

PACE



ROM based software

COMMSTAR

ROM BASED INTELLIGENT
COMMUNICATION FACILITY
FOR BBC MICRO



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PREFACE

What is Commstar?

Commstar is a comprehensive package of intelligent communications software supplied on EPROM, which will allow you to link your BBC computer, via a suitable modem, to another computer for the purpose of communicating with that computer.

Commstar will dramatically alter the way you visualise and use your BBC computer, it will literally open up a whole new world with endless possibilities.

Take for example British Telecom's Prestel service. Almost at the press of a button you can have access to a multitude of up-to-the-minute information pages, world news or weather, latest travel bulletins and much more. Access to Micronet 800 with many free programs that can be downloaded in seconds, free advice and news is just one example of how versatile your computer can really be.

Perhaps you might not have heard of 'bulletin boards', be sure that you soon will have! Free access bulletin boards are simply micro-computers whose dedicated task is to answer the telephone, take messages and provide the caller with access to its files or programs, and messages left by other users. If you have a problem, someone out there has a solution, so why not ask them? Simply leave your message on one or more of the many bulletin boards that have now been established and for the cost of a phone call you will soon have an answer.

At a more obvious level, how many times have you wanted to get a copy of a program to a friend or a business colleague, quickly? With Commstar you can transfer a file of ANY type, between two BBC's (or a BBC and a different computer) in the space of a phone call.

How to use this manual

As is typical of many areas of computing, the field of communications is shrouded in a cloak of technical jargon and abbreviations which to the layman cause only confusion. As complicated as this jargon might seem, the concepts it embodies are really rather simple and it is probably more useful to learn and use such terminology than to side-step it. For this reason Appendix A at the back of this guide provides a glossary of the most commonly used terms. The inexperienced communications enthusiast would be advised to study the glossary and try to absorb at least some of the terms before proceeding down the remainder of the slippery road to exorbitant telephone bills !!

You will find that Commstar is largely menu driven for ease of use and each of the menu options is fully described under it's own heading. Once each of these functions has been mastered, this manual will simply serve as a reference guide, hence the reason for Appendix B which gives a summary of the facilities which Commstar provides.

For those of you who are experienced communications buffs, Chapter 6 provides a quick guide on how to start communicating with Commstar almost instantly.

Throughout this manual angle brackets <> have been used to indicate a key on the BBC micro-computer. Thus, the notation <RETURN> refers to the Return key.

CHAPTER ONE

Introduction to Communications

1.1 Communications software

A 'terminal program' provides the means by which a micro-computer can act as a terminal to another computer. It is the software interface that works in conjunction with the communications hardware, to allow meaningful communication between two computers. Commstar is a very comprehensive and powerful terminal program which uses the RS423 port of the BBC micro-computer to send data to, and receive data from, the equivalent port of the 'host' computer.

Commstar may be used to access a huge variety of different systems ranging from a simple bulletin board to sophisticated public databases such as the American SOURCE system. Basically, what Commstar does is to read and interpret incoming data from the RS423 and store it or act upon it as required. When acting as the sender it reads data from a file or the keyboard and transmits that data to the RS423. Obviously there are many 'housekeeping' functions which must be carried out but Commstar 'hides' all of these from the user making it very simple to use.

1.2 Communications hardware

Within a computer, information is transferred between different components in 'parallel'. You may often hear the 6502 processor chip which is used in the BBC machine referred to as an '8-bit processor'. This indicates that the internal data bus used in the computer is 8 bits wide i.e. there are 8 separate 'wires' which carry data in the form of electrical signals around the computer simultaneously. However, when large distances are involved this method becomes unsatisfactory. The individual bits of data tend to travel at different speeds within the wires and introduce what is known as 'data skew' i.e. the data becomes garbled. It is for this reason that data cables used on disc drives and parallel printers are rarely longer than a metre and a half.

Apart from the problems of skew, there are other economic considerations e.g. it would be rather expensive to lay eight cables across the country instead of two!

In order to overcome these problems it is necessary to serialise the data and transmit it a single bit at a time through a two or three wire transmission circuit. This is the function of the RS423 serial port of your BBC micro-computer.

The RS423 interface converts data from your computer into serial form which makes it suitable for transmission over longer distances than would be possible with a parallel port.

The RS423 port of your computer, when used in conjunction with a length of suitable cabling, can be used to transfer data to and from another computer. Communication is only meaningful however, if the parties involved understand each other. In this respect, some form of 'protocol' is required to ensure that each computer knows how to interpret

the signals it receives from the other. This protocol is the equivalent of word, sentence and paragraph structure in English. The correct punctuation must be used in order to ensure that the text makes sense to the reader. Commstar, in conjunction with the hardware associated with the RS423 port on the computer, provides the necessary environment for ordered communication to occur.

1.3 The role of the telephone

It is both impracticable and expensive to connect two computers together over a long distance with a direct wire connection (commonly referred to as hard-wiring). Apart from the technical problems associated with laying the cable, there is a limit to the distance even a serial signal can travel without being 'boosted'.

The simplest solution (although not necessarily the most effective) is to use a network of cabling which already exists, the Public telephone network. There are however, a number of technical difficulties associated with using telephone lines in this way. These arise from the fact that they were not designed to carry digital signals from computers, they were designed to carry analogue wave forms, in particular, the human voice. Digital signals must be converted into analogue form before they can be passed to the telephone network and this task, called modulation is carried out by a Modem. In fact the modem carries out two jobs, that of converting the outgoing signal into analogue form and the reciprocal task of converting incoming signals into a form which the receiving computer can understand (demodulation). Thus a modem both MODulates and DEModulates electrical signals. In simple terms, it is just the interface which allows you to connect your computer to the telephone system.

1.4 Why an 'intelligent' program?

Intelligent terminal programs are so described because they offer sophisticated methods of receiving and storing data which has been transmitted by another system.

'Dumb' terminal programs are limited to simple operations such as sending whatever you type at the keyboard to the RS423 port, and as such are of very limited use.

Commstar can truly be described as intelligent because of the many complex and sophisticated features that it offers in order to ensure correct communication with the remote system. This manual describes each of these features in detail and illustrates how Commstar may be used to gain access to Prestel or the many bulletin boards and other forms of computer telecommunications that are now emerging.

1.5 Commstar - An Overview

Commstar consists essentially of two separate and independent sections, Prestel and Terminal emulation. This duality arises simply because Prestel utilises its own set of communications protocols which are different from those used by more generalised systems. In simple terms Prestel 'speaks' a different language to bulletin boards and other systems.

In addition to the 'built-in' emulation facilities, Commstar also allows the user to load from disc a different set of protocols and rules which may be used to emulate a more specific terminal type (e.g. VT100), further details on the subject of emulation are given in Chapter 7.

This manual has been written to reflect the differences in operation between the sections and, after detailing the installation procedure for Commstar, describes the Terminal, Prestel and specific terminal emulation facilities separately.

Getting Started**2.1 Fitting instructions**

Your Commstar EPROM may be placed in any of the 'sideways' or 'paged' ROM sockets. These are located on the front right-hand side of the circuit board inside the BBC micro-computer case. Alternatively, if you have fitted to your machine one of the proprietary 'sideways ROM expansion' boards that are now available, Commstar may be plugged into this as instructed in the literature supplied with the device.

Please read these instructions carefully before attempting to fit the EPROM. Also, refer to Figure 1 on page 14 to assist you in locating the ROM sockets. Avoid handling the ROM unnecessarily or touching the pins.

Before removing the case from the computer, switch OFF and REMOVE the mains plug from the wall socket, then follow these instructions :

1. To gain access to the ROM sockets remove the four screws (on early machines these were marked 'FIX'). There are two of these underneath the front of the computer and two more on the back panel.
2. When the top has been removed, release the bolts holding the keyboard in place. These are located at each end of the keyboard, early machines having three, later versions only have two. There is no need to disconnect the keyboard completely, simply move it to one side to expose the sideways ROM sockets.
3. Locate the row of five large sockets at the front right hand corner of the main printed

circuit board, two or more of which will already be occupied by ROMS. The rightmost four of these sockets, identified as IC52, IC88, IC100 and IC101 are sideways ROM sockets.

4. Before removing the ROM from its packaging, locate the half-moon notch on the top surface of the ROM.
5. Hold the ends of the ROM between finger and thumb, line up the pins with a free socket so that the notch is to the back of the computer.
6. Ensuring that all legs are correctly located press the ROM firmly into the socket. It is very important that none of them bend out or underneath the ROM. If the legs of the ROM are initially splayed too wide, the top surface of the power supply is ideal for bending them upon, should this prove necessary.
7. Replace the keyboard and lid (reverse the procedure from steps 1 and 2) and switch on the computer as normal. Typing *HELP will now display the various 'signatures' of the ROMs that are fitted. Commstar should appear in the list as :

*

Commstar nnnn

where nnnn is the registration number. If this signature does not appear check once again that the EPROM is inserted correctly.

8. All that remains having fitted the EPROM is to insert the function key identification strip beneath the clear plastic retainer above the function keys.

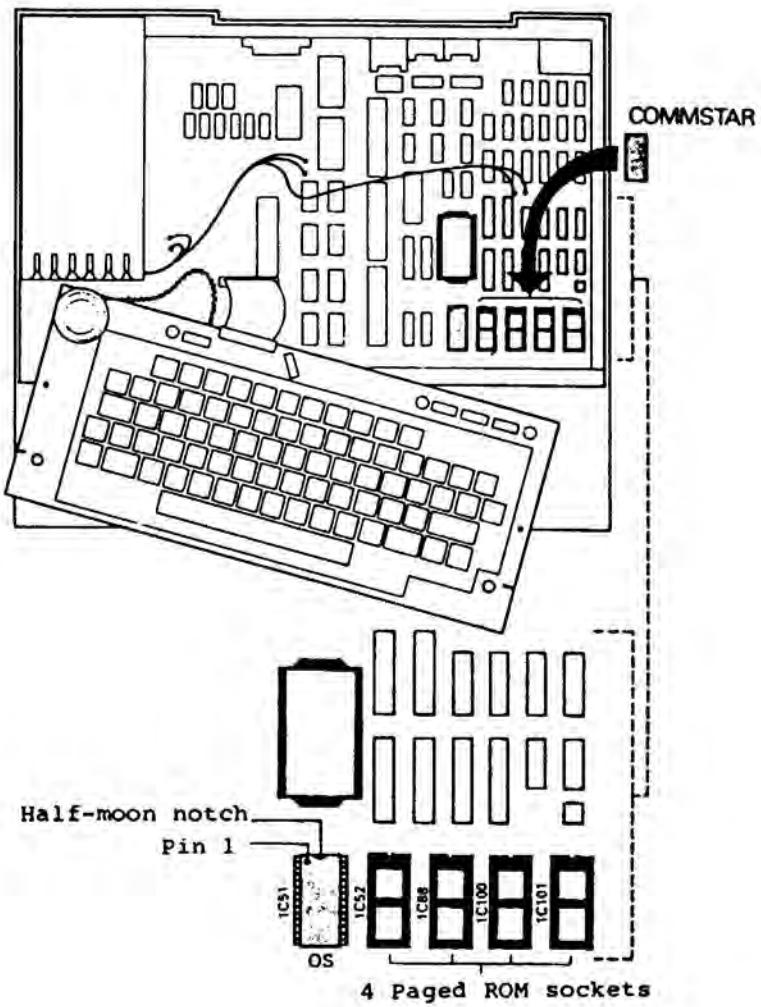


Fig 1.
BBC Model B board layout

2.2 User Registration

When Commstar has been correctly installed the serial number, 'nnnn' should be filled in on your registration card which should then be returned to PACE immediately. NO user support will be provided if this card is not returned ! Please ensure also that this number is quoted in any correspondence.

2.3 The Commstar main menu

Once Commstar has been fitted to your BBC computer it may be entered at any time by typing :

***COMMSTAR**

or simply

C

This will select the Commstar ROM and display the main menu of options and commands.

The first thing that you should notice is that Commstar always initialises itself in 'Terminal' mode. This is indicated just below the Commstar title with the following text :

Emulate : Terminal

In this mode Commstar will behave as an intelligent terminal but is not configured to emulate any specific terminal type such as VT100.

The remainder of the display is divided into two areas. The central area of the screen is the largest and serves as the main command menu and you will see that it is further divided into 3 sub-menus of related functions.

The first of these sub-menus groups together all commands which operate on Commstar's communications 'buffer'. The second lists various features which can be switched on or off. These are referred to as 'toggles' i.e. pressing the appropriate key once switches them out of their default settings, pressing it again returns them to their default state.

The third sub-menu includes those commands which have a more 'drastic' effect on the way that

Commstar is configured e.g. whether it is expecting to communicate with Prestel or to act as a terminal, whether it is being used interactively or in File transfer mode and so on.

Finally, at the bottom of the screen you will notice the status area which is reserved for information relating to the precise way in which Commstar is configured i.e. the current settings of the various toggles. If at any time during a Commstar session, you lose track of which options are set, return to the menu using the <ESCAPE> key and refer to this area of the screen.

CHAPTER THREE

Terminal Mode

3.1 Overview

This chapter describes in detail each of the commands and options which are available from the Commstar main menu when operating in 'Terminal' mode.

A discussion of <C>hat mode is followed by descriptions of 'buffering' and 'spooling' and details of those commands which operate on the buffer. Examples are provided where appropriate so that operations such as transmitting or receiving files can be easily and quickly mastered.

3.2 Chat Mode - the <C> option

<C>hat mode is so-called because it provides a means of allowing interactive conversation between two users. Both must select <C>hat mode (or the equivalent on a non-Commstar system) and both must have their serial ports initialised in the same way (see section 3.5.2). They must also ensure that their modems are correctly configured for full duplex operation at the appropriate baud rate, one in originate and one in answer mode. Although this sounds complicated it soon becomes a matter of habit so don't worry if you are a bit confused at the moment.

Pressing <C> from the main menu will cause the screen to clear except for the elapsed time clock in the top right hand corner (when operating in mode 7) and the 'Commstar ready' message in the top left. This indicates that Commstar is now ready to accept input from the keyboard to be transmitted via the RS423 or to receive input from the RS423 which will then be displayed on the screen.

Now press <ESCAPE> and you will be returned to the main menu. The <ESCAPE> key may always be used to return to the menu from <C>hat mode.

Perhaps the easiest way to get used to using <C>hat mode is to log on to one of the numerous bulletin boards that exist throughout the country. A list of numbers for the better known boards is provided with this manual and they are all free-access, the only cost involved being your telephone bill.

Enter <C>hat mode by pressing <C> and try dialling one of the numbers now. As soon as you hear the carrier signal (a high pitched whistle), connect your modem and replace the handset. Assuming that you are still in <C>hat mode you should notice the welcome message for the particular bulletin board which you dialled appear on the screen. If nothing

happens there are a number of items which could be causing a problem :

1. Is your modem correctly set up?
2. Is the modem correctly connected to the BBC (check that the lead you are using is in good condition)
3. Is Commstar correctly configured?

Details of the appropriate connections and set-up procedure for the modem which you are using should be provided by the manufacturer of the device. The signals provided at the RS423 are described in the User Guide.

If at this point, characters appear on the screen which do not seem to make sense it is likely that the format of the data which is being sent is different from that which Commstar is expecting. This is determined by the way in which the RS423 port is configured and Commstar's default setting has been chosen to correspond to the formats used by the bulletin boards in this country. So, if you do experience this type of problem try dialling a different board.

Note that some bulletin boards operate on what is known as a 'call-back' or 'dial-back' system. To use them simply dial the number and let it ring twice, replace the telephone handset and then proceed to dial the number again. This time you will hear the carrier signal as usual.

Once you have successfully received the 'logon' message from the bulletin board you may reply to the prompts by typing on your keyboard. You will usually be asked to enter your name and where you are calling from. Following this, any system messages, such as information relating to new operating procedures, may be displayed. Finally the

main command menu for the bulletin board will be displayed and you may proceed to use the board to leave messages, read messages or whatever.

To logoff the board simply select the appropriate option from the command menu and disconnect the modem. Pressing <ESCAPE> will return you to the menu.

Note that the <ESCAPE> key may be used at any time during a <C>hat mode session to return to the menu, perhaps to check the status of a toggle or perform a MOS command. Incoming conversational data will not normally be affected, simply return to <C>hat mode again by pressing <C>. However, if the buffer should become full while still at the menu, data will be lost. On return to <C>hat mode any data in the input buffer will be flushed to the screen. In order not to lose data, it is sensible to exit to the menu while the host system is NOT sending continuous streams of important data e.g. when it is waiting for a response.

3.3 Disc / Buffer - the <D> option

One of the most frequently used jargon terms in the world of computing is 'buffer'. A buffer is a simple but abstract concept, it is a temporary storage area in which data may be held before or after being processed. Buffers are required in order to reduce the overheads involved in transferring data from the computer itself to an external device such as a disc drive or printer. For this reason, computers are generally geared up to moving data around in 'blocks' in order to overcome the inefficiencies that would be incurred by transferring a single byte at a time. A prime example of this can be seen during transfers to and from floppy disc. When you read a single byte from a newly 'opened' disc file, what actually happens is that a complete block of data, perhaps 128 bytes in length, is read into a memory buffer from which the particular byte you require can then be extracted. Similarly, when writing to a disc file, data is first placed in a buffer and only when that buffer is full, or the file is 'closed', is it copied to the disc.

When Commstar is being used to transmit or receive data there are two choices as to how the data is handled. The first is to use the whole of the available memory on the BBC as a very large buffer. In this case any incoming data is simply stored in the buffer until the transmission is complete. If Commstar is acting as the sender, the data to be transmitted must first be loaded into the buffer from disc or tape. The obvious disadvantage of this method is that the maximum amount of data that can be transferred is limited by the amount of memory available for use as the buffer.

The alternative to buffering is to place the data on disc as it is received, thus the maximum amount of data that can be transferred by this method is limited only by the disc capacity. Similarly, when

transmitting using this technique, the data is obtained from disc as and when required. This method is termed 'spooling' and the only disadvantage is that if data is being received or transmitted at very high speed, the rate at which data can be obtained from or stored to the disc becomes the limiting factor and slows the transmission down.

You may choose to select either buffering or spooling as the means of handling data by use of the <D> option, the default being to buffer the data in memory. This is indicated on the screen by the line :

<D> Disc / Buffer

with 'buffer' highlighted in red.

Pressing <D> will cause Commstar to carry out three actions. Firstly it checks to see whether the current filing system is either Disc or Network. If this condition is not satisfied the screen is cleared and the error message :

Disc !

Press any key..

is displayed and the switch does not take place.

Secondly, if the buffer is ON, it is switched OFF, otherwise Commstar would not know whether it was activated for input or output or both!

Finally, if the switch to spooling is successful this is indicated on the screen by switching the highlighting from 'Buffer' to 'Disc'.

If the <D>isc option is toggled back to buffer while the uffer option is ON i.e a file is OPEN, then the file will be CLOSED.

Normally the buffer is simply the whole of free memory and it's size varies depending on the screen mode which you are using. It extends from the OS 'high water mark' (PAGE when using BASIC), to HIMEM for the display mode selected so that it's capacity is approximately 24K in Mode 7 and 9K in Mode 3 (on a disc based machine). This figure may also vary according to the filing systems which are resident, the actual value is indicated at the bottom of the menu screen by the line :

nnnn Characters in buffer : mmmm free

where nnnn and mmmm are 4 digit hexadecimal numbers.

For the majority of applications the 24k offered by Mode 7 is quite sufficient. However, in order to allow the transfer of data files which are larger than 24k, the <D>isc option may be selected. This allows files to be spooled to and from disc, thus any attempt to transfer data will request a filename to be used for the storage of received data, or as the source for data to be sent. Notice that the word 'data' is used generally to include any type of information which is to be transmitted, whether it be a BASIC program or a binary data file.

There are seven separate menu commands which operate on the memory buffer when it is in use. These, in conjunction with the ability to switch it 'ON' or 'OFF' (see section 3.4.1) make its use extremely flexible. Obviously, not all of these commands are suitable for use with disc spooling and differences in operation are pointed out in the discussion of each individual command.

Since the use of the buffer or disc spooling is fundamental to many applications for which Commstar may be used, each of the buffer control commands is described in the following sections in detail.

3.4 Buffer Commands

3.4.1 Copy to Buffer

When operating from <C>hat mode, the 'conversation' between yourself and the remote system is not normally stored, i.e. once displayed, the incoming data is lost, the default condition for <C>opy to buffer is OFF. The option on the menu allows you to override the default and switch the memory buffer ON, or if spooling is in use, store the incoming data in a disc file.

Try pressing from the menu now, ensuring that the <D> option is set to Buffer first. You will see that the Buffer entry in the status panel changes to reflect the new buffer status :

Buffer ON

with the ON in red text. Pressing again switches the buffer OFF once more.

When the buffer is ON and memory buffering is in use, all input to the RS423 will be copied into the buffer starting from low memory and working toward HIMEM.

In the event of received data exceeding the buffer capacity, Commstar will automatically send a signal (XOFF - see section 3.5.5) to the host computer in an attempt to suspend transmission. At the same time it will switch the buffer OFF (accompanied by a beep) and print a warning message:

Buffer full!!

on the screen.

If the host system acts on this signal you may proceed to <S>ave the buffer to disc or tape (refer to section 3.4.5) should you wish to do so. To

continue receiving data the buffer must be <W>iped and the buffer switched ON again before returning to <C>hat mode. At this point the host system, if it responded to the XOFF, will still be waiting for an XON signal. This is issued by pressing <CTRL-Q> from <C>hat mode and will re-activate transmission from the host.

Pressing while Disc spooling is active, will clear the screen and request a filename :

Filename ?

Entering a valid filename will cause Commstar to open a disc file into which incoming data will be spooled. Once the file has been OPENED you will be returned to the menu. It is very important when using spooling in this way that the active file is properly CLOSED before you exit Commstar or dial another system. For this reason, Commstar will automatically CLOSE the file when <ESCAPE> is pressed to exit <C>hat mode. Similarly if is pressed twice in succession the file will be first OPENED and then CLOSED.

The buffer may be activated or de-activated from within <C>hat mode by pressing function key <f1>. A message indicating the new status of the option will be displayed. If disc spooling is in use, pressing <f1> will CLOSE the file and no further data will be saved.

3.4.2 <L> Load Buffer

This option allows the user to load a file from the current filing system into the buffer in order that it may be transmitted via the RS423 port to the host system.

On selecting this option you will be presented with the prompt :

Filename ?

This may be any valid filename for the filing system which is currently in use, tape or disc for example. Refer to the appropriate filing system guide to determine what constitutes a valid filename.

If you intend to send the file that you have LOADED by using the <O>utput option (see 3.4.3) it must be an ASCII file. Tokenised Basic or machine code programs cannot be transferred using the <O> option, use the <F> option to send such files.

It is important to note that the <L>oad buffer option will automatically delete the previous buffer contents as if the <W>ipe option had been used. It is up to you to ensure that any important data residing in the buffer has been <S>aved prior to using this option.

This option may still be used even when <D>isc spooling has been selected as spooling does not affect the normal operation of the memory buffer.

3.4.3 <0> Output buffer

Selection of this option will output the current contents of the memory buffer, or a file if <D>isc spooling is in operation, to the RS423 port. When using spooling you will be asked for a filename :

Filename ?

You should then enter the filename of the file to be transmitted, ensuring that the usual filing system naming conventions are obeyed.

Following the filename, or immediately if you are using the memory buffer, you will be asked :

Delay (0-9) ?

The speed at which the data is sent to the RS423 may be varied by selecting a delay between 0 and 9, 0 being the minimum delay. Pressing <RETURN> will either select the default value of 2 or the last user selected value.

This does not affect the baud rate for transmission i.e. data leaving the RS423 does so at the selected baud rate. The necessity for this option arises in cases where the host system is incapable of receiving information in a continuous stream at the operating baud rate. A suitable setting for bulletin boards such as Forum 80 would be 3 or 4.

Having selected a delay you will be further prompted with :

Use codes ?

This refers to a system of buffer control codes which are recognised by a number of bulletin board systems e.g. Forum 80. Thus, answering 'Y' to this option will allow Commstar to automatically open the buffer in the remote terminal and close it

again when the transfer is complete. These codes should be used whenever possible to reduce the risk of spurious characters (caused by 'noise' in the line or equipment) from entering the buffer before or after file transfer.

This option may be interrupted at any time by pressing <ESCAPE>.

3.4.4 <R> Reset buffer

This option applies only when memory buffering is being used. It allows Commstar's internal buffer pointers to be reset to the beginning of the buffer without corrupting the data in the buffer. It is useful when either the <V>iewing or <O>utput options are interrupted by use of the <ESCAPE> key. Normally <V>iewing or <O>utputting would be resumed from the point of interruption. The <R>eset command overrides this default and allows these and other commands to operate from the start of the buffer once more.

3.4.5 <S> Save buffer

When using the memory buffer, it may often be necessary, following a file transfer or a <C>hat mode session with the buffer switched ON, to save the contents of the buffer to a file. The <S>ave option allows the saving of received data to a file on the current filing system.

You will be prompted for a filename :

Filename ?

to which you should reply with the name of the file that you wish the data to be saved into.

If a program has been <S>aved in this way, the catalog information will not be correct although the file contents and length will be. It is a simple matter, having exited Commstar, to re-LOAD or *LOAD the program file to the appropriate position in memory (PAGE for a BASIC program) and then SAVE or *SAVE once more to create the correct catalog information.

If the program consists of machine code the sender must supply the Load and Execute addresses and the length of the program so the re-Load and Save operations can be carried out. This also applies to BASIC programs which do not reside at the normal value of PAGE for the receiving machine.

3.4.6 <V> View buffer

When memory buffering is in use, the current buffer contents may be listed to the screen for <V>iewing purposes by using this option. Two further choices are offered :

Delay (0-9) ?

This operates in a similar manner to that described under <O>utput but it's function is simply to allow detailed inspection of particular areas of the buffer if required. A further option :

Hardcopy ?

will allow a hardcopy of the buffer to be obtained on a suitable printer.

The listing of the buffer may be temporarily halted at any time by pressing the <SPACE> bar. To continue listing press any key except <BREAK> or <ESCAPE>.

WARNING - The <V>iew command should only be used when the buffer contents are known to be ASCII. Non-ASCII files i.e. tokenised BASIC or machine code may contain control codes which will be interpreted by the Operating System as VDU driver codes resulting in erratic and sometimes 'fatal' results.

3.4.7 <W> Wipe buffer

This command empties the buffer clear of ANY data that it contains. Always use this command with care! It is generally only used before receiving program or data files in order to ensure that no unwanted characters are present.

When this command is issued, confirmation is requested :

Sure (Y/N) !?

Replying 'Y' will execute the command, any other key will cancel it. Note that there is no way of recovering the buffer contents once they have been <W>iped.

For the reasons discussed under <L>oad buffer this command may still be used when <D>isc spooling is operative.

3.5 Terminal Configuration Commands

3.5.1 Overview

Although the use of an RS232 or compatible port ensures a high degree of compatibility between different computers from the hardware point of view, there are still a number of factors which must be initialised correctly by the user before communication can take place.

The most obvious of these is the speed at which data is transmitted. This rate, commonly known as the baud rate may vary from 75 baud up to a maximum (theoretical) of approximately 19000 baud, 300 and 1200 being the commonest in use with micro-computers.

A second important factor is the format of the data which is transmitted. How long is each word? (Note that a word in communications equates to a character or byte in normal computing terminology). Is parity used and if so, is it even or odd ?, How many stop bits are used ?

All of these factors must be correctly initialised before any meaningful communication can take place. The commands and options described below provide great flexibility in the way that Commstar can be configured, giving it the power to be used with a huge variety of remote systems.

3.5.2 <I> Initialise RS423

This is one of the most important options on the Commstar configuration menu having been designed to allow simple initialisation of the RS423 protocols to be used. All of the effects offered can be obtained using the BBC's own FX commands but for ease of use and convenience, a simple table of valid settings is provided under the <I> option. It is also very helpful to be able to see at a glance the currently selected configuration.

The options offered in the initialisation table govern the precise way in which the RS423 converts the parallel data it receives into serial form for transmission, and conversely, how it interprets incoming data.

The table will appear as follows :

Word	Parity	Stop	
0	7	Even	2
1	7	Odd	2
2	7	Even	1
3	7	Odd	1
4	8	None	2
5	8	None	1
6	8	Even	1
7	8	Odd	1

<R>eceive 300 <S>end 300

Select ?

The currently selected option from the table is highlighted in red and a new option is selected by typing the appropriate number (from 0 to 7).

The most commonly used protocols are :-

FORUM 80 - 7 bit word
even parity
1 stop bit

TBBS & CBBS - 8 bit word
no parity
1 stop bit

Using an 8 bit word, no parity and 1 stop bit you will still be able to access FORUM 80 as the eighth bit is ignored in ASCII codes. This setting, option 5 on the table, is therefore used by Commstar as the default.

The <R>eceive/<S>end line below the table indicates the currently selected baud rate for the reception and transmission of data respectively. If instead of selecting one of the menu options, the 'R' or 'S' keys are pressed, the appropriate baud rate will cycle through the list of possible values, one step for each key press. Using this method it becomes a simple matter to select the required baud rates. The default baud rate is 300 for both send and receive when operating in Terminal mode.

When the appropriate data format and baud rates have been selected press <RETURN> to go back to the main menu.

3.5.3 <A> Auto Line feed

Some remote systems require that a Carriage Return character is followed by a Line Feed (ASCII 810), alternatively they may provide their own.

The <A>uto line feed option on the Commstar menu operates as follows :

If <A>uto line feed is ON, a Line Feed character is inserted into the output stream following every Carriage Return. This applies both when the buffer is being <O>utput and when it is being <V>iewed. If the remote system automatically generates a Line feed each time it receives a Carriage Return this option may be left OFF.

Similarly, if Carriage Return characters are detected in the incoming data stream in <C>hat mode and <A>uto line feed is ON, a Line Feed will be inserted as the data is displayed.

The default condition is Auto Line Feed ON and the current status of the option is displayed at the bottom of the menu screen.

Auto line feed ON/OFF may be toggled from <C>hat mode by pressing function key <f2>.

3.5.4 <E> Local echo

Most bulletin boards and mini/mainframe host systems provide an 'echo' of the characters that you are sending. Thus, what you view on your screen is actually the echo from the remote computer.

When transmitting to systems that do not supply an echo it is necessary to provide your own so that you can see what is happening. This is termed 'local echo' and is may be switched ON from the menu by pressing <E>.

Note that switching this option ON does not cause Commstar to send an echo of the characters received from the host back to the host. Therefore, when two BBC computers with Commstar are communicating in <C>hat mode, both must have <E>cho switched ON.

Local echo may be toggled switched ON or OFF from <C>hat mode by pressing function key <f0>. The current echo status is displayed at the bottom of the screen when working from the menu.

3.5.5 <X> XON/XOFF

In order to ensure that data is transferred correctly between two computers, a number of protocols, both simple and complex, have been developed. One of these involves the use of XON/XOFF flow control. The <X> option on the main menu will allow you to transfer files using full XON/XOFF flow control protocols.

When a host computer which utilises XON/XOFF protocols, wishes to access one of it's discs or perform some other background task, it will interrupt Commstar's <0>utput buffer function by transmitting an XOFF signal (CTRL-S). On receiving this signal during transmission Commstar will enter a 'wait' state until an XON signal (CTRL-Q) is received at which point it will resume transmission. This technique ensures that data is not lost due to buffer overflow in the receiving terminal.

As each XOFF signal is received you will notice a '*' appear in the top left hand corner of the screen and the listing will pause. When the next XON is received the '*' will be replaced by a space and the listing will continue.

The BBC keyboard is strobed at all times during buffer <0>utput and even while Commstar is in a wait state you may exit this option by pressing the <ESCAPE> key. This feature is particularly useful if the system 'hangs' because no XON signal is received from the host following an XOFF.

Switching XON/XOFF ON will cause Commstar to acknowledge the protocol described above, switching it OFF will cause it to ignore any XON or XOFF signals received.

It is possible that the particular remote system with which you are communicating acknowledges

characters other than CTRL-Q and CTRL-S as XON and XOFF. If this is the case, typing :

*FX238,n

may be used to redefine the XON character, where n is the ASCII character number of the actual XON character.

Similarly

*FX239,n

will redefine the XOFF character as CHR\$(n)

3.5.6 <@> Filter ON/OFF

The ASCII character set requires only 7 bits in order to represent the 128 characters available. Since data is transferred within the computer 8 bits at a time, the eighth bit is usually set to '0'. This is also true of the vast majority of incoming data. However, it is quite possible that noise occurring on the line during data transfers could cause the eighth bit to be set to a '1' in which case it could be interpreted as a control code and acted upon accordingly.

For example, if an incoming byte with the value &8D (a Carriage Return) was corrupted so that the 8th bit was set, it would be received as the character &8D or 141 in decimal. On the BBC machine this code is used in Teletext mode to initiate double height characters.

In order to avoid this situation all incoming data is normally masked (logically ANDed) with &7F in order to ensure that the eighth bit is '0'. Continuing the example used above :

&8D	=	%10001101	AND
&7F	=	%01111111	

gives : &8D = %00001101

which is the correct character. Masking in this way will only ensure that the 8th bit of an incoming byte is set to 0, it will not detect corruption in any of the other bits. This process is termed 'filtering' and the default condition is Filter ON.

If control codes are being deliberately sent and you wish the BBC to act upon them, the filter may be switched OFF by pressing the <@> key once. Pressing it again will restore the default condition.

3.5.7 <M> Mode

The screen display format used in <C>hat mode can be cycled through modes 0 to 7 using this option. The currently selected mode number is displayed in red at the menu so that you can see at a glance which mode you will be using on entering <C>hat mode.

Note that when memory buffering is in use, the amount of memory available for the buffer will vary depending upon the currently selected mode. If an attempt is made to switch to a new mode while Commstar's internal pointers indicate that the top of the buffer will exceed HIMEM for that mode, Commstar will sound the internal bell to warn you that there is insufficient memory and will automatically cycle through the possible modes until a suitable one is reached. This prevents data in the top of the buffer from being overwritten by the screen display. You may of course <S>ave or <W>ipe the buffer and then proceed to change mode.

The toggle between the two modes can also be effected from <C>hat mode by pressing function key <f5>. The same checking and 'auto-cycling' will take place.

3.5.8 <P> Printer ON/OFF

Using the <P>rinter option from the menu or by pressing <f3> from <C>hat mode, input from the RS423 may be copied to a printer. Note that this applies only to input during <C>hat mode.

When the printer is active, XON/XOFF protocols are used in order to avoid the situation where the computer 'hangs' because it's input buffer is full. The problem is particularly acute when either the printer is very slow or the transmission rate is high i.e. the printer buffer fills and in turn causes 'jamming' at the RS423. If the printer is sufficiently fast (or when a printer buffer is in use) the problem will not arise.

The use of XON/XOFF in this way is essential and is independent of the XON/XOFF menu option. In order to receive data reliably while printing, the host system must be capable of supporting XON/XOFF.

The default condition is Printer OFF.

3.6 Miscellaneous Features

(see Section 8.2 for MOS commands)

3.6.1 The Elapsed Time Clock

Commstar maintains it's own internal clock which displays the elapsed time in minutes and seconds since it was reset. There are three conditions under which re-setting may occur :

1. When Commstar is first selected
2. The <BREAK> key is pressed
3. <f8> is pressed from <C>hat mode.

The clock is displayed at the top right of the screen when operating from either the menu or from <C>hat mode when 40 column display is selected.

The clock display is updated every second and remains unaffected by other operations until it is reset by one of the means listed above.

After reaching 59:59 the clock 'wraps around' to 00:00, this should be taken as warning that your next phone bill will be astronomical!!

If you wish to switch off the clock display you may do so by pressing <f4>, this does not reset the clock. Pressing <f4> again will restore the clock display.

3.6.2 Transmit 'ESCAPE' character

When operating in <C>hat mode the <ESCAPE> key is used to return to menu level. It may sometimes be necessary to send an <ESCAPE> character (ASCII 27) to the host system. Since this cannot be achieved via the <ESCAPE> key, <f7> is programmed to generate ASCII 27.

3.6.3 Transmit 'Break' level

Many intelligent terminals are equipped with a special key labelled 'Break'. This is NOT the same as the <BREAK> key on the BBC micro-computer. It's function is to transmit a 'Break' level or 0 volts on the data line in order to 'wake-up' the host computer and initiate the Logon procedure. In order to maintain compatibility with such systems, function key <f6> will generate a Break level from within <C>hat mode.

3.6.4 Buffer Control Codes

The use of Buffer Control codes by bulletin boards was discussed in section 3.4.3. Two such codes exist, one for opening the communications buffer in remote host and the other for closing it when the transmission is complete.

Commstar will normally acknowledge and use such codes when it receives them from a remote system. However, the same codes may have an entirely different meaning on systems other than bulletin boards with the result that the buffer is opened and closed unexpectedly. In order to prevent this from happening, the command :

*FX240,1

may be used from the menu to tell Commstar to ignore incoming Buffer control codes. The codes may be reinstated by typing :

*FX240,0

CHAPTER FOUR

<F> File Transfer

4.1 An overview of XMODEM

This section of Commstar provides full XMODEM file transfer capabilities, to and from a host system with XMODEM capability, using Ward Christensen type protocols and handshaking.

Files which are sent or received under XMODEM are broken down into sequentially numbered 128 byte blocks of data for transmission purposes, although this action is totally transparent to the user.

An 8-bit CRC checksum is calculated for each block prior to transmission which is then sent with the data. The checksum is re-calculated at the receiving XMODEM terminal and compared with the original CRC. If these are different then it is assumed that corruption of the data has occurred and re-transmission of the appropriate block is requested.

The generation of checksums and block numbers, and the requests for re-transmission of corrupted blocks, is carried out entirely automatically and need not concern the user.

All errors encountered are re-tried 10 times before the user is given the option of <Q>uitting or <R>etrying. When the option to <R>etry is selected the transmission will be resumed starting with the block following the last block to be successfully transferred.

This system virtually assures perfect data transfer even under extreme conditions such as temporary loss of carrier signal or excessive line noise.

Note that the <F> option can only be used in conjunction with another terminal that is capable of handling the XMODEM protocols e.g. another Commstar or a CP/M based package such as Modem-7.

Under XMODEM, data is transferred in the following format :

<SOH> - Start Of Header, decimal 01 to start each block

Block Number - one binary byte

255-Block no - (block number EOR 255)

128 data bytes

Data checksum - 1 byte, carry discarded

It is not within the scope of this manual to fully cover the operation of XMODEM type file transfer and the user is given the above information purely to aid understanding of the process and the error messages that may be generated by Commstar while in this mode. The procedures for using the <F> option are detailed below.

4.2 Sending Files

This section describes the correct procedure for using the <F> option to transmit files.

Firstly, check that the RS423 port is suitably initialised. When transferring to another BBC machine which is fitted with Commstar, the default settings are perfectly adequate. If however, the remote system is not Commstar based but uses another proprietary XMODEM package, an alternative setting may be appropriate. This option may only be selected from options 4, 5, 6 or 7 in the initialise menu i.e. those options using an 8 bit word. XMODEM requires an 8 bit word and will not operate with options 0 - 3.

Now, selecting <F> from the main menu will display the prompt :

<S>end / <R>eceive ?

Simply press S or R to select the appropriate option, <S> in this case.

Remember that when using the memory buffer, as opposed to spooling a file to or from disc, you must first <L>oad the buffer with the file that you wish to transmit.

When spooling is in use you will be prompted for the appropriate filename :

Filename ?

Data to be transferred will then be loaded a block at a time from the file specified. When the transmission is complete the file will be closed.

The sequence of operations that actually occur during the <S>ending of a file is described below :

Having selected <S>end mode while using the memory buffer, the buffer contents will be padded out with spaces so that its length is a multiple of 128 bytes. If spooling is in use, the last block read from the active file will be padded out in the same manner.

The message :

Awaiting Initial <NAK>

will then be displayed and on receiving the correct code from the remote XMODEM system, Commstar will proceed to transmit a block. This is indicated by the message :

Block n

where n is the sequence number of the block currently being transmitted. Data is sent without echo to the screen and if transfer is successful the next block will be sent.

If errors are detected by the receiving system a request for re-transmission of the block in question will be sent i.e. the sender will generate a 'No Acknowledge' signal for the block. This is indicated on the sender's screen by the message :

NAK

in red. The block will then be re-transmitted.

Successful completion of the transfer will be indicated by the message :

Transferred

Press any key

Pressing a key at this point will automatically cause Commstar to return to the menu.

4.3 <R>ceiving files.

The sequence of events for receiving a file is very similar to that for sending. Having selected the <F> option you will be asked if you wish to send or receive, pressing the <R> key will select receive mode. If spooling is in use you will be asked for the filename of the file into which the received data will be stored, alternatively the memory buffer will be used to store the received data.

Once the destination for the data has been established, the number of the next block expected (nn) is displayed :

Awaiting nn

As each block is received the message :

Block nn

is displayed. If any errors are encountered Commstar will inform the host computer by sending a 'No Acknowledge' signal (NAK) and display the error message :

Block cancelled

along with the error numbers of the errors that were logged. It will then wait for the block to be re-transmitted.

Successful completion of the transfer is acknowledged in the same manner as for <S>end above, pressing a key other than <BREAK> will return you to the menu from which you may proceed to <S>ave the file from the buffer onto disc or tape. If spooling is in use the destination file on disc will be automatically closed.

4.4 File transfer at 1200 baud

Modems which are capable of operating at 1200 baud in full duplex mode are very expensive. However, it is possible to transfer files between two Commstar systems, using the <F> option, at 1200 baud providing that the modem being used is capable of operating at 1200/75 baud rates.

The procedure is as follows :

1. Choose the <I>nitialise option and set the <S>end and <R>eceive baud rates appropriately (sender at TX1200/RX75 and the receiver at RX1200/TX75).
2. Configure the modems appropriately.
3. <L>oad the buffer with the file to send if you are acting as the sender and buffering is in use.
4. Select <F> followed by the appropriate options to transfer the file.

This is directly equivalent to the procedure described in sections 4.2 and 4.3, the only difference being the initialisation.

4.5 File transfer - additional notes

4.5.1 'Timeout' message

During both <S>end and <R>eceive modes you may see the message :

Timeout

followed by a number. This is to let you know that the initial 'wait' period for the first block has been exceeded and the next wait period is being entered.

4.5.2 Error codes

During file transfer the error numbers of any errors which occur in a block, are displayed in red. A list of the numbers and their meanings is given below :

<u>Error number</u>	<u>Description</u>
1	Bad block header
2	Bad block number
3	Bad check number
4	Bad checksum
5	Lost data
6	RS423 error

In the vast majority of cases, errors which occur during data transfer are caused by 'noisy' telephone lines just as telephone conversations are difficult to conduct on a 'bad' line. There are however a number of faults which can occur at the RS423 port itself. If an error occurs which indicates that the RS423 is indeed malfunctioning, first check the serial lead for poor connections. If the lead proves to be in good condition it may be necessary to have your machine inspected by a qualified dealer.

4.5.3 Direct connect transfers

It is possible to transfer files between two BBC computers or between a BBC and another computer with a direct wire connection i.e. without using a modem.

When two BBC computers are being used you will require a 'back-to-back' lead with a 5-pin domino connector at each end. However, in order to function correctly, CTS and RTS must be shorted together at one end of the lead. Note also that the Data-out from one machine must connect to Data-in on the other and vice-versa.

A lead constructed in this manner should be no longer than about 20 metres.

4.5.4 Downloading ASCII files

Many of the programs that are offered for downloading on bulletin boards are held in pure ASCII form and will not therefore RUN immediately following downloading. This allows compatibility with other terminal programs which do not have XMODEM capability. In order to reconstitute the program into tokenised form the ASCII file must be *EXECed into memory from disc or tape and then SAVED as you would normally save a Basic program. From then on the program may be LOADED and RUN or CHAINED as usual.

CHAPTER FIVE

Prestel mode

5.1 Overview

Using Commstar to emulate a Prestel terminal is essentially a completely separate function to Commstar's general Terminal emulation. Prestel uses its own character set and communications protocols and this results in a number of significant differences which should be understood in order to master the use of Commstar with Prestel.

The most obvious difference is the fact that Prestel utilises the Teletext graphics and character set which can of course only be displayed correctly in screen mode 7 on the BBC micro-computer. Prestel uses full colour text and graphic display screens with special features such as double height characters, hidden text fields and flashing text or graphics. All of these features are supported on the BBC resulting in impressive screen displays which Commstar fully utilises.

More importantly from the communications point of view is the use of unusual protocols and transmission rates. Prestel operates at 1200/75 baud i.e. it transmits data to the user at 1200 baud and receives responses at 75 baud. The reason behind the use of different baud rates for send and receive is the fact that the public telephone network provides insufficient bandwidth to allow 1200/1200 baud full duplex transmission with anything but the most expensive modems. Since full duplex functioning is essential to the correct and efficient operation of the Prestel protocols, a narrow bandwidth 'return' channel is provided for user responses, while the bulk of the data i.e. the Prestel 'screens', is transmitted at 1200 baud giving reasonable speed.

The overall result of these differences is that many of the normal Commstar menu options are redundant when operating in Prestel mode and are in fact 'locked' out.

Before continuing with this section you should first ensure that you understand the operation of spooling and buffering (Sections 3.3 and 3.4) as these operate in the same way as for Terminal mode. The other options which remain useful, and differences in the way in which they operate in Prestel mode, are described in the following sections. These include :

<#> Comms/Prestel	<D> Disc/Buffer
<C> Chat	<W> Wipe buffer
<I> Initialise	<S> Save buffer
<@> Filter ON/OFF	

and

<*> (for MOS command)

The screen mode is automatically switched and locked into Mode 7 and all toggles are switched to their Prestel mode default condition i.e. all OFF. The buffer may not be switched ON because the format in which the Prestel screens are received does not allow the pages to be reproduced correctly if the buffer is <V>iewed. An alternative method of 're-tracing your steps' is allowed with the <COPY> page and 'tag' & 'retrieve' page options which are described in detail later.

The memory buffer may be used normally for the purpose of downloading telesoftware. Similarly spooling may be switched ON so that downloaded files which are larger than the memory buffer may be transferred directly to disc.

The Prestel 'logon' and user procedures are described in the following section. Experienced

Prestel users will notice minor differences in the way Commstar operates but you will soon become used to these. Prestel is of course a subscription service, charges being levied via your normal telephone bill. Many of the actual pages (sometimes called frames) are free, some are charged for. Complete Prestel details, including charge rates, will be provided when you first subscribe. It is not within the scope of this manual to provide a comprehensive Prestel User Guide, such information can be obtained from The Prestel Directory which is provided on a regular basis to Prestel customers. However, those features which are 'Commstar dependent' will be described in full.

5.2 Logging on to Prestel

As discussed previously, when Commstar is first selected, it defaults to terminal emulation mode. To switch into Prestel emulation simply press the '#' key (shifted 3 on the BBC keyboard). You will notice that the line at the top of the Commstar menu now says :

Emulate : Prestel

Also, the status panel at the bottom of the screen indicates that all options are set to OFF.

The RS423 interface is also automatically configured to receive at 1200 baud and transmit at 75 baud. This can be observed by selecting the <I> option from the main menu. You will also notice that option 2 from the table (7 bit word, even parity and 1 stop bit) is now active. The <I> option is left active in Prestel mode so that the 300/300 baud service provided by Prestel can be utilised.

Now, returning to the main menu select <C> for chat mode. Initially the screen will be completely blank except for the cursor at the top left. The clock is not displayed in Prestel mode. Dial the appropriate number for your local Prestel computer and wait for the 'carrier' signal. When this is present activate the 'modem connect' or equivalent switch on your modem. You should then observe the Prestel introductory page being displayed.

In response to the prompt type in your 10 digit Prestel identification number using the BBC's normal numeric keys. For each key pressed a dash (-) will appear on the screen. If an error is made during entry the attempt may be cancelled by pressing the '*' key twice.

After your correct identification number has been

entered the next Prestel screen will be displayed requesting your 4 digit personal password. Type this in on the keyboard and again a dash will be printed for each key press. Incorrect entries may be cancelled by pressing '*' twice.

Following a successful logon procedure, Prestel may be used as it would with any other Prestel adaptor. There are however a number of minor differences which are described below. New users should consult the Prestel directory before reading these notes.

5.3 The Prestel '#' key

Prestel makes extensive use of the '#' symbol to mean 'proceed to next frame'. Within Commstar the <RETURN> key is used in place of '#', so where a message such as :

GOTO # to continue

occurs, simply press the <RETURN> key instead of <#>.

The reason for this is that some of the character codes used by Prestel differ from those in the ASCII character set. The code used by Prestel for <#> actually corresponds to the underline <_> character in ASCII, a point that is reflected in the fact that pressing underline in place of the <RETURN> key produces the same results.

5.4 Copy current screen to disc

At any point during a Prestel session the <COPY> key may be used to obtain a disc image of the current Prestel screen. On pressing <COPY> once you will be prompted :

Filename ?

Entering a valid filename at this point will allow Commstar to save a copy of the current screen in that file on the disc. When the action is complete the original Prestel screen will be restored unless there is insufficient room in the buffer in which it may be placed while the <COPY>ing is being carried out. This problem will only occur if you have downloaded a large program and have not transferred it to disc or have simply not emptied the buffer following <S>aving.

To view the screen at a later time type :

CLS

*LOAD <filename> 7C00

in mode 7, where <filename> is the name that you gave to the file. This is best carried out from Basic after you have left Commstar. If you wish to obtain a printed copy of the screen image, a printer graphics dump routine will be required which is capable of dumping mode 7 graphics. There is unfortunately, insufficient free space in Commstar to include this facility in the EPROM.

5.5 The function keys in Prestel Mode

When operating from Prestel chat mode the function keys operate as follows :

5.5.1 <f0> Tag current page

This key provides the facility to 'tag' Prestel pages of particular interest so that you may return to them at a later stage in the Prestel session.

To tag a particular page in this way simply press <f0> once. This will store the page number of the currently displayed page, at the top of the Commstar buffer. In theory you will be able to tag many pages but in practice a limit of 25 is advisable. Page numbers are stored in the same sequence as they are tagged.

5.5.2 <f1> Retrieve tagged page

When you wish to retrieve pages which have been tagged using <f0>, the <f1> function key may be used. This will retrieve previously tagged page numbers from the buffer which are then passed to Prestel by Commstar so that the corresponding page is re-displayed on your screen. One page number is retrieved for each key press, in the same sequence as they were initially tagged. Pressing <f1> four times in sequence will cause the fourth page tagged to be re-displayed.

When the last page tagged has been retrieved Commstar 'wraps' around to the beginning of the page sequence i.e. the first page tagged.

5.5.3 <f2> Clear page tags

Pressing <f2> when using Prestel will clear any tagged page numbers. These cannot be re-instated so use this key with care!

5.5.4 <f3> Reveal hidden text

There is a facility on Prestel to create 'hidden' text fields which cannot normally be seen. These are useful for such activities as quizzes which may be run from time to time. The answers to questions can simply be hidden on the screen and only revealed by the user should he wish to do so. The <f3> function key is used from Commstar to carry out just this function. Pressing it once will reveal any hidden fields which are present. Note that if there are no hidden fields pressing this key will have no effect.

5.5.5 <f5> Download program

Function key <f5> is used to initiate the program download procedure from Prestel mode. This is the same key that is used by other Micronet software and should only be used when requested i.e. when you are currently located at a Prestel/Micronet 'header frame'. Full downloading instructions are provided on Micronet for newcomers to the system. Briefly the procedure is as follows.

Select the program that you wish to download and step through the introductory pages until you reach the header frame. This frame consists of information relating to the size of the program, and any special download procedures that apply. The page number of this frame will normally be suffixed with a 'c' and is termed a c-frame. It is also usual at this point for a message along the lines :

Press f5 to download

to be displayed. As an alternative you will be offered the choice of returning to the telesoftware menu.

Assuming that you wish to continue with downloading, press <f5>. If buffering is in use you will notice a short delay and the message :

Checking..

and then a number which indicates the number of frames to be received. The screen will then clear and the stream of characters comprising each frame will be displayed in turn. When the last frame has been transferred a short, high-pitched bell will be sounded and you will be prompted by Prestel on how to proceed. Normally you may exit to the menu and save the file on the current filing system.

The above discussion applies when buffering is in

use. If you have selected disc spooling, pressing <f5> will clear the screen and prompt for a filename :

Filename ?

As usual, this is the file on disc into which the program will be stored. There will be a short delay while the file is opened and the download procedure is initiated.

Downloading will then proceed as discussed above.

One important feature to note is that Commstar will automatically switch to disc spooling if the number of frames being downloaded will exceed the buffer capacity. Be sure that you always have a formatted disc ready!

You will find that many of the programs that are available on Micronet will consist of two or three sections which must be downloaded in sequence. In these cases the download procedure is simply repeated for each section, making sure that each file is <S>aved before the next is downloaded.

When the downloading is complete you will be informed on how to proceed, usually you will return to the telesoftware menu. Since some of the programs are designed to run from tape, it may be necessary to amend them before they can be run from disc. In this respect Micronet usually provides the appropriate instructions in the introductory pages to help you sort things out.

Important note on downloading

There have, at certain stages during the development of the Prestel service, been a number of changes in the specification for the downloading procedures. Unfortunately some of the software, at the time of writing this manual, still obeys the

'old' rules and as a result, certain software cannot be downloaded by normal means. This applies particularly to some of the Viewfax programs. In order to overcome this it has been necessary to include in Commstar an additional option to use the old protocols. On the rare occasion that this option is required it may be effected by the following command :

*FX1,1

To turn off the option and return to 'normal' rules simply enter :

*FX1,0

Either of these commands may be entered in the usual manner from the Commstar Prestel menu. The default condition is that produced by *FX1,0.

As a further note with respect to the use of Prestel, you may notice from time-to-time that some screens do not appear to be constructed properly and which display faults which you cannot attribute to corruption during transmission. For instance, text on the screen may appear as the top half only of a double height line. This can be due to the fact that certain 'experimental' dynamic screens are occasionally used which are likely to cause problems with any Prestel/Micronet software.

5.5.6 <f7> Transmit 'Escape' character

Function key <f7> has the same function in Prestel mode as in Terminal mode, i.e. to send an Escape character (ASCII 27) via the RS423 port.

This feature may be used on certain Prestel frames to create teletext graphic effects on the screen.

5.5.7 <f8> Re-display current page.

It is possible when accessing Prestel that some pages will be corrupted during transmission. This is generally due to noise on the telephone line and cannot be prevented. If the line is intermittently noisy, the current page may be re-displayed by pressing function key <f8>. This action requests the Prestel system to re-transmit the current page which will subsequently be re-created on the BBC screen. It may still of course be corrupted during transmission but more often than not the problem will be alleviated sufficiently to read the page correctly.

If page images are persistently corrupted it may be worthwhile to logoff from Prestel and re-dial to obtain a new line.

5.5.8 <f9> Return to previous page.

Function key <f9> may be used at any time to return to the 'previous' page. In this case previous means the previous page accessed by the user, NOT the previous page in numeric sequence. As an example, if you select one of the options from a Prestel menu and find that it is not the required page you may return to the menu simply by pressing the key <f9>.

5.6 Additional notes

It was noted at the beginning of this chapter that the <I>initialise and <@> Filter options also remain valid for use in Prestel mode.

<I>initialise behaves in exactly the same manner as described in Section 3.5.2. It is provided so that users with 300 baud modems only, can configure the baud rates for use with the 300 baud Prestel system that is available on a London number at the time of writing this manual. It is important that you do NOT alter the word format when using Prestel.

Similarly, the <@> option is left in for flexibility. Since Prestel only uses 7 bit words filtering has no effect anyway.

Getting started quickly

The purpose of this chapter is to enable those users who are already well-versed in the field of communications, to get to grips with using Commstar quickly. The procedures used to gain access to bulletin boards and to Prestel are described, very briefly and any additional information required should be obtained from the relevant chapter in this manual. The following notes assume that Commstar has been correctly installed and that you are familiar with the operation of your modem and its connection to the BBC micro-computer.

6.1 Logging on to a bulletin board

The majority of the bulletin boards which operate in this country use 8 bit words, no parity and 1 stop bit at 300/300 baud. These are in fact the default values used by Commstar. If the board which you intend to access uses a different word format you must adopt the following initialisation procedure :

1. Select <I> from the main menu.
2. Select the appropriate option from the table of possible formats.
3. Set the the send and receive baud rates by pressing either <S> or <R>.
4. Press <RETURN> to go back to the main menu when you have finished.

Now, check that the modem is correctly configured and press <C> for Chat mode, dial the number of the bulletin board and wait for the carrier signal. If the system uses dial-back, let the phone ring twice, put the handset down and then re-dial. When

the carrier is present, activate the 'modem connect' or equivalent switch on the modem. You should then see the introductory page from the bulletin board being displayed.

6.2 Logging on to Prestel

Commstar defaults to terminal emulation mode. In order to access Prestel you must select Prestel emulation by pressing <#> once. You will notice at the top of the screen a line that now says :

Emulate : Prestel

Commstar automatically initialises the baud rates and word format so all that is necessary now is to press <C> for Chat mode and dial your local Prestel computer. When the carrier is present, connect the modem and enter your 10 digit customer identification number using the normal numeric keys. If you make a mistake press the <*> key twice, this will cancel the entry so far and allow you to start from the beginning of the number again. Note that a dash (-) is displayed for each keypress.

Having entered the correct identification number the next page will request your personal password which may be entered in the same manner as the identity number.

Important Note : When accessing Prestel via Commstar, to obtain the Prestel <#> symbol you must use the BBC's <RETURN> key. For instance, to leave Prestel type :

*90 <RETURN>

instead of : *90#

Remember that the #, or in this case the <RETURN> is not actually displayed on the screen.

Other Prestel functions such as 'page tagging' may be obtained as follows :

- <f0> - pressing <f0> will 'tag' the current page for later retrieval.
- <f1> - pressing <f1> will retrieve previously tagged pages in sequence, one page per key press.
- <f2> - pressing <f2> will clear all page tags.
- <f3> - pressing <f3> will reveal any hidden text fields.
- <f5> - this has the same function as in the Micronet software and is used to initiate the program download procedure.
- <f7> - may be used to send an Escape character (ASCII 27) to Prestel.
- <f8> - pressing <f8> will re-display the current page (useful if it was corrupted)
- <f9> - pressing <f9> will return you to the previously accessed page.

CHAPTER SEVEN

Specific terminal emulation

7.1 The <G>et emulation command

In addition to using Commstar as an intelligent terminal or a Prestel terminal there are many other more specialist applications. The majority of these involve using the BBC as an inexpensive terminal to a mainframe or mini-computer, usually with a specific application in mind such as graphics or word-processing. It may, for example, be necessary to emulate a particular type of terminal such as VT100. In this respect the BBC machine, or more accurately Commstar, will be required to interpret and act upon control codes which normally have entirely different meanings on the BBC computer.

For instance, a VT100 terminal provides facilities such as 'erase-to-end-of-line' or 'inverse video' which are activated on receipt (from the host computer), of a particular control code. Emulation software such as Commstar must translate such codes as they are received and act upon them in a sensible manner. It may be that the function that the code is supposed to effect is not possible on the BBC in which case the most logical reaction could be to report an error or simply ignore the code.

Commstar has been designed to be as flexible as possible, hence the presence on the main menu of the <G>et emulation option. The function of this option is as follows. Commstar has two built-in tables which determine the way in which it reacts to incoming characters. One of these is very generalised giving basic terminal emulation, the other is much more specific being tailored for Prestel.

The <G>et emulation option allows the user to specify an alternative table which may be loaded into the BBC's RAM from disc and used instead of the two built-in tables.

It must be emphasised that that the process of creating such a file is complex and should only be carried out by those who are conversant with communications and who have the requisite knowledge of 6502 assembly programming. For this reason, details of the emulation file format and Commstar's internal vectors are available as a separate Appendix to this manual. Pace will be making available a number of specific emulation files, including VT100, which may be purchased separately.

If you require any further details please write to us or telephone on our usual number.

Global features8.1 The <BREAK> key

The effect of the <BREAK> key on the BBC keyboard, when used from within Commstar, is to restore the Commstar main menu and all default settings i.e. the emulation mode will be Terminal, Auto Line feed and Filter will be ON and all other toggles will be OFF. However, any data that was resident in the buffer prior to pressing <BREAK> will remain intact, the buffer pointers are NOT affected.

8.2 MOS commands from Commstar

Most MOS commands can be safely used from within Commstar. From the menu simply type <*> as usual followed by the command that you wish to execute. On pressing <*> the screen will clear and you may type the remainder of the command.

Once the command has been executed the message :

Press any key..

will be displayed whereupon you will be returned to the menu.

This option will allow you to inspect a disc catalogue or execute an FX call for example. Care should be taken however not to use MOS or filing system commands that interfere with user RAM space which is occupied by the buffer i.e. *COMPACT, *BACKUP etc. especially if it contains important data. It is also important that commands which list files to the screen should be carried out only on ASCII files for the same reason as discussed under the <V>iew buffer command.

When using Commstar, the <ESCAPE> key is normally re-programmed to cause an exit to the menu. This is not true from MOS command level where it will actually generate an Escape condition to allow exit from other ROM commands, tape catalogs etc. This Escape will then be trapped by Commstar's own error handling routines and a return to normal Commstar operation will be effected.

Glossary of terms

Acoustic modem

An acoustic modem is a modem which has two flexible cups into which a telephone handset can be pushed to provide a coupling between the modem and the telephone line. One of the cups contains a microphone and the other contains a speaker. Data can then be passed between the modem and the telephone system via a normal telephone handset.

This method of coupling lacks reliability due to the interference which may be caused by environmental noise penetrating the cups. Data may be lost or corrupted due to this.

Auto-answer modem

Some types of direct-coupled modem are capable of automatically answering a dialled-in call and setting up the data link. This is referred to as auto-answer. Modems of this type are essential for host systems such as bulletin boards which are left unattended.

Auto-dial modem

A type of direct-coupled modem which is capable of dialling a telephone number under the control of the computer to which it is connected.

Baud rate

The baud rate is an indication of the rate at which data is passed between two communicating devices, the higher the baud rate, the faster the data transfer. An N baud line is one in which the signal level can change N times per second. In most cases

there are only two possible signal levels representing binary 1 and 0. In this case the bit rate is the same as the baud rate. If then, the word length is 10 bits, comprising of 8 data bits and two 'stop' bits, then a 300 baud line is capable of transferring 30 characters per second ie 300/10.

Bulletin board

A bulletin board is a 'service', usually set up on a micro-computer, that accepts calls via an auto-answer modem. The software that runs the system is generally left unattended and controls access to the facilities that the computer provides. Thus, users may be able to pass messages to each other, download software or even ask the advice of other users.

Communications software

This term is generally used to describe software that allows a micro or other computer to emulate a terminal device. More intelligent communications packages provide facilities, such as selective storage of incoming data or automatic dialling of telephone numbers for use with auto-dial modems, which may not be available on 'dumb' terminals.

Direct connect modem

A type of modem that connects directly into the telephone line via an isolation transformer or optical coupler. These are more reliable than modems of the acoustic type because they are unaffected by environmental noise.

Downloading

The term used to describe the process of transferring data or programs between a user and a host system, via the telephone line.

Host system

A computer which accepts communications from other remote computers or terminals via a suitable transmission medium, usually the public telephone network.

Modem

A device which M0dulates digital data into a form suitable for transmission over the analogue speech telephone system or DEModulates incoming analogue data into digital form.

Originate modem

A type of modem which is capable only of transmitting.

Parity bit

A parity bit is an extra bit that is sometimes added to a character as a simple form of error check. Parity may be either even or odd.

When Odd parity is in use, the parity bit of a given character will be a 1 if the number of 1 bits in the character is even. The parity bit will be 0 if the number of 1 bits is odd i.e. the total number of 1 bits in the word will always be odd after parity has been added.

If even parity is used then the number of 1 bits in the character following the addition of the parity will always be even.

Both the receiving and sending equipment must be working on the same parity. If a character is received with an odd number of 1 bits (including the parity bit) when even parity is in use, then it is obvious that an error has been introduced during the transmission.

Protocol

A protocol is the set of rules which both the sending and receiving equipment must obey in order to establish meaningful communication.

RS232 interface

An RS232 interface is a device which converts parallel data into a serial form which may be transmitted over a two or three wire circuit. It provides the link between a computer and a modem. The interface also converts the incoming serial bit stream into parallel form.

The RS232 interface is an international standard for connecting communicating devices and may be referred to as V21, its international name. A more recent 'upgrade' of RS232 is the RS423 interface, the type of interface which the BBC computer possesses.

RS423 - see RS232

Start bits

This is an extra bit added to a data word before transmission so that the receiving equipment recognises the start of the character. The start bit is automatically generated by the sending RS232 interface and then removed by the receiving interface.

Stop bits

During data transfer, 1 or 2 extra bits may be added onto the data word by the RS232 interface so that the receiving equipment can detect the end of the word. These are the 'stop' bits and depending on the quiescent state of the line may be 0's or 1's. The generation of the correct start and stop bits at the sender and then their removal at the

receiving equipment, is totally transparent to the user and is carried out by the RS232 interfaces.

Terminal

A device by which a user can communicate with a host system.

Word Length

The number of bits which are recognised as comprising a unit of data transfer, a word. This need not be the same as the word length within the computer, extra formatting bits are added during data transfer (stop and start bits).

XON/XOFF

A simple form of data transfer protocol. If the receiving system wishes to stop the transmission, for example, to transfer the data it has already received on to disc, then it sends an 'XOFF' signal to the host. Once the sender receives an XOFF signal it ceases transmission until it receives an 'XON' from the receiver.

XMODEM

A relatively sophisticated form of file transfer protocol, developed by Ward Christensen, that allows the transfer of any type of file, either ASCII or binary, without conversion. Complicated error checking is carried out to ensure the integrity of the transferred file.

Command Summary

Terminal mode menu - Major options**<#> Comms/Prestel**

Pressing <#> once from the menu will switch Commstar into Prestel emulation mode, pressing it again will return you to Terminal mode.

Default : Comms

<D> Disc / Buffer

The <D> option selects disc spooling as the means of handling data instead of buffering, pressing <D> again will re-select buffering.

Default : Buffer

<G> Get emulation

This command allows the user to obtain from disc an emulation file which Commstar may use as an alternative to its internal emulation tables.

<C> Chat mode

This command causes Commstar to switch into interactive mode so that you may 'chat' to a bulletin board or to some other remote system.

<F> File transfer

Allows any type of file to be transferred to or from another Commstar or other XMODEM system.

<I> Initialise

Send and Receive baud rates, word length, parity and number of 'stop bits' used may be selected from a table of options by pressing <I> from the menu.

Default : Receive baud rate = 300
Send baud rate = 300
Word Length = 8 bits
Parity = none
Stop bits = 1

Terminal mode menu - Buffer commands

** Copy to buffer**

When this option is ON, all input from the RS423 is copied into the memory buffer if the <D> option is set to Buffer, or into a disc (or network) file if the <D> option is set to Disc. Function key <f1> may be used from within <C>hat mode to obtain the same effect.

Default : OFF

<R> Reset buffer

Pressing <R> from the main menu will reset Commstar's internal buffer pointers, without losing data, in order to ensure that the <V>, <S> and <O> options may commence from the start of the buffer.

<O> Output buffer

The contents of the memory buffer, or disc file when the <D> option is set to Disc, are sent to the RS423 for transmission. Two further options, Delay and Use Codes (i.e. buffer control codes) are offered.

Default : Delay = 2
Use codes = NO

<W> Wipe buffer

Pressing <W> from the main menu will delete the entire contents of the memory buffer.

<L> Load buffer

The buffer may be <L>oaded from a file on the current filing system by pressing <L> from the menu. You will be prompted for the filename.

<S> Save buffer

The current contents of the buffer are **<S>aved** to a file on the current filing system.

<V> View buffer

This command may be used to examine the current contents of the buffer on the screen with the option of obtaining a hardcopy of the data on a printer. You will be prompted for the required Delay and whether or not you require a printed copy.

Default : Delay = 2
Hardcopy = NO

Terminal mode menu - Configuration commands

<A> Auto Line Feed

Pressing **<A>** will toggle the Auto line feed option ON or OFF according to it's previous state. Auto line feed may be toggled On or OFF from **<C>hat** mode by pressing **<f2>**.

Default : ON

<M> Mode

The screen format for **<C>hat** mode may be set to any of the modes available on the BBC by pressing **<M>** from the menu or **<f5>** from **<C>hat** mode.

Default : Mode 7

<X> XON/XOFF

XON/XOFF flow control protocols may be toggled ON or OFF from the main menu by pressing **<X>**.

Default : OFF

<E> Local echo

Local echo may be toggled ON or OFF from menu by pressing **<E>** and from **<C>hat** mode by pressing **<f0>**.

<P> Printer ON/OFF

A hardcopy of all incoming data in **<C>hat** mode may be obtained by switching the Printer ON from the menu. Alternatively, function key **<f3>** may be used from within **<C>hat** mode.

Default : OFF

<@> Filter ON/OFF

All incoming data is normally 'filtered' through a mask byte (&7F) in order to set the 8th bit to 0. If filtering is not required it may be switched OFF from the menu by pressing <@>.

Default : ON

Prestel mode menu - Major options

<#> Comms/Prestel

Pressing **<#>** once from the menu will switch Commstar into Terminal emulation mode, pressing it again will return you to Prestel mode.

<D> Disc / Buffer

The **<D>** option selects disc spooling as the means of handling data instead of buffering, pressing **<D>** again will re-select buffering.

Default : Buffer

<G> Get emulation - not applicable

<C> Chat mode

This command causes Commstar to switch into interactive mode so that you may 'chat' with Prestel.

<F> File transfer - not applicable

<I> Initialise

Send and Receive baud rates, word length, parity and number of 'stop bits' used may be selected from a table of options by pressing **<I>** from the menu.

Default : Receive baud rate = 1200

Send baud rate = 75

Word length = 7 bits

Parity = Even

Stop bits = 1

Prestel mode menu - Buffer commands

- Copy to buffer - not applicable
- <R> Reset buffer - not applicable
- <O> Output buffer - not applicable
- <W> Wipe buffer

Pressing <W> from the main menu will delete the entire contents of the memory buffer.

- <L> Load buffer - not applicable
- <S> Save buffer

The current contents of the buffer may be <S>aved to a file on the current filing system.

- <V> View buffer - not applicable

Prestel mode menu - Configuration commands

<A> Auto Line Feed - not applicable

<M> Mode 7 / 3 - not applicable

<X> XON/XOFF - not applicable

<E> Local echo - not applicable

<P> Printer ON/OFF - not applicable

<a> Filter ON/OFF

Pressing <a> once will switch filtering ON causing all incoming data is masked (ANDed) with &7F in order to set the 8th bit to 0. Since Prestel uses only a 7 bit word format this has no effect, the option has been left available for future expansion.

Default : OFF

Miscellaneous commands

<*> MOS command

A MOS command may be issued by simply typing the requisite command in its usual form. The screen will clear on pressing the <*> key and allow the remainder of the command to be typed.

<BREAK> Reset Commstar

Pressing the <BREAK> key at any point within Commstar will initiate a return to Terminal mode and the associated default conditions. Data in the buffer will however be preserved.

<CTRL-BREAK> Exit Commstar

This is the quickest and safest means of exiting Commstar and returning to BASIC. All buffer contents will be lost and pointers reset.

Two useful programs

The XMODEM file transfer procedure provided by Commstar may be used to successfully transfer ANY type of file to another XMODEM system. However, if the remote host is not capable of using this type of protocol, only ASCII files may be sent (using the <0>utput buffer option). This excludes the possibility of transferring BASIC programs in their tokenised form or sections of machine code. Files containing non-ASCII data must first be converted to ASCII in order that they can be <0>utput.

The two BASIC routines given in Listings 1 and 2 below provide the means of converting BASIC or machine code files into ASCII form and then back into their original form again. Both are written in BBC Basic but may easily be converted for other machines.

The first program BACONV (Binary to ASCII convert) asks for the name of the file to be converted and places the resultant file back on disc (or tape) under the name of your choice. This file may be then be <L>oaded into the buffer and <0>utput to the remote system.

The received file may then be reconverted by ABCONV (or the equivalent program on another computer) into its original form.

Listing 1 - BACONV

```
1 ONERROR PROCerror
10REM ASCII to binary file conversion programme
20REM -----
40REM Copyright A.Hood 1984
60CLS
70PRINT' "ASCII to binary disc file conversion"
80INPUT"Source file name ";I$
85I = OPENIN(I$)
90 PRINT
100INPUT"Object file name ";O$
1200 = OPENOUT(O$)
130REPEAT
140     msb=BGET#I
150     lsb=BGET#I
160     PROCbyte
170     BPUT#0,byte
180UNTIL EOF#I
190CLOSE #I
200CLOSE #O
210PRINT CHR$13,"File Converted OK"
220END
240DEFPROCbyte
250lsb$=CHR$(lsb)
260msb$=CHR$(msb)
270byte=(INSTR("0123456789ABCDEF",msb$)-1)*16+(I
NSTR("0123456789ABCDEF",lsb$)-1)
280ENDPROC
300 DEFPROCerror
305 CLS
310 REPORT
315 PRINTTAB(10,20);"PRESS ANY KEY"
318 C=GET
320 RUN
330 ENDPROC
```

```

1 ONERROR PROCerror
10REM Binary to ASCII file conversion programme
20REM -----
40REM Copyright A.Hood 1984
60CLS
70PRINT' "Binary to ASCII disc file conversion"

80INPUT"Source file name ";I$
85I = OPENIN(I$)
90 PRINT
100INPUT"Object file name ";O$
1200 = OPENOUT(O$)
130REPEAT
140     byte = BGET#I
150     PROChexstring
160     BPUT#0,msb
170     BPUT#0,Lsb
180UNTIL EOF#I
190CLOSE #I
200CLOSE #O
210PRINT CHR$13,"File Converted OK"
220END
240 DEFPROChexstring
250 Lsb=ASC(MID$("0123456789ABCDEF",byte-INT(byt
e/16)*16+1,1))
260 msb=ASC(MID$("0123456789ABCDEF",INT(byte/16)
+1,1))
280ENDPROC
300 DEFPROCerror
305 CLS
310 REPORT
315 PRINTTAB(10,20);"PRESS ANY KEY"
318 C=GET
319 CLOSE#O
320 RUN
330 ENDPROC

```

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