbose code set.

ATW Connect message format

This command determines the format of the messages returned by the modem when it connects in error corrected mode.

W0 Report DTE speed only e.g. CONNECT 57600

W1 Report line speed, EC protocol and DTE speed

W2 Report DCE speed only e.g. CONNECT 33600

ATX Result code set and blind dialling

The **ATX** command determines which result code set is to be used by the modem and also determines the level of network tone recognition.

X0 Select basic result code and disable all network tone recognition.

X1 Select extended result codes and disable all network tone recognition.

X2 Select extended result codes and enable dial tone recognition.

X3 Select extended result codes and enable busy tone recognition.

X4 Select extended result codes and enable both busy signal detection and dial tone recognition.

ATY Break disconnect format

This command is used to switch the break disconnect off or on. When the modem is in a non error corrected mode and the long space disconnect is switched on, the modem will transmit a 4 second break before going on hook. In error corrected mode the modem will go on hook if it receives a break of greater than 1.6 seconds.

Y0 Disable long space disconnect.

Y1 Enable long space disconnect.

ATZ Modem reset

The **ATZ** command resets the modem to the profile selected.eg. ATZ1 Reset the modem to profile 1.

Zn Reset the modem and load configuration n

AT&C Data carrier detect

AT&C controls how the modem presents the DCD signal.

&C0 DCD is always on

&C1 DCD follows carrier

AT&D DTR options

The **AT&D** command in conjuntion with the **AT&Q** command determines how the modem will react to a loss of DTR.

&D0 Interpret DTR transition as per &Qn
&Q0, &Q5, &Q6 The modem ignores DTR
&Q1, &Q4 The modem hangs up
&Q2, &Q3 The modem hangs up

&D1 Interpret DTR transition as per &Qn
&Q0, &Q1, &Q4, &Q5, &Q6 Asynchronous escape
&Q2, &Q3 The modem hangs up

&D2 Interpret DTR transition as per &Qn
&Q0 - &Q6 The modem hangs up

&D3 Interpret DTR transition as per &Qn
&Q0, &Q1, &Q4, &Q5, &Q6 The modem performs soft reset
&Q2, &Q3 The modem hangs up

AT&F Factory reset options

This command loads the selected profile.

&F Load factory configuration.

&F1 The pre-stored configuration for cellular operation is loaded into the modems registers.

AT&K Flow control options

The **AT&K** command selects the type of flow control to be used by the modem. Flow control is essential when the DTE speed is greater than the actual line speed.

&K0 Disable flow control from DTE to modem.

&K3 Enable RTS/CTS DTE/DCE flow control .

&K4 Enable XON/XOFF DTE/DCE flow control

&K5 Support transparent XON/XOFF DTE/DCE flow control

&K6 Enable RTS/CTS and XON/XOFF DTE/DCE flow control

AT&Q Asynchronous operation

The **AT&Q** command selects the data and transmission mode.

&Q0 Select direct asynchronous mode

&Q5 Modem negotiates an error corrected link

&Q6 Select asynchronous operation in normal mode

AT&R CTS control

AT&R controls the response of the CTS signal. CTS is also affected by the **AT&K** command.

&R0 CTS operates in accordance with V.24 spec.

&R1 CTS always ON.

AT&S DSR control

This command determines how the DSR signal operates.

&S0 DSR always ON.

&S1 DSR operates in accordance with V.24 spec.

AT&T Loopback test options

These commands are used to perform V.54 modem self tests. The tests operate for the length of time specified in S register 18. If this is set to 0, tests can be cancelled by **AT&T0**.

&T0 Terminate any test in progress.

&T1 Initiate Local Analogue Loop-back Test.

&T3 Initiate Local Digital Loop-back Test.

&T4 Accept requests for remote Digital Loop-back.

&T5 Deny requests for remote Digital Loop-back.

&T6 Initiate remote Digital Loop-back Test (V.54)without self test.

&T7 Initiate remote Digital Loop-back Test with self test.

&T8 Initiate local analogue loop back with self test

AT&V Display modem configuration

AT&V displays the current configurations and the other stored profiles.

&V Display current configuration.

AT&W Save to non-volatile memory

This command saves the current configuraion into non-volatile memory.

&Wn Write active configuration to stored profile n where n is 0 or 1.

AT&Y Set power on default

AT&Y determines which profile is to be loaded when the modem is powered on. eg. **AT&Y1** means that the profile stored in location 1 is loaded on power up.

&Yn Load configuration profile n at power-up.

AT&Z Store telephone numbers

The **AT&Z** command stores a telephone number into the modems telephone directory. There are 15 telephone locations available, each containing up to 24 digits. eg. **AT&Z2=12345** stores the telephone number 12345 in location 2.

&Z=n Store first telephone number.

&Z1=nStore second telephone number.

&Z14=n Store fifteenth telephone number.

AT\A Set MNP packet sizes

The **AT\A** command sets the maximum block size used during an MNP connection. This command is only used when the phone line is very noisy.

\A0 Set max. packet size to 60

\A1 Set max. packet size to 128

\A2 Set max. packet size to 192

\A3 Set max. packet size to 256

AT\B Set Transmit break

The **AT\B** command is used to transmit a break from the local modem to the remote modem when an error corrected link is established

\Bn Send break of n (n = 1-9) durations of 100ms.

AT\F Display telephone directory

AT\F displays the telephone numbers stored in the modem's directory.

\F Display telephone directory.

AT\G Modem to modem flow control

In non-error corrected mode, the modem enables or disables the generation or recognition of modem to modem XON/XOFF flow control according to the parameter supplied. In error correction mode, the setting of modem to modem XON/XOFF flow control is ignored. However, the AT&K settings remain active.

Due to the buffering system used in the modem, modem to modem flow control is normally disabled.

\G0 Disables modem to modem XON/XOFF flow control

\G1 Enables modem to modem XON/XOFF flow control.

AT\K Break control

The **AT\K** command determines how the modem will react when a break is received. A break can be received by the modem from the remote modem, or the DTE device, or from the local modem with the **AT\B** command. This command only affects the modem in non-error corrected links.

\K0 Break from DTE causes the modem to enter command mode and not transmit break.
Break command causes the modem to purge its' buffers and transmit break to line
Break from remote modem causes the modem to purge its' buffers and transmit break to DTE device.

\K1 Break from DTE causes the modem to purge its' buffers and transmit break to line.
Break command causes the modem to purge its' buffers and transmit break to line.
Break from line causes the modem to purge its' buffers and transmit break to DTE.

\K2 Break from DTE causes modem to enter command mode and not transmit break.
Break command causes modem to transmit break to line immediately.
Break from line causes modem to transmit break to DTE immediately.

\K3 Break from DTE causes modem to transmit break to line immediately.

\K4 Break from DTE causes modem to enter command mode and not transmit break.
Break command causes modem to transmit break to line in sequence with the data
Break from line causes modem to transmit break to the DTE in sequence with the data.

\K5 Break from DTE causes modem to transmit break to line in sequence with the data.
Break command causes modem to transmit break to line in sequence with the data.
Break from line causes modem transmit break to DTE in sequence with the data.

AT\L MNP stream\block

This command controls the selection of block or stream modes of operation in MNP mode.

\L0 Use stream mode for MNP

\L1 Use block mode for MNP

AT\N Error correction options

AT\N selects the error correction protocol to be used by the modem. Both LAPM and MNP4 are supported. eg. **AT\N**4 will cause the modem to establish a LAPM error corrected link only, if an error corrected link cannot be established the call is dropped. In reliable or auto-reliable V.42 mode, LAPM takes precedence over MNP.

\N0 Disable MNP and LAPM operation

\N1 Disable MNP and LAPM operation.

\N2 Enable reliable V.42 operation.

\N3 Enable auto-reliable V.42 operation (fallback to normal).

\N4 Enable reliable LAPM.

\N5 Enable reliable MNP operation .

AT+MS Select line modulation (V34 Only)

This extended format command selects the modulation, enables or disables automode, and specifies the lowest and highest connection rates using one to four subparameters.The command format is **AT+MS=** <<mode>>,<<automode>>,<<min-rate>>,<<max-rate>>

Example : to force the modem to use V.34 line modulation, autodetect line speed, and accept a minimum connection of 300bps and a maximum connection of 28800bps, use the command :

AT+MS= 11,1,300,28800 this is the default setting.

Example : to force the modem to use V.32 line modulation with the data rate fixed to 4800bps, use the command :

AT+MS= 9,0,1200,4800

To determine what options the modem supports, use the command :

AT+MS=?

A typical response to this command is :

(0,1,2,3,9,10,11,64,69,74),(0,1),(300-28800),(300-28800)

The parameters for the AT+MS command are as follows :-

mode>	Modulation	<min-rate> <max - rate>
0	V.21	300
1	V.22	1200
2	V.22bis	2400
3	V.23	1200
9	V.32	9600 or 4800
10	V.32bis	14400, 12000, 9600, 7200 or 4800
11	V.34	28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800 or 2400
64	Bell 103	300
69	Bell 212	1200
74	V.FC	28800, 26400, 24000, 21600, 19200, 16800 and 14400

<<automode>>Option

0	Automode disabled
1	Automode enabled (default)

AT%C Data compression options

The **AT%C** command is used to select the data compression mode. The modem supports both MNP5 and V.42bis.

%C0 Disable MNP 5 and V.42bis data compression.

%C1 Enable MNP class 5 data compression only.

%C2 Enable V.42bis and disable MNP 5

%C3 Enable V.42bis and MNP 5

AT%E Auto retrain options

This command selects the auto-retrain facility. When enabled, the modem monitors the line quality and performs a retrain when the line deteriorates. If retraining is unsuccessful, the modem disconnects the call.

%E0 Disable line quality monitor and auto retrain

%E1 Enable line quality monitor and auto retrain

%E2 Enable line quality monitor and fallback/fall forward

%E3 Enable line quality monitor and auto retrain, but hang up immediately when the line becomes too noisy

AT-K MNP10 options

This command enables or disables conversion of a V.42 LAPM connection to an MNP10 connection.

-K0 Disable MNP10 extended services

-K1 Enable MNP10 extended services

Messages from the modem

When you initially use the modem you will receive Hayes verbal messages in response to your commands. You have the choice of receiving no messages, or messages in either verbal or digital form. You can easily understand the verbal form, but your computer may find it easier to handle the digital form. The table below lists the Hayes digital codes and their verbal equivalents.

Numeric	Long form
00	OK
01	CONNECT
02	RING
03	NO CARRIER
04	ERROR
05	CONNECT 1200
06	NO DIALTONE
07	BUSY
08	NO ANSWER
09	CONNECT 0600
10	CONNECT 2400
11	CONNECT 4800
12	CONNECT 9600
13	CONNECT 7200
14	CONNECT 12000
15	CONNECT 14400
16	CONNECT 19200
17	CONNECT 38400
18	CONNECT 57600
19	CONNECT 115200
22	CONNECT 75TX/1200RX
23	CONNECT 1200TX/75RX
24	DELAYED
32	BLACKLISTED
33	FAX
35	DATA
40	CARRIER 300
44	CARRIER 1200/75
45	CARRIER 75/1200
46	CARRIER 1200
47	CARRIER 2400
48	CARRIER 4800

49	CARRIER 7200
50	CARRIER 9600
51	CARRIER 12000
52	CARRIER 14400
53	CARRIER 16800
54	CARRIER 19200
55	CARRIER 21600
56	CARRIER 24000
57	CARRIER 26400
58	CARRIER 28800
59	CONNECT 16800
61	CONNECT 21600
62	CONNECT 24000
63	CONNECT 26400
64	CONNECT 28800
91	CONNECT 31200
84	CONNECT 33600
66	COMPRESSION : CLASS5
67	COMPRESSION :V42BIS
69	COMPRESSION : NONE
70	PROTOCOL : NONE
77	PROTOCOL : LAPM
80	PROTOCOL : ALT
81	PROTOCOL : ALT-CELLULAR
+FC	FCERROR (fax error)

The result codes shown comprise the **Extended Command** set. Result codes 0-4, 6-8 and 16-18 comprise the **Basic Command** set.

S-Register Definitions

Your modem has a set of internal registers which are used to control its operation. These are known as "S" registers.

The modem command set includes a command to view the contents of a specific register and another to alter its contents. If you want to examine the contents of register r, use the command :

ATSr?

The contents of the specified register are returned to the DTE as a three digit decimal number.

The contents of a register can be changed using the command:

ATSr=n

Where the S register r is set to the decimal value n. As the registers are all 8 bit, the value of n can be any integer from 0 to 255. Refer to the specific S register descriptions for values.

AT? returns the value of the last S register interrogated. **AT=nn** modifies the last S register interrogated.

Note*: It is recommended that users do not try to modify the contents of the bit mapped S registers.*

The following section details the function of these S registers. The number in brackets following the register number is the factory default value.

When specifying bit-mapped registers with multiple options, the bit pattern is displayed in binary format starting with the most significant bit to the left.

S0 (0) Auto Answer Ring Number.

Units: Rings æ Range: 0 - 255

Defines the number of ring bursts before the modem automatically answers an incoming call. When set to zero, auto-answer is disabled.

S1 (0) Incoming Ring Count (read only register).

Units: Rings æ Range: 0 - 255

Counts the number of ring bursts received. Reset to zero after 8 seconds of no ring.

S2 (43) Escape Character.

Units: ASCII æ Range: 0 - 127

Defines the ASCII character used to exit into command mode from data mode. A value greater than 127 disables escape code detection.

S3 (13) Carriage Return Character.

Units: ASCII æRange: 0 - 127

Specifies the ASCII code to be used as carriage return.

S4 (10) Line Feed Character.

Units: ASCII æ Range: 0 - 127

Specifies the ASCII code to be used as line feed.

S5 (8) Backspace Character.

Units: ASCII æ Range: 0 - 127

Specifies the ASCII character to be used to erase the last command character entered.

S6 (4) Wait time for dial tone before blind dialling.

Units: Seconds æ Range: 4-7

Determines the period of time that the modem waits after connecting to line before commencing blind-dialling of the telephone number specified. The W modifier in the dial string will override this and cause the modem to wait for a dial tone before commencing dialling.

S7 (40) Wait for carrier or Silence after dialling.

Units: Seconds æ Range: 1 - 58

Determines the period of time that the modem waits for carrier from the remote modem before hanging up.

S8 (4) Pause time for the comma (,) dial modifier.

Units : seconds - Range : 4- 11

This register contains the time period (in seconds) of the (,) dial modifier used in the dial string. Consecutive commas will invalidate the modem's approval if the total pause period exceeds 12 seconds.

S9 (6) Carrier detect response time.

Units : tenths of a second - Range : 1-255

This register contains the time period (in tenths of a second) that a received carrier signal must be present for the modem to recognise it and turn on the DCD signal on the V.24.

S10 (14) Loss of carrier to hang up delay time.

Units : tenths of a second - Range : 1 - 255

This register contains the time period (in tenths of a second) that the modem takes to disconnect from the telephone line upon detection of loss of carrier. If S10 is set to a value less than S9 any loss of carrier will result in disconnection. The loss of carrier time period that can be tolerated is the difference between S9 and S10.

S11 (0) Duration and spacing of DTMF tones.

This register contains the time period (in milliseconds) of the duration and inter-digital pause of the DTMF dialling tones. This is a read only register.

S12 (50) Escape code guard time.

Units : fiftieths of a second

This register contains the time period of the escape code guard time. The escape code guard time is the delay required prior to and immediately succeeding the escape code. If the guard time is defined as 0, there will be no guard time and 3 consecutive escape characters will cause the modem to enter the command mode.

S13 Reserved

S14 (138) Bit mapped register.

Bit 0 Reserved
Bit 1 0 Disable command echo.1 Enable command echo.
Bit 2 0 Enable result codes.1 Disable result codes.
Bit 3 0 Short form result codes.1 Long form result codes.
Bit 4 Reserved
Bit 5 0 DTMF dial.1 Pulse dial.
Bit 6 Reserved.
Bit 7 0 Answer 1 Originate

S15 Reserved

S16 (0) Test options, bit mapped (read only register).

Bit 0 0 Local analogue loop-back inactive.
1 Local analogue loop-back active.

Bit 1 Reserved

Bit 2 0 Local digital loop-back inactive.
1 Local digital loop-back active.

Bit 3 0 Remote digital loop-back requested from remote modem active.
1 Remote digital loop-back requested from remote modem active.

Bit 4 0 Status bit, remote digital loop-back inactive.
1 Status bit, remote digital loop-back active.

Bit 5 0 Remote digital loop back disabled
1 Remote digital loop back enabled

Bit 6 0 Local analogue loop back disabled
1 Local analogue loopback enabled

Bit 7 Not used.

S17 Reserved

S18 (0) Test timer.

Units : seconds - Range 0-255
This register defines the time period (in seconds) of the modems diagnostic tests. When a test has been active for a period given by the register then the modem will automatically cancel the test. A value of 0 will disable the test timer and any test will remain active until cancelled by the user.

S19 Reserved.

S20 Reserved

S21 (116) Bit mapped register.

Bit 0 0 &J0
1 &J1

Bit 1 Reserved

Bit 2 0 CTS always on.
1 CTS tracks RTS.

Bits 4,3 00 DTR is ignored.
01 Enter command state when DTR inactive.
10 Clear down call when DTR inactive.
11 Clear down call and reset when DTR inactive.

Bit 5 0 DCD always active.
1 DCD is active when carrier present.

Bit 6 0 DSR always active.
1 DSR active in data mode only.

Bit 7 0 Long space disconnect disabled.
1 Long space disconnect enabled.

S22 (117) Bit mapped register.
Bits 1,0 00 Speaker off
01 Speaker low
10 Speaker medium
11 Speaker high

Bits 3,2 00 Speaker disabled.
01 Speaker on until carrier.
10 Speaker always on.
11 Speaker on until carrier, off when dialling.

Bit 6,5,4 000 Basic result codes, no busy, blind dials.
100 Extended result codes, no busy, blind dials.
101 Extended result codes, no busy, detects dialtone.
110 Extended result codes, detects busy, blind dials.
111Extended result codes, detects busy and dialtone.

Bit 7 Reserved

S23 (189) Bit mapped register.

Bit 0 0 disable remote request for remote digital loop-back.
1 enable remote request for remote digital loop-back.

Bit 3,2,1 000 DTE baud rate = 300
010 DTE baud rate = 1200
011 DTE baud rate = 2400
100 DTE baud rate = 4800
101 DTE baud rate = 9600
111 DTE baud rate = 19200

Bit 5,4 00 parity even
01 not used
10 odd parity
11 no parity

Bit 7,6 Reserved

S24 (0) Sleep inactivity timer
Units : 10 seconds

Sets the length of time that the modem will operate in normal mode with no detected telephone line or DTE activity before entering low-power sleep mode. The timer is reset upon any DTE line or telephone line activity.

S25 (5) Delay to DTR

Units : seconds - Range 0-255
Sets the length of time that the modem will ignore DTR before hanging up.

S26 (1) RTS to CTS delay

Units : hundredths of a second - Range : 0-255
Sets the time delay before the modem turns CTS on after detecting an off-to-on transition on RTS when &R0 is commanded.

S27 Bit mapped

Bit 0,1,3	0,0 &M0 or &Q0
	1,0 &M1 or &Q1
	2,0 &M2 or &Q2
	3,0 &M3 or &Q3
	0,1 &Q4
	1,1 &Q5
	2,1 &Q6
Bit2,4,5	Reserved
Bit 6	0 CCITT mode
	1 Bell mode
Bit 7	Reserved

S28 (0) **Bit mapped**

Bit 0 0 V.23 split screen disabled
1 V.23 split screen enabled

Bit 1 0 75 Tx
1 1200 Tx

Bit2 0 half duplex disabled
1 half duplex enabled

Bit 3,4,5,6,7 Reserved

S29 (0) **Flash dial modifier**

Units : 10 milli seconds - Range : 0-255
Sets the length in time, in units of 10ms, that the modem will go on-hook when it encounters the flash (!) dial modifier in the dialstring.

S30 (0) **Disconnect inactivity timer.**

Units : tens of seconds - Range : 0-255
Sets the length of time that the modem will stay on line before disconnecting when no data is sent or received. In error correction mode, any data transmitted or received will reset the timer. In other modes, any data transmitted will reset the timer.

S31 (2) **Modem modes.**

Bit 0 Reserved

Bit1 0 line speed detection disabled
1 line speed detection enabled

Bit 2,3 00 Error correction progress messages report DTE speed only
01 Full report given
10 DCE speed only reported

Bit 4,5,6,7 Reserved

S32 (17) XON character.

Units : ASCII - Range 0-255
Sets the value of the XON character.

S33 (19) XOFF character

Units : ASCII - Range : 0-255
Sets the value of the XOFF character.

S34 Reserved

S35 Reserved

S36 (7) LAPM failure control.

This value indicates what should happen upon a LAPM failure. These fallback options are initiated upon connection if S48=128.

Bit 0,1,2
- 000 Modem disconnects
- 001 Modem stays on line and a direct mode connection is established
- 010 Reserved
- 011 Modem stays on line and a normal mode connection is established
- 100 An MNP connection is attempted and if it fails the modem disconnects
- 101 An MNP connection is attempted and if it fails a direct mode connection is established
- 110 Reserved
- 111 An MNP connection is attempted and if it fails a normal mode connection is established

S37 Desired line connection speed (0)

Bit 4, 3,2,1,0	00000	Attempt auto mode connection
	00010	Attempt to connect at 300bps
	00100	Attempt to connect at 300bps""
	00110	Attempt to connect at 300bps""
	00100	Reserved
	00101	Attempt V32bis/V32 4800bps
	0110	Attempt to connect at 2400bps
	11000	Attempt to connect at V23
	11100	Attempt V32bis/V32 9600bps
	11110	Attempt V32bis 12000bps

S38 (20) Delay before hanging up.

Units : seconds - Range 0-255
This register determines the time period that the modem waits before dropping the line when in error correction mode.

S39 (3) Flow control

Bits 2,1,0	000 No flow control
	011 RTS/CTS
	100 XON/XOFF
	101 Transparent XON
	110 Both methods
Bits 7,6,5,4,3	Reserved

S40 (105) Bit mapped

Bit 0	0 Disable extended MNP services
	1 Enable extended MNP services
Bit 1	Reserved
Bit 2	0 MNP link negotiation at highest speed
Bit 7,6	00 MNP block size 64 characters
	01 128 characters
	10 192 characters
	11 256 characters

S41 (227) Bit mapped

Bit 1,0	00	Compression disabled
	01	MNP5
	10	V42bis
	11	MNP5 and V42bis
Bit 2	0	Retrain disabled
	1	Retrain enabled
Bit 3	0	Modem to modem flow control disabled
	1	Enabled
Bit 4	0	Stream mode
	1	Block mode

Bit 7,6,5 Reserved

S46 (138) Data compression control.

Range : 136 or 138
136 Execute error correction protocol with no compression
138 Execute error correction protocol with compression

S48 (7) V.42 negotiation action

Range : 0, 7 or 128

The V.42 negotiation process determines the capabilities of the remote modem. However, when the capabilities of the remote modem are known and the negotiation is unnecessary, this process can be bypassed if so desired.
If an invalid number is entered, it is accepted but S48 will act as if 128 has been entered.
7 Enable negotiation
0 Disable negotiation
128 Disable negotiation; bypass detection and proceed with LAPM

S82 (128) Break handling.

Units : 10 milli seconds - Range 0-255

This register determines the way the modem will handle breaks. To guarantee break detection by the modem, the length of break must be at least 10ms. The modem will detect the break and transmit the break on the nearest 10ms boundary in the range 10ms to 2.55 seconds. Breaks longer than 2.55 seconds will be transmitted at 2.55 seconds.

3 "Expedited", break is actioned immediately regardless of data but data integrity is maintained.

7 "Destructive", break is actioned immediately. Current Current data is destroyed.

128 "In sequence", break is handled as data is sent andreceived, data integrity is maintained.

S86 (0) Connection failure identification (read only register).

This register gives diagnostic information regarding why the modem failed to connect.

0 Normal disconnection, no error occurred

4 Loss of carrier

5 V.42 failed to detect an error corrected modem at the other end

9 The modems could not find a common protocol

12 Normal disconnect initiated by the remote modem

13 Remote modem does not respond after 10 re-transmissions

14 protocol violation

S95 (0) Extended result codes

Bit 0 Connect result code indicates DCE speed instead of DTE speed

Bit 1 Append /ARQ to connect XXX result code if error correction is on

Bit 2 Enable carrier XXX result code

Bit3 Enable protocol XXX result code

Bit 4 Reserved

Bit 5 Enable compression result code

Bit 6,7 Reserved

Appendix A
Modem Trouble Shooting Guide

A recommended init string for most comunications software is:
AT&F&C1&D2W2S95=0

When using the Modem Enabler program, please read the associated README.TXT text file first.

Problem: Modem doesn't respond to commands.

Possible cause/solution :

1) Check that modem is not in quiet mode (**ATQ0**).
2) Check that you are addressing the correct Com port.
3) Check that you are not addressing the port too fast.
4) Check the interface lead, ensure that the modem is not on-line.
5) Ensure that there are no interrupt or addressing conflicts, eg. mouse on Com 1 and modem installed on Com 1.

Problem: Modem connects but gibberish appears on screen.

Possible cause/solution:

1) Check stop bit parity in software. Most commonly used is 8 data bits, 1 stop bit, no parity (8-1-N). Viewdata services usually use 7 data bits, 1 stop bit, even parity (7-1-E).
2) If parity is correct and only some characters are legible, en sure that you made an error corrected link (**AT\N2**) and that the software is using the correct terminal emulation.

Problem: Modem doesn't dial.

Possible cause/solution :

1) Is the BT lead connected ?
2) If connected to an extension of a switchboard, ensure that BT sockets are 2 wire extensions and not 4 wire extensions. Modems won't dial on 4 wire extensions.
3) Make sure that you are using the correct dial command eg. **ATDP** for pulse dial and **ATDT** for tone dial.

Problem: Modem responds with ERROR message.

Possible cause/solution :

1) You entered an invalid command.
2) Your command string consisted of more than 40 characters.
3) The number you have dialled is blacklisted.

Problem: Modem responds with NO DIALTONE message.

Possible cause/solution :

1) Ensure modem is connected to BT socket.
2) If dialling from an extension of a switchboard, check that the extensions are 2 wire and not 4 wire extensions.
3) Use the command **ATX0** to disable network tone recognition.

Problem: Modem won't answer an incoming call.

Possible cause/solution :

1) Check the value of register S0, **ATS0?** This should be greater than 0 for the modem to auto-answer.
2) If S0 is greater than 0 check that the modem is connected to the BT socket.
3) Ensure that you are using communications software that presents a DTR signal to the modem.
4) Ensure that the computer is also connected to the modem.

Problem: Modem responds CONNECT but nothing else appears on screen.

Possible cause/solution:

1) Ensure that full duplex modem has been set in software.
2) Ensure that echo is set correctly in software.

Problem: Characters entered appear twice on screen.

Possible cause/solution :

1) If **AT** is entered at the keyboard and AATT appears on screen, use the command **ATE0** to turn local echo off or configure the software correctly.

Problem: Modem connects but you cannot hear it dial.

Possible cause/solution :

1) Use the **ATM** command to adjust the speaker according to your requirements.

Problem: Data is missing.

Possible cause/solution :

1)Ensure that flow control is the same at both ends.

Appendix B
Glossary of Modem Terms

ASCII
The American Standard Code for Information Interchange.

Asynchronous Data
Most common type of modem data, using stop and start bits. Applies to all CardModem GSM modems.

AT Commands
Usually called Hayes Commands, allows the user to control the modem. Used to control all CardModem GSM modems.

Autoanswer
The ability of the modem to answer an incoming call automatically, featured on all CardModem GSM modems.

Autobaud
Allows the modem to sense the speed of the calling modem and configure itself accordingly. A feature of all CardModem GSM modems.

Baud
One signalling element per second.

Bit
BInary digiT, either 1 or 0.

Bps
Bits Per Second.

Byte
A group of bits, normally 8 which represent one data character.

Carrier
A continuous frequency capable of carrying a signal.

Class 2
Latest fax standard as implemented by the majority of fax software developers and featured on all CardModem GSM fax modems. The fax session is controlled by the modem not your computer, thus allowing you to carry out tasks in foreground mode at full speed while sending a fax in background mode.

Class 1
The fax session is controlled by the computer, thus using valuable processing power when sending faxes in background mode.

CTS
Clear To Send, modem control signal.

Data Compression
Techniques for increasing throughput by compressing the data eg.MNP5 or V.42bis.

DTE
Data Terminating Equipment eg. your computer.

DCE

Data Communications Equipment eg. your modem

Error Correction

Techniques to correct line errors eg. MNP4 and LAPM. Featured on all CardModem GSM modems.

GSM

Global System for Mobile communications. It is a digital cellular communications standard which includes a channel specifically for data.

Handshaking

A pre-defined exchange of signals enabling modems to establish the data link.

Internet

Worldwide network of computers.

ITU-T

The new name for the CCITT. The governing body that specifies the V Standards for modem communications.

LAPM

Link Access Procedure, error correction, part of the V42 spec. for error correction. To be found on all CardModem GSM modems.

MNP5

The common data compression technique that typically doubles data throughput.

PSTN

Public Switched telephone Network, i.e. Your analogue telephone line.

V.17

14400bps fax standard. The fastest fax standard featured on all CardModem GSM fax modems.

V.21

300bps data standard. A rarely used data transmission speed.

V.22

1200bps data standard. Rarely used now.

V.23

1200/75bps data standard.

V.22bis

2400bps data standard. Rarely used now.

V.27ter

4800bps fax standard. An early fax speed to be found on all CardModem GSM fax modems.

V.29

9600bps fax standard. A fast fax speed featured on all CardModem GSM fax modems.

V.32

9600bps data standard. A common fast data speed, featured on all CardModem GSM modems.

V.32bis

14400bps data standard. featured on all CardModem GSM modems.

V.34
33600bps data. Standard speed found on CardModem GSM modems.

V.42
Official error correction standard incorporating LAPM and MNP4..

V.42bis
Official data compression standard typically trebling data throughput.

VFC
VFast Class. Rockwell's proprietary VFast standard at 28,800bps.

X modem
File transfer protocol, one of the first techniques developed. Still popular, but slow.

Y modem
File transfer protocol, useful for non-error corrected links.

Z modem
File transfer protocol, one of the latest and fastest techniques.

Appendix C
Statutory Information

The modem is approved for use with Austel Regulations in accordance with the conditions in the instructions for use. The following section provides the statutory information that relates to this approval.

Model No: The units referred to in this guide is the NetComm Card modem GSM.

Type of circuits: The modem is approved for connection to telecommunications systems specified in the instructions for use subject to the conditions set out in them. It is not approved for a shared service, 1+1 carrier system or as an extension to a pay telephone.

Dialling : The modem may be used with either pulseor tone signalling.

Functions: The modem is an autodialling (tone and pulse) modem conforming to V.32bis, V.32, V.22bis,V.23,V.22,V.21,V.17 V.29, and V.27ter standards. V34 modems also conform to V.34 & V.FC standards. It supports V.25 auto answering recommendations.

Echo suppressor: The modem is equipped with echo-suppressor (V.25) when auto answering.

REN : The modem has a REN of 1.

Explanation of REN :

Equipment for the attachment to the Public Telephone network is assessed to determine it's "ringer equivalence" number (REN). The REN relates to the performance of the apparatus when used in combination with other items of apparatus. The REN is a customer guide indicating approximately the maximum number of items that should be simultaneously connected to the line.

To determine the maximum number of items of apparatus that should be connected simultaneously to an exclusive line, the total REN obtained by summing the REN values of each of the items of apparatus connected to the exclusive line should not exceed the maximum REN value of 4. This value includes any BT provided instrument each of which is assumed to have REN value of 1.0 unless otherwise marked.

The modem has a REN of 1 and care must be taken not to use it with other telephone equipment that would result in the maximum figure of 4 REN being exceeded.

Due to the wide spread of ringing detector characteristics, a guarantee of successful operation in an installation of mixed types of ringing detectors may not be given by the suppliers.

PBX use :

This apparatus is suitable for connection to a PABX which returns secondary proceed indication.

This apparatus has been approved for use with the following facilities :-

Multi-frequency (tone) dialling and loop disconnect (pulse) dialling.

No recall.

Detection of initial proceed indication.

Detection of secondary proceed indication.

Operation in absence of proceed indication.

Automatic dialling facilities.

Dialling blacklist to BS6789 section 3.1 category A.

Automatic storage of last number dialled.

Detection of V.25 answertone.

Auto-clear from call operating end.

Automatic call initiation.

Modem.
Call progress monitor.
Tone detection.

Any other usage would invalidate the approval of the apparatus if as a result it then ceases to conform to the standard against which the approval was granted.

The apparatus is only approved for use as an extension instrument to compatible PBX's. The supplier of the apparatus should be consulted for an up to date list of PBX's with which the apparatus is compatible. It cannot be guaranteed that the apparatus will operate correctly under all possible conditions of connection to compatible PBX's. Any cases of difficulty should in the first instance be referred to the supplier of the telephone apparatus.

The connection of the modem to an exchange line or PBX extension is via a BT modular socket. If your PBX was not installed by British Telecom then contact your authorised maintainer.

PBX Dialling :

Instructions on short code dialling, repeat dialling (multiple and single) and the disabling of the secondary proceed indication are given in the main body of this guide.

Dialling Note :

When entering telephone numbers from the keyboard, the user should ensure that the numbers are correct before commencment of dialling.

Network Connection

Data transfer rate	Up to 115200bps with V.34 and V.42bis (com pression is dependant upon file type) Up to 57600bps with V.32bis and V.42bis (compression is dependant upon file type)
Operational modes	V.34 33600bps full duplex VFC 28800bps full duplex V.32bis 14400bps full duplex V.32 9600bps full duplex V.22bis 2400 bps full duplex V.22 1200 bps full duplex V.23 1200/75 Half duplex 75/1200 Half duplex V.21 300 bps full duplex V.27ter 4800 bps fax send and receive V.29 9600 bps fax send and receive V.17 14400bps fax send and receive
Line connection	2 wire PSTN
Signal level	-9 dBm
Equalisation	Transmit fixed compromise Receive automatic adaptive
Interface	600 ohm
Error correction	V.42 incorporating LAPM and MNP Class 4 MNP Class 10
Data compression	V.42bis and MNP Class 5

Autodial/Auto Answer

Dial Method	Pulse or tone dial, selectable
Call Progress	Loudspeaker with volume control Extended result codes

Call Control	Extended “AT” command set
Automatic Answer	To ITU-T (CCITT) V.25 recommendation
Mode selection	Automatic configuration to V.21/V.22/V.23 V.22bis/V.32/V.32bis/VFC/V.34 on receive
Call Disconnection	Loss of carrier, DTR or by command

Data Connection

DTE Speed	300, 600, 1200, 2400, 4800, 7200, 9600, 12000, 14400, 19200, 38400, 57600 , 115200
Test Modes	V.54 Analogue and Digital Loops
DTE Interface	16C550 compatible UART

Physical description

PC Card Environment	0 - 50 C	0 - 95% non-condensing

Host Independant User guide statements

Please ensure that the host apparatus can provide adequate power (750mW 180mA at 5V) for the modem and any auxilliary apparatus.

The modem should only be used when mounted inside the host apparatus.

It should be inaccessible without the use of a tool. The modem approval label should not be attached to the host apparatus.

This user guide must be supplied with the modem otherwise the modem approval will be invalidated.

It should be noted that it is the modem which has the approval and not the host.

The modem approval mark (attached to the modem adapter cable) must be visible whilst the modem is installed in the host.

Interconnection circuits shall be selected to provide continued compliance with the requirements of 2.3 for SELV circuits and with the requirements of clause 6 for TNV circuits after making connections between equipment.