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Soft in the Head

SHOPPING FOR SOFTWARE? LOOK NO further than these pages. This month it seems as if there's never been a wider choice of program available and you have to congratulate the software houses in the ingenuity of their staff.

Ariolasoft Info

Ariolasoft is making headlines and movies this month. Did you ever think that you could play at being Steven Spielberg with the aid of your C64? Movie Maker allows you to do just that. You can create your own animated pictures with the aid of this program. You probably won't make as much money as the great directors but you should have some fun.

Claims for the program include: mixing text and graphics, creating tracks of up to 30 frame each, and combining six of these in a single animated sequence. There are also hundreds of built-in pictures, ready for use plus the power to create your own. There are numerous animated greetings cards and a music and sound library. You can videotape your efforts and bore your friends with them if you feel that way inclined.

It's on twin disks and costs £16.95.

Two other newies from this Covent Garden based house - they've just moved - are Starship Andromeda and Panzadrome.

The latter is a futuristic war game set on a robot inhabited island. The Robots are tanks and hostile, of course, and you must build a better one in order to defeat them. Look out for mines and mortars.

Panzadrome costs £8.95 and is a product of the programming and design skills of the Ramjam Corporation.

Starship Andromeda sees you battling the evil tyrant Alana, who wears a crystal around her neck which just happens to be the security key to the great computer which controls the galaxy. A tough situation - especially since the only thing that will free the crystal is a Proton lance. Get the lance and get the crystal. Easy, huh?

The program includes 12 arcade/strategy games and 10,000 locations. It's also £9.95.

Not content with these launches, Ariolasoft is entering the Amiga software market with a collection of Electronic Arts' utilities.

Deluxepaint is an incredible graphics program which allows the beginner to explore the Amiga's capabilities whilst giving the more experienced user an excellent tool. Features include tools to create lines, curves, shapes and textures. There's also split screen zoom enlarging and colour cycling to create animation.

DeluxePrint is a sister program with 15 formats for easy customisation of print outs - in colour or black and white. The formats include greetings cards, business cards, stationary, calendars, letterheads, posters and many more.
Deluxe Video brings another dimension to computing. Make video slide shows, animation, business presentations. Find out about wipes, fades, and dissolves. Also compression of images, control of the foreground and background and much more.

Ariolasoft's Ashley Gray said: "The Deluxe series of Amiga programs are the most powerful, integrated, creative tools ever released for a personal computer."

Maybe you should try them when you've saved up for your Amiga?

**Activision — Out of Time?**

**WANTED — DEAD OR ALIVE!** SAM Harlow, that's you, a marked man. Your past has caught up with you, punk. They're out to get you - but you don't know who they are. Check your files, Sam, you need to prevent your own murder, and it's one of those bums who you've put away behind bars during your auspicious career.

**Interested?** Activision's latest adventure - Borrowed Time - puts you in the position of both hunter and prey. There are 20 serious suspects who are guilty of your blood. Track the murderer down before it's too late.

Perils including getting shot at, burned, anaesthetised, beaten up, strung up, sentenced to life imprisonment, bopped on the head, ripped to pieces by mad dogs etc.

If you've got £14.99 and want to die horribly then you know how to spend it.

**And the Rest**

**IF YOU'RE AN AVID WATCHER OF NOEL Edmonds' ridiculous Late Late Breakfast Show, then you'll know the background to Mr Puniverse.** Now Mastertronic has jumped on the bandwagon yet again to bring you Big Mac - 2 which features the character immortalised in this hilarious TV spoof. It's on the C-16 and is in the £1.99 range of course.

**Halley's Comet fever has now hit the software industry with a release from Firebird to mark the approach of the space probe Giotto to the heart of the comet.**

It's one of those games in which, once again, you play the part of an intrepid spaceman coming to the aid of the entire human race. This time the danger involves germ bugs from the comet which are threatening the health of the world.

The game has three phases starting with the launch, followed by controlling the ship's computer in its flight to the comet (the spaceman is in suspended animation at this point), and finally the destruction of the germ bugs so that they won't reproduce and infect the globe. £2.95 on the C64, and available now.

Rino Software is taking the bull by the horns in its decision to call a spade a spade - or more accurately a shoot 'em up a shoot 'em up.

Gone are the days when zappy games had zappy names. Rino's new release is for the C64, priced at £2.99 and is unabashedly entitled Shoot 'Em Up.

**Generally Speaking**

**IN THIS HIGHLY TECHNOLOGICAL BUSINESS, the Japanese are still the people who are often first with the newest ideas.** Now Cumana has brought another Japanese invention to this country in the form of the Astron IC card.

Physically, the card resembles a credit card but contains integrated circuitry which enables it to be used as a solid state memory device. It has a 38 pin connector which plugs into a cheap (about £2) socket and does not need a magnetic or laser reader.

There are four different types of card: ROM, Masked ROM, EPROM and RAM.

Cumana claims that they are totally reliable and durable and are unaffected by electromagnetic/electrostatic conditions, extreme temperatures, humidity and minor scratches. It is also an added protection against software piracy. Adaptors for the cards will be available for the C64 and C128.

Cumana has proposed a host of applications for the new card: Memory for telecommunication devices; identification for security keys, bank accounts, computer input and cashless shopping; speech for vending machines, language labs, measuring and sensing warning devices; instructions for robots and other automated equipment; personal identity; applications and ROM software; portable memory for hand held micros, programmable printers, process control, alarm systems. And this is only the tip of the iceberg. Look out for them.

**The Astron Integrated Circuit Card**
Mike Mahoney and Tony Crowther

After an absence of two years, Games programmer Tony Crowther has returned to Alligator software and as you can see from the picture he seems to be having quite a good time there already.

Because of this new arrangement Alligator is promoting some exciting releases in the near future.

If you’ve bought an A’n’T game recently or in the past then you may be offered to you by the company to help you out with any problems which you may have run into.

A new mail order and queries line has been established which will provide a 24 hour service. The number is Rochdale (0706) 341111. There’s also been an announcement from A’n’T that a new arcade adventure is in the pipeline at the moment. We’ll bring you more news on that as soon as we have it.

A company called Mupados has come up with an original idea. It has launched a software/audio cassette. It combines theme tunes in full, fantastic stereo dance mix from some popular games - namely Rambo, Neverending Story, Ghostbusters, Crazy Comets and Hyper-sports - with a database called Softwhere? which would help you organise a reference system for your programs, games, or record collection.

The idea behind it is apparently to combine the purely functional with pure entertainment. Whether the punters will think this worthwhile is another question but at £4.99 from W H Smiths it may be worth a shot.

On Line

MICRONET USERS HAVE RALLIED round and forked out to make the lives of some disabled young people a lot easier.

A user called Jon Bye, who became non-vocal as the result of an accident several years ago, let Micronet know, via mailbox, that communications services had made an incredible difference to his life.

Hard Lines

COMMODORE 128 OWNERS WHO have had trouble finding a suitable monitor for their computer (other than Commodore’s own product) could find that Cascade has come to their aid.

The RGB output of the 128 is incompatible with the majority of monitors on the market. Commodore’s 1901 monitor is expensive and people who already own a Microvitec probably feel that this is a high price to pay.

Cascade has come up with an interface which provides a full RGB composite display via the RGB TTI input. Microvitec 1431 dual mode monitor can now provide full 40 column composite video and 80 column RGB with simple switching between modes, thus allowing full use of the 128’s three operating modes.

At £108.95 it could be a worthwhile investment.

Musical computer owners will be tempted by Commodore’s new Complete Music System. It costs £330 including a C64 and the Music Expansion pack priced at £149.99 for those who already own a C64 or C128, contains everything needed to produce music which is normally only possible on expensive synthesizers. Or so Commodore claims.

Launched at the Ideal Home Exhibition the products should be in your local shop now.
Enter the world of Avenger, a Ninja warrior of unparalleled skills and deadly powers, as he battles the forces of evil in defence of his faith and protection of the weak.

Be calm and stay silent as the outstanding animation and unrivalled combat routines take you to levels of action you'd never have thought possible.

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Spectrum Graphics Software Limited, Alpha House, 10 Carver Street, Sheffield S1 4FS, Tel: 0742 753423

Screenshots from Spectrum 48K

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What are you waiting for?

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Study the two cartoons. There are several differences between them. Mark the differences clearly on the picture attached to the entry coupon. Fill in the coupon and send it off to US Gold Competition, Your Commodore, 1 Golden Square, London W1R 3AB. Write the number of differences you found on the back of your envelope.

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In the first of a new series, Eric Doyle introduces you to the secret of your Commodore’s memory.

WE ALL TAKE THE CHIPS INSIDE our computers for granted but a greater understanding of them can lead to better programs. Over the next few months I hope to clarify the function of each chip and to reveal the inner workings and hidden secrets of the Commodore range of computers: the Vic 20, C64, C-16, Plus/4 and C128.

The heart of any computer is the central processor and the most common application of the central processor is to run Basic programs so this is where our Odyssey will begin.

The microprocessor in Commodore micros is one of several derivatives of the Motorola 6500 series microchip. This processor is the number cruncher inside which are the registers that assist in all of the computer’s mathematical operations. Diagram 1 shows the basic architecture of all 65000 range microprocessors.

As far as the processor is concerned this is the whole of the computer memory is an extension of itself from which numerical values can be loaded (read) or sent (written).

A good way of imagining memory is like a large pigeon hole internal mailing system. Each box represents a byte of memory and can contain a value from zero to 255. Don’t worry if you don’t know how computers deal with numbers larger than 255, all will become clear later.

Memory comes in two varieties: Read Only Memory (ROM) and Random Access Memory (RAM). As the name implies ROM can only be read from but RAM can either be read from or written to if it is necessary to change its value. For example variables defined by a Basic program must be stored in RAM for two reasons. Firstly, because it must have a value written to it to start with and, secondly, because that value may change later on in the program.

Another difference is that ROM is a permanent, non-volatile store which cannot be erased by turning the power on and off but RAM is volatile and its contents disappear when the computer is switched off.

ROM is where the Basic operating system is stored and at power up it reserves certain parts of RAM for storing the transient values generated as its routines are executed.

Load and run Listing 1 to see how the processor operates.

The program counter tells the processor where the current instruction is located in RAM/ROM memory. When it is executed, it provides a piece of machine code, the current value of the program counter is stored in a special reserved area of RAM memory (the processor stack area) and the internal stack pointer is adjusted to point to the next free location in the stack. The start address of the new machine code routine is then placed into the counter. This value is then loaded into the address buffer which directs the data bus to the correct location.

The data bus copies the information found in the given location and carries this back to the processor which is expecting a machine code operator. When this is evaluated in the instruction decoder it determines whether an operand or two will follow. Depending on the type of operator, any operands are evaluated and stored in the X or Y register or in the accumulator.

If the operator is a finite address the address buffer is given this value and the data bus reacts accordingly. If the value is an offset address, the finite address has the value of the X or Y register added to it and this value is passed to the address buffer.

All mathematical work is performed in the ALU which can access all of the registers which merely act as passive stores for transient values.

The instruction decoder determines whether the data bus is reading or writing its encoded information and which internal register provides or accepts the information.

When an RTS command is detected the last value to be stored on the stack is read into the program counter and the processor continues from where it was before it was asked to execute the routine.

I have said that the processor only responds to machine code routines so how does it respond to Basic?
Down to Basics

When the computer is switched on the program counter automatically loads the value it finds at SFFC which causes the processor to run the ROM machine code routine for power reset. This organises the memory ready for Basic and ends by printing READY on the screen. The routine then loops around until a keyboard input is entered. After typing in or loading a program, the command RUN brings the Basic execution system into operation. To understand how this works we have to look at the way a program is stored in memory. Now enter Listing 2 to reveal the structure of a line of Basic.

The program PEEKs the program storage area and writes the actual contents of the memory locations to the screen. The first screenful of information shows the first three lines. Notice how all the lines end with a zero byte which causes the operating system to start a new line when LISTING to the screen or a printer.

The first four bytes of information have been coloured to highlight their special significance. The yellow pair of bytes gives the line number. Their actual value can be revealed in the following way:

i) Write down the first of the two bytes and then write the second byte after it (e.g. 2C 01 becomes 012C).

ii) This is the hexadecimal value of the line number. To convert it to decimal multiply the first figure by 256, the second by 256, third by 16 and the fourth by one. Then add the new values together. (e.g. (0x4096) + (1x256) + (2x16) + (1x1) = 300).

Remember that A=10, B=11 etc.

The cyan coloured figures also reveal a two byte number in the same way but this number indicates the memory location at which the next line starts. These bytes are called the link line and they help the operating system to find a particular line quickly when GOTO and GOSUB are executed or when DATA is being READ in. In other words the link line always points to the first byte of the next line link.

After these first four bytes the details of the Basic instructions follow. To make sense of

Listing 2

10 REM * THIS WILL NOT WORK ON UNELECTED VICS
20 REM ** FOR VIC-20 OWNERS
30 REM ** OWNERS OF VIC-20S SHOULD USE THE REMOVED INSTRUCTIONS

40 REM
50 FOR=I=0 TO 256:READ A:PRINT A
60 NEXT
70 PRINT "*"
80 REM ** ON VIC-20 UNTIL ASCII
90 REM

Program: Listing 2

This note shows that the green figures are tokenised keywords. Yes, a word like PRINT is converted into a single figure which by the line is encoded but a variable such as SBD would occupy two bytes corresponding to the CHR$ (or ASCII) values for each letter.

Another point worthy of note is that arithmetic operators have a value which is at variance with their ASCII values. When words such as PRINT or arithmetic signs are used within quotes they are not given their special status and are just evaluated as normal ASCII characters.

Slow Motion

Now back to the question of how a program RUNs.

First of all the operating system causes the processor to check if there is a program in memory. If the first two bytes of user RAM have a value then the system assumes a program is in residence. These two bytes are assumed to be a line link and are stored away for reference. The whole line up to the link location is copied into a special area of memory for analysis. This is the basic buffer. Similarly the line number bytes are stowed away elsewhere in RAM.

After the line number the system expects to find a command of some sort. Evaluation of the token value representing the command (reserved word) is found by storing the value in the processor's accumulators and comparing it with a list of values stored in Basic ROM. If no match is found then the line is scanned in the buffer by sequentially loading each byte into the accumulator to see if there is an equals sign. The system is also comparing the accumulator's value with the token values of various punctuation marks or looking for the end-of-line zero byte. If one of these is found instead of the equals sign an error is signalled.

When such an error is indicated a Syntax Error Inline message is printed on the screen by loading each letter into the accumulator and moving it into screen display RAM. Next, the line number stored in RAM is dragged out, converted into a decimal value and printed after the message.

If the system has detected a
variable being created it checks the syntax of the variable name.
Then an area of RAM is used to store the value along with the variable name.

If a reserved word has been found the position of the token value in the ROM list determines where the program jumps to in the Basic ROM to verify the correct syntax of any characters which follow the word until a colon or zero byte is discovered. For example, if the line was PRINT "HELLO", the PRINT token would be 99 Hex. The system would then expect a variable name, a quotation mark, a colon or a zero. In this case it finds a space, which is ignored, followed by a quotation mark.
The system then takes the ASCII code from between the quotes one by one. The ASCII is converted into a screen POKEN value and this places the letters which spell HELLO on the next available screen location.

When the end of a line is found the line link is retrieved from memory and the next line link is stored along with the new line number. The line is then copied into the Basic buffer and the line is scanned and interpreted as before.

This process continues until there are no more lines left or an END or STOP command is located.

Obviously all this memory movement, evaluation and syntax checking going on the program runs a lot more slowly than a pure machine code program written specifically to create the same effect but it should be remembered that all programs are executed by the microprocessor in machine code. Basic is only a fragment of the ROM's memory. When a language such as Logo or Pascal is loaded the Basic ROM is switched out in favour of the new machine code routines which interpret the syntax of the new language.

Any language on a computer is a language of convenience rather like Margaret Thatcher and President Mitterand discussing policies through the medium of an interpreter. As we all know this not only lengthens the time taken for the discussion but can lead to misunderstandings unless great care is taken.

Next month we shall see how the processor helps to store numerical and string variables.
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Whenever the word 'Amiga' is mentioned, someone will have something to say about Commodore's wonder-baby. At first all that was said was how wonderful this machine was, and how it would take the world by storm; gradually, however, people saw the Atari 520ST, at least than half the price — and started wondering.

I have owned an Amiga for nearly six months now, and in that time I think it is safe to say that I have formed a very personal view about a machine which, if used to its potential, can really show the true power of a personal computer.

What makes the Amiga so different from all the other personal computers is its sheer versatility. Being a true multi-tasking machine means that it can do almost as many things as you want simultaneously, enabling you to jump from one task to another with the knowledge that all the other tasks will continue.

**Hardware**

To successfully explain the Amiga you must really split the hardware into different sections; specification, workbench, graphics, sound, and peripherals. Although this cannot cover everything to do with the Amiga, it should give you a valuable insight into this machine.

**Specification**

The specification given here is of the American Amiga, when launched in Europe it will probably come with two disk drives and 512K as standard. Basically the components of the Amiga are:

- Motorola MC 68000 16/32 bit main processor.
- 256K bytes of internal RAM, expandable to 512K.
- 256K bytes of ROM containing a real-time, multi-tasking, operating system with sound, graphics and animation routines.
- Built in 3½" double sided disk drive.
- Expansion port for up to 3 external disk drives with either 3½" or 5¼", double sided.
- Fully programmable serial port.
- Fully programmable parallel port.
- Two button mechanical mouse.
- Two 9 pin D type controller ports.
- Detached 89-key keyboard with numeric keypad, 10 function keys and cursor section.
- Ports for analog or digital RGB output, as well as composite video.

**Workbench**

At present, to start up an Amiga system, you must first insert a disk that loads the operating system into write-protected RAM. Although this does take time, it means that in the future, when new versions are released, you will not have to mess about switching chips around. Having done this you will be requested to insert what is called a Workbench disk.

This is the program that makes the Amiga so easy to use, and enables a complete beginner to start harnessing the machine's power.

**Computer's Functions**

To use the Workbench, most people will immediately recognise the Macintosh-esque windows and icons, however this time they are in colour! The Workbench is provided for two real reasons; firstly it lets you control the computer's functions via a mouse, and secondly it lets each individual owner customise his Amiga. Using a program called Preferences, you can choose the colour of text, the colour of the background, how sensitive you want the mouse to be, and also redefine the cursor which indicates the mouse position.

**Technical Side**

Preferences allows you to set baud rates, and redefine the bit images required for your printer.

The Workbench screen, when operated, displays one large window, within which are a variety of draws. On selecting a draw with the mouse, a new window will appear, giving you another selection of icons to choose from. Icons can best be described as small pictures which appear on the screen representing; tools, projects, disks, draws and the Trashcan. Windows let you see the contents of projects, draws, disks, and the Trashcan. Windows can be altered both in size and position.

On the current version of the Workbench disk (v1.1) there are four draws — Demos, Utilities, System and
the detailed story

Empty, Demos are three different programs which show well how efficient a multi-tasker, the Amiga really is. Utilities gives you an on-screen calculator and notepad, a la Mac, and System produces a disk copier. The Empty draw allows you to create a personal file for the Workbench disk.

To make the most of the system, it is preferable to create your own Workbench disk to suit the type of application you will be running, I, for instance, would rather use the keyboard than the mouse, and have my Workbench set up accordingly.

Graphics

If one feature makes the Amiga stand out in a crowd more than any other it has to be the graphics. What makes this, and the sound, so outstanding are the three dedicated chips designed by Jay Miner, founder of Amiga. These chips, affectionately called AGNUS, DENISE, and PAULA, effectively allow the main CPU to do other things while they take on specific roles, such as controlling graphics and sound.

In exact terms, the Amiga has four resolutions; 320 * 200, 320 * 400, 640 * 200, and 640 * 400. However, the two modes that involve the use of 400 vertical pixels are more difficult to control as it requires a special feature called Interfacing. This allows the programmer to utilise the unused spaces to double the vertical resolution.

In each different mode you also have different amounts of available colours. In total the Amiga has a palette of 4096 colours, and in low-resolution you can put up to 32 different colours on screen at once. However, the higher resolution modes have correspondingly less available colours. One clever trick that can be used in certain situations however is called HAM (Hold And Modify). This method allows all 4096 colours to be displayed on screen simultaneously, while only sacrificing 48K. By producing this quality of colour resolution you can produce pictures of a standard as yet unsurpassed on a personal computer.

One word that will be recognisable to almost all of you is sprites. The Amiga can cope with up to eight sprites on screen at once, each of which can be as tall as is required, although only 16 pixels across. For animation purposes the Amiga also has something called a Blitter (Block Image Transfer), and although this is by no means limited to graphics, it can be used to move large amounts of graphics data around the screen at amazing speeds, creating some outstanding effects.

It is features such as the colour palette, as well as the Blitter, that make it obvious what potential the Amiga has as a graphics machine.

Sound

To complement the Amiga's graphics, it comes with a dazzling potential for sound generation. Controlled by the Paula chip, it can produce stereo output through the left and right external sockets, and without too much difficulty, can produce sounds to rival some more expensive synthesisers.

The Amiga provides the user with four separate sound channels, each of which can be used to carry a wide range of sounds, they do not have to be monophonic. By using digital sounds and envelopes, the Amiga is quite capable of producing sounds which have been sampled, and then converted to the correct format, only to reproduce them perfectly later.

As well as producing excellent quality sound, the standard Amiga can produce quite breathtaking speech, simply by using simple commands, thus narrating software packages are no longer a thing of the past!

Peripherals

If you want a machine that will grow as a system, then the Amiga certainly has the potential. With its plethora of ports, it should be possible to interface almost anything to this machine, with the right software.

Printers are well provided for in the Preferences program, with most popular makes such as Epson, Diablo, Commodore, and others all having software already written to take advantage of the graphics.

Modems too are easy to rig up, with a totally programmable serial port, it should just be a question of plug in and go. I am currently running a 1200 baud modem with no troubles.

Conclusion

Although I have only managed to touch the surface of what the Amiga is really capable of, it is clear to me that, if it is marketed properly, this machine could succeed by creating a market, rather than fitting in as a run of the mill PC, that would be a real shame!
The M/c Loader

MICROFILE64 is a complete database creation and management system for the C64. It consists of a suite of three programs. The first program is mainly a machine code loader but it also carries out "once only" operations such as setting up the SID and VIC chips, etc., for the main programs, and then auto-runs the management program. The management program consists of shell-metzner sorting routines, a very powerful data search and edit system and a unique data access method for tape and disc. The third program is the format program which allows the user to design a complete screen layout for the input of data using any of the available colours, rvs video graphics characters and even the full-screen editing facilities of the 64. Then by using a sprite cursor and an overlayed pop-up menu, it defines the parameters affecting each of the fields i.e. length, datatype, input position and name.

The m/c is placed above Basic in the 4K block at $C000 from SCAA3 to $CACA5. So taking no Basic memory. The m/c is wedged between the stored screen definition which is split into two; the screen memory from $C000 and the colour memory from $CACA5 using m/c routines the screen can be stored and recalled instantly for updating the file. Being stored in this block means that over 28.5K free for data. This is allocated to 200 records of up to nine fields each one being allowed a maximum length of 255 characters (this number of records could easily be altered up to two or three times more and although the maximum field length is 255 this would probably never be used and is set at this to impose no constraints on the user. Since string storage is dynamic, the field length could be set to this and it would not immediately be allocated 25 bytes. Details on how to extend the program will be given later in the documentation).

The leader itself stores 5 m/c routines. They are:

1. Interrupt driven routine (SCAA8 - CB43): To control the basic input routine and use the full cursor editing. This has three purposes: to stop the cursor scrolling the screen by denying it access to the top and bottom lines; de-activate the colon and comma keys while allowing their shifted, controlled and CBM functions to be registered; allows the INPUT routine to be exited by pressing function keys as well as RETURN.

2. Interrupt routine (SCAA8 - CB43): This routine simulates the Basic input routine but improves on it by adding the ability to preset the maximum number of characters to be entered; allowing only certain data to be entered which can be preset and can be of four types - alphanumeric, digit, numeric or for any other numeric data being entered it is possible to specify a particular amount i.e. less than, greater than or between.

3. Cursor. AT (SCB46 - SCB72): This simulates the PRINT AT command found in many other Basics. It uses the kernel PLOT routine at $F800 and a few Basic ROM calls to allow parameter passing of the row and column positions from the SY$ call.

4. Screen store (SCB73 - SCB83): This stores a copy of the screen layout defined by the format program (except for the top and bottom rows). It stores the screen memory at SCC05, the colour memory at $C000.

5. Screen recall (SCB65 - SCB04): This recalls a copy of the screen stored by the routine above.

If you wish to use the system on disk then the three programs must be saved under the filenames MF64.M/C, MF64.MAIN and MF64.FORM in order to maintain the compatibility with the routines used in the main and format programs. Also certain lines need to be altered in the machine code loader so that the main program is auto-run correctly, this is shown below.

Type in the following lines, with the m/c loader in memory:
The Format Program

The format program can be run by selecting option eight of the main menu of microfile64 (this is discussed fully in the section dealing with the main program). The format program transfers data to the main program by saving the data as a file called "FORMAT" which can be loaded into the main program again using option eight. The screen data is not actually saved since this could only be lost if the computer is switched off as it is stored above basic. The transferring of data has to be carried out this way since no CHAIN command exists in CBM Basic to control variable storage when a new program is loaded.

When the program is run, you are asked how many fields you will need from one record (this maximum of nine could be increased easily if necessary. The method is described later). A field is an individual data item within a record, for example, if you wished to design a layout for a club membership booking system you might need four fields: name, address, telephone and membership number. After you've typed this in, the next step is to design the screen layout.

A cursor will start flashing near the top left, you can move it anywhere on the screen using the full editing functions of the C64. Care should be taken though, since use of the insert will cause the whole screen to move down a line which can mess up your design. Apart from colon and comma keys which cause the awful "?Extra ignored" message, all other characters are acceptable including graphics, also colour and reverse can be used in the usual way. All this means that pretty nifty displays can be designed if time and care is taken.

In the design screen mode, the top line shows the user the job for each of the function keys; F1 (Exit) allows you to start designing the database again from the beginning if you made a mistake; F3 (Clear) will clear the screen to allow you to start designing the screen layout again without having to go back to the beginning; F5 (Next) skips to the next process of defining the fields and recalls a previously defined screen, this is useful if you wish to redesign the parameters for the database without having to design the screen layout again. Once you've finished designing your screen, press RETURN. The new screen will be stored instantly, wiping over any previous definition.

The next part of the program is more complex, this is where the parameters affecting each field are defined. This is in four steps. First the input position, secondly the field datatype, thirdly the input length and last of all the name of the field, this is repeated for each field. When you reach this section, the first thing to notice is the fast flashing cursor in the top left - move this cursor to where you wish each field to be input in turn, pressing RETURN to store the position. In the top right of the screen the number of the field currently being defined is...
displayed. If we take the example of the club membership system, then the display might look something like this:

**Club Membership System**

**Name -**

**Address -**

**Tel. -**

**Membership no. -**

Then, to define the input position for 'Name', you might move the cursor to the column next to the dash after 'Name' and then store the position by pressing RETURN.

After the input position has been set an overlayed menu will come down (if you've just typed the program in it's not a bug). This is where you select the type of data the field will hold, there are four types: alphabetic, numeric, digit and other. These options are on the menu plus another five. The extra ones are used to limit the values of data entered and all conform to the rules for 'DIGIT' data:

1. **ALPHABETIC** - alphabetic characters only
2. **NUMERIC** - 0 to 9 plus +, -, / and point
3. **DIGIT** - 0 to 9 only
4. **ANYTHING** - any keyboard character
5. **BETWEEN** - between but not equal to two numbers
6. **<** than
7. **>** than
8. **<** than or = to
9. **>** than or = to

To select datatype move the blue cursor with the up/down cursor key to the required type and press RETURN. If you select any datatype above four then you will be asked to input the relevant values, which must be conformed to, in the window at the bottom of the menu. If you have made a mistake in selecting the input position, pressing 'E' will return back to this part without updating the field pointer to the next field, so that you may redefine.

The third parameter to define is the length. After the datatype menu has disappeared, a cross cursor will appear next to the position you defined for the input, with a reverse video representation of the field number in the exact location. Holding down any key will move the cursor which will leave a trail of dots behind it, each representing one character. This gives a visual representation of the field length, but on the bottom line is a count of the number of characters. The cursor may be moved until either a length of 255 is reached, or another character is encountered in front of the cursor. RETURN sets the length and DEL allows you to move back the cursor.

The final part of this section of the program is typing in the field name. You will be prompted to do this on the bottom line after defining the length. All the processes discussed then have to be repeated for each field. As in the previous section for defining the screen layout, in this section the function keys have certain uses. They are: F1 (Exit) returns back to the program; F3 (Clear) homes the cursor and resets the field count to one; F5 (Back) allows you to go back and redefine the previous field if you made a mistake.

When you have finished defining the database the program will ask if you wish to save the data to tape or disk. If you choose tape remember to take note of the tape count. You must also wind the tape back to the position of the main program so that it can be auto-run (of course on disk this is automatic).

**Management or Main Program**

When the main program has auto-run, press any key to exit the intro screen so that you are then presented with the main menu. In the top right of the screen is printed the number of empty records remaining i.e. how many more records can be input. Laid out below this are the 10 main functions of the management program which can be accessed by pressing zero to nine. When the program is first run only options one and eight can be selected since no data is present and also there is no 'format' where it can be held. The format can be one using option eight, which will be described later, or option one can be used to lead in a format or any data.

To describe how to use the program I'll go through each option in turn:

1. **Press this yields yet another menu with five more options all of which are really**
self-explanatory. When any of these are selected you will be asked to supply a filename. This must be no longer than 16 characters. Typing 'E' will exit to the main menu. Before describing other parts of DATA I/O, I must first describe the unusual method in which the program handles data files. Files can be loaded/saved in one of two forms either program-data or the actual records of data or the format data. The format data takes a while to load/save even with disk since it is itself split into two halves. Firstly, the format parameters are saved i.e. field length, name etc, and then the screen layout data which takes the time to load. Saving the data as two separate files may sound strange but it creates a very flexible system. For example, if you select load from tape and a format is already present then the program automatically assumes you wish to load a format, firstly, you will be prompted to enter the type of file to be loaded: "Format or data". This means that if you select data you can load in different sets of data for the same format, so it is possible to create many data files from one format file so overcoming memory limitations. If you select format and load a new format then the data present will be erased and new data file must be loaded.

If you try to load a file which is data but you select format when prompted the computer will give an error message after reading the file header and return to the menu.

Note

The data I/O option cannot be used to load a transfer file from the format program. Option eight must be used for this.

The next option two, is print file. I have left this unwritten since I have no printer and also there are many different types, but provision has been made for a subroutine. If pressed the menu will just be listed again. My suggestion is to place the subroutine starting at line 400 which means the third line number (30) in the ON.GOSUB at line 35 must be altered. To help you - the s/r at 4005 will list all the records found by a search. Also look at the view option. Finally, the

array BS holds the format data and BS (field number two) contains the name of each field and the actual records are held by AS in the form AS (field number, record number).

The third option - Update - allows the updating of the file i.e. typing in new records. When pressed, the layout you designed using the format program, should be displayed and a blue non-flashing cursor will be at the first field. Type in the necessary data and press RETURN to store and move to the next field. In the top right hand corner, a number displays the current record being typed in, as usual, the function keys have been used which are also displayed on the top line they are: (Exit) will exit back to the main menu, this will not update the record counter and any data that was typed for the current record will be lost; F3 (REDO) this allows you to retype the previous record and not deleting any data that has been typed on the current field; F5 (Memory) displays on the bottom line the number of free bytes remaining, this may take a few seconds and is due to FRE(0) and not to my program. The menu line on the bottom line until any key is pressed.

The fourth option - Edit - is probably the most complex in the program but has some very powerful function. When pressed you are presented with another menu. Again I will go through these options in order starting with Edit. After selecting this and entering the number of the record you wish to edit, once entered, the screen will display the record, and the bottom line will list the key function. The top right shows the record currently being displayed using the inequality keys (<, >). You can look at other records going backwards/forwards and when you have definitely found the record you wish to edit, pressing 'D' will delete the whole record, 'E' will exit back to the menu or 'A' will allow you to alter it. Selecting 'A' changes the prompts on the bottom and top lines and also turns the data in the first field to inverse video. Using the cursor up/down key, you can select the field to alter when you have it, pressing RETURN will change the prompts again for the third and final time asking you to select the 'Edit option', 'D' will delete all the data in the
field or 'O' will allow you to overwrite new data into it. If you made a mistake selecting the field, E will let you exit back to choose another field.

Next on the EDIT menu is SEARCH and REPLACE. This is a very powerful feature using fully all the SEARCH routines in the program. After selecting the field you wish to search, type in the search data. The string must be prefixed with a character to indicate which type of search is to be done. The six different types are listed at the top of the screen (for information on these see the documentation on for the search option).

If scan string is used it can be made to insert data in a number of records, e.g., to insert a middle name into MARK ANTHONY you would type:

Search data @ANTHONY Replace data @ANDREW ANTHONY

The name ANDREW would then be inserted at every occurrence of this name, but be careful since the routine searches for the first occurrence of the string within a field, i.e., if you wanted to insert my middle name DANIEL into GARETH THOMAS you could not use the shortened version e.g.

Search data @TH Replace data @DANIEL TH

since the result would be GAREDANIEL THOMAS because THoccurs twice in my name, instead you would have to type the whole e.g.

Search data @THOMAS Replace data @DANIEL THOMAS

Search and Delete is similar in operation and replace. If you select any of the search options apart from '@' scan string the whole field will be deleted. Using scan string can enable you to delete from inside a string e.g. to delete my middle name;

Search data @DANIEL

Note the space before DANIEL, since otherwise the result would be GARETHTHOMAS because the new string is reassembled around the position of the old one and their are two spaces around the old one.
The computer will then tell you how many records it finds but it will not display them.

Instead the screen is set to its original form and you are prompted for more data. The next search done will not search all the records but it will search only those found by the previous search, this means that you can continually search a decreasing number of records using different search formats and so narrowing the down to the few you are looking for. This is a very powerful feature if used properly.

Suppose a file was created of names and addresses of people for a tennis club, you might need to search for all the people living in BATH who play singles and have a name beginning with A. Let's suppose that field one is Name, two is Address and three is type of player. You would enter 2@BATH (need to scan all of the address for the string BATH)
If you do not wish to search the records found by the previous search then typing 'c' will clear the records found and allow you to search the whole file again. This must be typed before every search if it is to be of the whole file. The different searches are:

1. * wildcard – this isn't a true wildcard since it only compares the first few letters of a string i.e. typing *SA will search field one for all strings starting with SA.

2. I compare directly – this is self-explanatory it compares directly the whole string with the whole of the file i.e. 2EDINBURGH will search field two for any records containing EDINBURGH, so in this case, if a field contained EDINBURGH CASTLE, it would be ignored.

3. @ search string – this will search all the data in a field for the occurrence of a string i.e. 2@DE will search field two for any occurrence of DE so JADE EVANS would turn up.

4. 5. and 6. – these are the inequalities and the same applies to all, with less than and greater than is less than or greater then but NOT equal to. Also the search can be used for alphabetic as well as numeric data i.e. 'A' < 'F'.

Next on the main menu is seven – sort. The simplest of all the options. Just enter the field to be sorted and the rest is done automatically. The eighth option is Format which when selected will first ask you if you wish to load program or data. The program is the format program, if 'p' is pressed this will be loaded and auto-run otherwise pressing 'd' will load the transfer file of data format created by the format program. Both these operations will require (if you are using tape) the winding of the tape to the correct position. The program will prompt you through all. So if you run the format program by selecting 'p', then design your format, and lead the main program back in, you will use 'd' to load the file saved by the format program. The penultimate option, nine, is new data, this will prepare the program for new data to be loaded or for a completely new file i.e. format and data will be erased. When this is selected you are asked whether you wish to erase data only or data and definitions, obviously if you select data only the format will remain, allowing you to load in another data created under this format. The final option, 0, is to exit the program, this uses the KERNAL routine to completely re-initialise the computer, so be careful.

To finish, I said in the section for the m/c loader, that the max number of records set at 200 could easily be extended to more. The lines that have to altered are 9900 and 1800 – the changes are obvious. If in the event that the program should lock up to an I/O error or an unforeseen bug should crash it and CTR will not continue, then GOTO 30 will return you to the program data intact.

Note

Regarding the use of the format file – the file stored by the format program is only used as a transfer data quickly across to the main program – a copy of the screen is not saved as this takes a lot longer and remains intact above Basic anyway, therefore once you have the format file in memory after using option eight then remember to save a full copy of the format i.e. screen and definition data by using option one selecting save, and pressing 'f' for format when prompted to by the computer. This is a proper copy of the format!
860
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0

630 SYS AT,0,24:PRINT "GREEN,
SPC,1,NUMBER OF CHARACT
RS = [I(SPC2, HOME)]
:POKE 2023,32
640 CD=1:PS=1024+PS
:POKE PS+1,43:POKE 54273+PS,1:POKE 350,128
650 FOR T=0 TO 1 STEP 0
:SET & IF 64=""THEN NEXT
660 IF G=#CHR$(131) THEN B4(3,1)=0:SYS 720:T=1:
NEXT GOSUB 1190:RETURN
670 IF G=#CHR$(20) AND CD=1:
TEN CD=CD+1:POKE PS,CD,43
:POKE PS+CD,32:GOTO 710
680 IF PEEK(PS+CD+1)>=32 OR
CD=255 OR GOSUB 1983 THEN
NEXT
690 IF G=12 OR G=CD="1:
POKE PS,CD,45
:POKE 5427:PS+CD,1
710 SYS AT,25,24:PRINT STR$(
CD-1)$,SPC2,HOME):NEXT
720 EF=1:125=""SYS AT,0,24
:PRINT "C7YLDOWN,5F
I ELD,"STRA(1)" NAME?
(SPC16,HOME)
730 POKE 251,0:POKE 252,24
:POKE 253,4:SYST,13,24
:XP=14:YP=24:GOSUB 960
740 IF I=11 THEN 720
750 AS=ASC(1) IF AS=64 AND
ASC(91) THEN 1=CHR$(AS+128)
1=RIGHT$(1,LEN(1)-1)
760 B6(2,1)=16SYS AT,0,24
:PRINT "C7YLDOWN,5F
CURSOR TO INPUT POS &
PRESSGSPC,WHITE,SR,SE,ST,
SU,SN,HOME:
770 POKE 2023,160
:POKE 55295,190:RETURN
780 POKE T,CL:RETURN
790
800 REM SET UP VARS FOR M/C
INPUT
810 X=B6(4,1):POKE 251,0
:POKE 252,6:POKE 253,3
:YP=20
820 ON ASC(1)*52 GOSUB 830,
880,900,920,940:RETURN
830 XP=21
840 SYS AT,8,20:PRINT "CSL
LOWER LIMIT?SYS AT,20,20
:GOSUB 960:B6(3,1)=18
:POKE 251,0
850 SYS AT,8,20:PRINT "ISU
UPPER LIMIT?SPC11,RVSDP,
61:SYS AT,20,20
:GOSUB 960:B6(6,1)=16
860 IF VAL(B6(1,1))<VAL(B6(5,1))THEN B40
870 B8(4,1)="3":RETURN
880 IF 19=YSYS AT,8,20
:PRINT "GREATER THAN?"
:SYS AT,18,20:GOSUB 960
:BB(5,1)=18
890 B8(4,1)="5":RETURN
900 XP=22:SYS AT,8,20
:PRINT "GREATER THAN?"
:SYS AT,21,20:GOSUB 960
:BB(5,1)=18
910 B8(4,1)="7":RETURN
920 XP=23:SYS AT,8,20
:PRINT "IF THEN OR =10?"
:SYS AT,22,20:GOSUB 960
:BB(5,1)=18
930 B8(4,1)="9":RETURN
940 IF XP=20 THEN 1=LEFT$(16,
PEEK(2511)):NEXT
950 B8(4,1)="13":RETURN
955 REM GRAPHICS CHAR 15 CBM
O (CRP)
960 PRINT "C7U1P1"
:SYS AT,XP,YP,11=""**
:FOR T=0 TO 1 STEP 0
:SYS 150:IF PEEK(254)
970 IF P=20 THEN 1=LEFT$(16,
PEEK(2511)):NEXT
980 IF P=13 THEN 1=16+CHR$(
P):NEXT
990 RETURN
1000 1
1010 REM TRANSFER FORMAT TO
MAIN PROG
1020 PRINT "CLEAR!"
:SYS AT,5,3:PRINT "SIP"
RESS 'R' TO RE-RUN
1035 SYS AT,3,4:PRINT "WHITE,
SISEMPSPC,STAPE OR
(SPC,93ISK(T/0)?)
1049 GET B6SYS AT,29,6
:PRINT B6:"DOWN2"
1051 IF G6="#THEN PRINT"
"DOWN,RIGHTS,SPRESESPC,
RVSDP,SR,SE,ST,SU,SR,SN,
RVSDOFF,SPC10 SAVE"
:WAIT 197,1,OPEN 2,1,1,
"FORMAT":GOTO 1070
1035 IF G6="#THEN RUN
1040 IF G6="#THEN 1029
1050 PRINT TAB(15):DOWN3,882
AVING....
1060 OPEN 15,8,15,"10"
:OPEN 2,8,2,90
:FORMAT,S,9,"M"
1070 PRINTW2,FD FOR 60 TO 60
FOR H=0 TO FD
:IF B6(H)="#THEN B6(H)
:="*
1080 PRINTW2,B6(H):NEXT
1090 IF G6="#THEN CLOSE 15
1100 CLOSE 2
1110 IF G6="#THEN POKE 198,0
:GOTO 1140
1120 PRINT "CLEAR,DOWN23
LOAD CHAR$(34)"MF64,MAIN"
HR$(34),",8"POKE 198,2
:POKE 631,13
1130 POKE 632,13:PRINT
"DOWN4:RUN:HOMEM):NEXT
1140 PRINT "CLEAR!"
:SYS AT,2,6:PRINT "I$300"
TO MAIN PROGRAM & PRESS
(SPC,RVSND,SR,SE,ST,SU,SR,SN,
DOWN2)
1150 GET G6:IF G6#"CHR$(13)
THEN 1150
1160 POKE 198,1:POKE 631,131
:NEW
1170
1180 REM MAKE SOUND
1190 POKE 54276,65
:FOR DE=1 TO 150:NEXT
POKE 54276,6:RETURN
1200
1210 REM SPRITE MOVE ROUTINE
1220 FOR T=0 TO 1 STEP 0
:GOSUB 1340:T=#GHR$(13)
1230 REM ANY 4 DIRECTIONS
1240 IF G=12 THEN G=12
AND X>(336 THEN Y=Y-8
1250 IF X>24 THEN X=X-8
1260 IF G=13 THEN
"DOWN"
1270 REM CONTROL SPRITE MSB
1290 IF X>255 THEN POKE V+16,
11=F=1:POKE V,X-255
Poke V+1,Y:GOTO 1220
1300 IF F THEN F=0
:POKE V+16,0
1310
1320 REM FLASH SPRITE
1330 POKE V,X:POKE V+1,Y:GOTO 1220
1340 FOR W=0 TO 40:GET G6
IF G=0 THEN RETURN
1350 NEXT POKE V+21,0
1360 FOR W=0 TO 40:GET G6
IF G=0 THEN POKE V+21,1
1370 NEXT POKE V+21,1
:GOTO 1340
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Runecaster delves once more into the secrets of adventuring.

As we watch many software houses striving to improve the graphics which now illustrate most adventures, it is interesting to talk to the actual players of these modern-day marvels.

Whilst nearly everyone agrees that swiftly drawn, colourful graphics can always enhance the appearance of an adventure, most of the players I have spoken to recently, also go on to say that unless the pictures have some relevance to the game play, then the contents - either descriptive text and/or good puzzles - is what really matters.

Following this is usually a discussion on the attributes of the latest parser. These too seem to become more complex as time goes on, with longer and longer sentences being understood and actioned with astounding accuracy. But do you need all these wonders? Most, it seems, tend to use the least possible number of words and letters. The exception occurs when repeating a set of commands to get to a previously attained position.

Interesting ain't it? Who are we all trying to kid? Probably the only people to gain from all these parser promulgations are the programmers - you do have to admit it sounds better if you are advertising an all-singing, all-dancing program. Then there is the newcomer to adventures. It certainly provides something to look at while trying desperately to think about what to do next!

Let us know what you think. And give us some examples of what you like listed in the order of preference. Whilst thinking about it, try playing a text only adventure like The Secret of St Brides.

Back to School

St Brides is a real location and a real school. Girls pay money to stay there but it is no ordinary school. It is as though time was stopped 50 years ago. The scenario is straight out of those storybooks our parents used to read, although this adventure takes things a step further.

You play the part of a recently joined 'pupil', puzzled by the apparently total belief of all the others, that the time is 1929 and not 1986. Your self-determined quest is to find Amulet, the school's secret treasure.

The program has been around for some time for the Spectrum but has only recently been produced for the C64. It is a Quill-based game and is not easy! There is plenty of descriptive text and lots of things to find. The problem is working out what to do with them.

There are two approaches to the game - the basic one of tracking down what is going on and also an additional one to find the Amulet. If you can find it and let St Brides know, the school will award you an 'A' Level in Adventuring.

The vocabulary is fairly extensive and the problems met along the way are devious - the instructions suggest that they may all be solved by logic, inventiveness and a lot of homework. All I can say is that I must have missed some of the lessons where they explained this homework. I'm stuck!

A neat touch is the option to save a game position to either disk or tape (the program is on tape). It is not an expensive program but it will keep you frustrated for hours. Try it and see, then let me know what to do with the cat basket!

Come Home Mike Hammer

The latest detective adventure is the C64's from US Gold's All American adventure series. It's entitled Masquerade. This is a fairly middle of the road program without unusual features to make it remarkable. It is only available on disk, from which the graphics are called up each time they are needed and take about eight seconds to appear.

The pictures are clear and colourful and are in a semi-cartoon style that comes across well. There are three modes of presentation - text only, all graphics shown, and a neat variation called up by the command 'MIXED'. This will display text only but a null RETURN tips the display into all graphics until the next null RETURN.

You play the part of a private-eye on the trail of a Mr Big in the crime world. The accent is on observation and you must not expect to see everything immediately at first glance. Various messages and descriptions are not repeated so have your notebook handy!

There is a time element to your play, as the initial locations will explode into thin air, 75 minutes (not real time) after you start out on your investigations. This could be crucial as you must intercept a telephone message before this happens!

The command interpreter is the basic VERB/NOUN input and the vocabulary does not appear to be very large. The first five letters of many commands must be given for them to be actioned. This is very important since the response to anything it does not recognise is 'SORRY CAN'T DO THAT RIGHT NOW'. Fortunately, this does not apply to direction commands (N,S,E,W) and things like inventory (I) and look (L).

The general style is reminiscent of Mindshadow (which is now available on cassette) but does not have quite the same polish exhibited by Activision's game. It should prove an ample challenge to the detective brigade and although not excessively difficult, is probably not to be recommended to the novice adventurer.
Diabolical

I always knew that I had a strong tendency towards the more active type of adventure games - Halls of Death, The Valley, Exodus: Ultima III and more recently the reconstituted Temple of Apsahl Trilogies - but I never thought that I would suffer a program that crashed so many times that I lost count.

I just browsing through the shelves of a software emporium not too far from home base, I came across Telegard produced by Eclipse Software for The Avalon Hill Games Company. I thought I remembered seeing this advertised in some American magazines but could not remember it being pushed at all in this country, so, at £7.95, I gave it a try.

There have been many attempts to reproduce Dungeons and Dragons style games on computers. Some have been reasonably successful, some have been pretty ghastly. Telegard, I find fairly addictive, but it is true to the main aim of a D & D type of scenario.

Telegard is a graphics adventure in which the main aim is to gain experience and find treasure whilst fighting off all the nasties that hinder your progress. The graphics are reasonable and the tension mounts from the first few moves to the last moments of life.

You start at the bottom of stairs that lead up to a congenial inn. So far so good. All around you is a maze of passages. These you must explore to find treasure, gems, gold, silver, even refuge! You start out with sword, shield and armour, all of a pretty mediocre brand, because if you search diligently you can find better quality items, indicated by such as "A47 SWORD''!

All of this is very much par for the D & D course, even the opening determination of your characteristics is very sensible. You see a series of random numbers allocated for your character's attributes - strength, intelligence, wisdom, constitution, dexterity and charisma.

These series of numbers will continually be updated until you press 'RETURN' to signify your acceptance of the present batch. This may sound as though you can cheat to get the character you want, but in practice, all this means is that you can 'fly' the result by concentrating on one or two characteristics - you are not likely to see an 'all 18's' series very often! You may also choose your character's name.

The instruction booklet firmly recommends that you choose a character with a sound constitution! Heed the advice well, it's based on knowledge of the game. A character's 'hit points' are initially equal to its constitution. As these are whittled away each time you are hit by a monster, the larger the starting value the better.

Lost 'hit points' may be regained by a restful night's zizz at an inn. Unfortu-
artefacts found have 'plus' factors. Careful that you... or inadvertently press 'RETURN' to pick up an item which has a smaller 'plus' factor than the one you already have. Its very easy to do in the heat of the moment! Sadly, you will have lost the one you were carrying.

I have found items up to 'plus 8' but I suspect that there are more powerful creations deeper down. One of the most useful (thus far) is 'Rune of Regeneration', which speeds the recovery of your hit points by its 'plus factor' with each step you take, a definite necessity for exploration below level two.

There are also the useful 'Scrolls of Rescue' - you may pick up several of these. Using one will take you back to your original place of entry to Telengard (under that hill), but there is a cost, any gold you have with you is lost on the way. This is sometimes a fair price to pay if you have been teleported to an unknown corner of the underworld.

Characters may be saved on a separate cassette and I would recommend doing this immediately you enter the game - especially if you have taken any time in trying to get the character's attributes to your liking.

The instruction booklet bumbles on about being able to load dead characters if their name begins with 'SV' - I think this must be a throw back to a disk based predecessor, as I died with monotonous regularity and had no trouble time, shifting my character to a 'save' before he died.

I hope I have whetted a few appetites of the more adventurous amongst you now with what has gone before perhaps now is the time to look at the other side of Telengard.

For a start, it cannot be in the true spirit of the dedicated D & D game. Why? Because I do not think you could stay alive long enough to get anywhere without 'saving' your character to tape at very frequent intervals. I was prepared to accept this as part of the 'overall battle', others may not be so sanguine about it.

There are other problems you have to overcome too. And not part of the game either! I have never had a program crash so often before. It loaded perfectly and within the first few moments crashed with a SYNTAX ERROR IN LINE XXX. Sometimes RUN gone it going again, only to crash once more with a syntax error in a different line!

Once past the first few minutes, things were OK until I saved a character. Most times this went perfectly but there were many occasions when the program crashed after a successful 'save' and the main program had to be loaded from scratch (about four minutes).

The program as you must have guessed from the above is written in Basic and of course is a little slow to re-draw your character's surroundings as you move location. But it is not that slow, if it was, I do not think I could have become so involved. In this day and age it is surprising that the present version was not compiled. On my machine just ask - who knows?

Neither does the keyboard buffer get cleared, so you have to watch that you do not type in ahead of yourself or you will find you have not picked up that '8 Armour'!

For all these genuine criticisms, I have to admit I enjoyed the game enormously, quite addictive in fact, and that's something, for someone who plays as many adventures as I do. But then I'm a simple barbarian at heart.

I do not think that Eclipse Software still exists - it was an 'imprint' for Longmans (the publishers) but the program is still for sale. The cost is not high, so if you are a frustrated 'dungeon dweller' why not have a try - I really would like to hear what you think of it.

If you cannot find it in your local shops you can get it direct from: Customer Services Dept., Longmans Group Ltd., 4th Avenue, Pinners, Harrow, Essex CM19 5AA. The price is £7.95 plus 75p post and packing. Mine may have been a rogue copy, but if yours comes in a box just consider it as part of the adventure, and please do not complain - you have been warned!

Adventures

- New MEGAUTILITY Disk V.4.0
- MEGAUTILITY Disk V.4.0
- MEGATAPE Super Value
- 56 Disks at Low, Low Prices
- We take a bite out of Disk Prices!
This program allows the user to produce neat inlay cards for cassette tape boxes for music tapes or computer data tapes using a Commodore 1520 Printer/Plotter. It uses many of the features of the 1520 including the four character sizes, four colours, and vertical text for the spine of the inlay.

The program requests input of the tape number, a title for the tape and for each side, and the option to list up to 10 items on the index of each side of the tape. If any input is made incorrectly, then pressing RETURN on its own at the next input will cause a jump back to the previous prompt. The plotter will then produce the required inlay card.

The plotter draws an outline for cutting out and folding the card. The tape number and title are then printed, followed by the title and index for each side. The tape number and title are then printed on the spine. The character size is set automatically depending on the length of the titles required. Finally, the tape title and side titles are printed on the back flap (though if the tape title and side titles are the same, then only one will appear). On completion of the card, the option to print another is given.

Control characters in the text are detailed in preceding REM statements, but these REM statements need not be typed in.

---

**TAPE 67**

**CLASSICAL PIECES**

1 - BEETHOVEN

2 - BACH

---

**TAPE 26**

**YOUR COMMODORE PROGRAMS**

1 - UTILITIES

2 - GAMES

---

**PROGRAM: INLAY MAKER**

10 REM ** TAPE INLAY MAKER

20 REM ** BY IAIN MURRAY

(C) 1986 ***

30 REM ** FOR YOUR COMMODORE

E ***

50 POKE 53280,61553281,6

60 PRINT "CLEAR, WRITE, BOWNS, RIGHT13, RYGBN, SPACE, INLAY MAKER, SPACE, OFF.

70 PRINT "DOWNSTAIRS TAPE NUMBER: \*

80 TN=** : INPUT TN

90 IF TN>99 THEN PRINT "TAPE NUMBER TOO BIG!": GOTO 70

100 PRINT "DOWNSTAIRS TAPE NUMBER:\*

110 NL=2: IF LEN(TN)>2 THEN NL=1
Stuart Cooke puts Ariolasoft's

Homepak to work.

IF, LIKE ME, YOU USE A COMPUTER FOR a lot of your work it is very important that it gives quick access to everything that you wish to do. For example you may do a lot of wordprocessing and require access to a database or a spreadsheet occasionally. No problem, I hear you say, buy one of each program. This is a great idea, but one major thing is being forgotten, time.

The C64 and its disk drive are not exactly well known for their speed, in fact most people moan about the lack of it. A typical wordprocessor will take about five minutes to load, a database around the same. Now the problem becomes apparent. If you need to do a lot of swapping between programs then a lot of time is wasted loading them all in, defeating the whole point of having a computer around in the first place. Why use a database when a card index box is a lot quicker?

Obviously, if all of the programs that you require are available on one disk, a lot of time can be saved in exchanging disks etc. This is exactly what Ariolasoft has done with one of its latest releases, Homepak. A wordprocessor, database, and communications program are all available on one disk.

It is also possible to go one step further. Wouldn't it be great if all of the programs that you needed to use regularly could all be in the computer's memory at the same time? Press a couple of keys and the program needed would burst into life ready to obey your every command. Team-Mate, a program that looks extremely similar to the 3+1 software that is found on a Plus/4, offers just this facility. With Team-Mate up to three programs can be in memory at any one time. The programs are a Wordprocessor, a Database and a Spreadsheet. As an added bonus a graphics package, for drawing graphs, pie charts etc. is also present on the software disk.

Homepak

As previously mentioned this suite of programs goes some way to solving some of the speed problems of the C64 as all of the programs are on one disk. However they are all quite slow in loading and a great deal of disk swapping is necessary if you need to use the other programs.

Each of the available programs are extremely well presented and easy to use - the 61 page manual makes sure of that - and have facilities that you would probably only expect to see on individual pieces of software costing as much as this complete package.

The manual, even though it is very good, can only be described as microscopic. It has been reduced so that it will fit inside the standard disk box that the programs come in. Get a magnifying glass if you are going to be reading a lot of it at once, you'll probably need it.

Each of the programs are dealt with in turn. Screen shots are used to give you a general idea of what you should see on the screen when certain menus are accessed. And a handy crib sheet at the end of each program's documentation gives a handy reminder of the keys needed to operate the software. I must admit that I fail to see the relevance of a very large section of the manual (seven pages) being given over to an explanation of how to use the telecommunications software with Compuserve and the Commodore Information Service, these are American software services. Come on Ariolasoft, you've gone to the trouble of printing your name on the front of the manual, why not alter the last section so that it refers to a British system such as one of the many bulletin boards available or even Telecom Gold. I wouldn't have thought that too many people would be phoning America so that they can follow your instructions.

Hometext - yes you've guessed it - the wordprocessor, has some extremely interesting features. All of the available commands are selected from 'pull down menus' that are controlled by the function keys. This means that when you press the relevant key a menu, for example the printer format menu, will appear on the screen on top of your text, replacing the text underneath when you have finished using the menu. This is great as you never have to memorise any of the commands, such as those for headers or setting margins, as they can all be called up on screen. There is one slight gripe here however. A reminder could have been put on the editing screen so that you
could see at a glance what function key brought up which menu, it's frustrating to go through them all every time you want to do something. I suppose if you were really bothered you could always stick a bit of paper over your function keys.

When you have finished typing your latest novel you can have a look at what the page layout looks like with the view function. This 'draws a picture' of every page with each letter being represented by a dot. This does come in very useful when things need to be positioned correctly, it may even help you to spot your mistakes in the layout.

Of course all of the normal printer facilities such as underlining and spacing are catered for, though headers and footers are dealt with in a strange way. Not only do you have to tell Hometext where a heading starts you must also tell it where the heading finishes. This means that it is possible to have headers that run over more than one line of the paper when printed. I must admit this did leave me a little confused at first as I didn’t tell the program where my header finished the first time that I tried to use this function. The view option showed that something was amiss and I was able to correct the problem before I sent the document to the printer, I told you that view was handy.

Homefind - the database - is a little strange. In case you have never used a database I should explain how you would normally use one. Your computer is treated as an electronic card index box. You would set up a series of fields into which you should enter information. You can then ask the computer to find specific information from what it has stored on disk. An example of a layout for a database may be:

**NAME**

**ADDRESS**

**TELEPHONE**

You can no doubt see where the similarity to the old card-index comes in. Well, Homefind is totally different. Yes, it is still used for information storage and retrieval but there is no fixed format as to what can be entered into the system. For example a few entries to the database may be:

Fred's Birthday is August 23rd
Jim's Birthday is June 5th
Fred's Address is 123 Main Street

As you can see you almost talk to the computer, and any information can be stored. Once the information has been stored you can ask questions such as:

What's Fred's Address?

And the answer will appear as if by magic.

There is no provision within the program to get printouts of specific information though it is possible to keep a printed copy of any conversations that you have with the computer. And of course information can be stored on disk for later inclusion in the wordprocessor.

Personally, I find this structure for a database very restricting. I can't see any way that you could use the program to run a mailing list or store information about a record collection. Even so the program is very clever and great fun to use. No doubt many people will love the 'friendliness' of the program and use it for just those things that I said I couldn't see a way of doing.

One handy facility that the program has is that of Macros. It is possible to set up a file that holds information such as your name, and your password. These macros can then be used to send the information required to the computer saving you a lot of typing if you access a particular system a lot.

Not much more can be said about these packages. They are all very good and would be worth a look at if the asking price was just for one of them. As I have said I found Homefind a little limiting but no doubt others will love it. All of the programs are well presented and easy to use. If you need any of the programs then the package is well worth the price even though some of the ‘polish‘ may be missing that its more expensive, individual program, competitors have.

**All in one**

The other package mentioned is TeamMate. What makes this program stand out from the rest is the fact that it is possible to have all of the programs in memory at any one time. Obviously, this means that you are limited to how much space is available at once for a specific task. Team-Mate gets around this in a very clever way. It allows you to choose, upon loading the software, exactly what you want in memory. Below is the menu presented when you load the software:

(1) Desktop (3prgs)
(2) Plus Graph (1prg)
(3) Write File (2prgs)
(4) Home Office (2prgs)
(5) Utilities
Dealing with each option in turn. Desktop comprises a Wordprocessor, Spread sheet and file manager (database) all of which are loaded into memory at the same time and very easy to switch between.

Plus Graph is a stand alone business graphics program that is used to display information from either the spreadsheet or entered by hand.

Write file comprises of the wordprocessor and the file manager both now with a help facility.

Home Office is Wordprocessor plus help and a spreadsheet plus help.

Utilities are such things as 'Format Disk' and 'Rename File'.

As can be seen from the above breakdown quite a number of differing tastes are catered for. My personal favourite is Writefile. This allows me to have a database at my fingertips with information such as company addresses and telephone numbers, and access to a fairly decent wordprocessor at the same time. Up until now the only that this has been possible was to have two C64s on my desk.

hit the streets. Granted that the software does have its limitations but in my eyes these are more than adequately overcome due to the software's convenience.

As with the Plus/4 only 99 lines of text can be entered into the wordprocessor. This doesn't sound too many but when you realise that a line is 80 characters a quick calculation will show that around 1000 words can be entered before you run out of room. This is more than enough for the small office. All of the usual commands are present in the wordprocessor, such as line spacing and margins. There are however some notable omissions, such as the lack of headers and footers. An interesting way of overcoming this problem is given in the manual, but more of this later.

Obviously the wordprocessor is not as sophisticated as many of its competitors. There are no fancy menus or icons in this program. Don't forget that you do have the Help function in the expanded versions which soon solves this problem. It is remarkably easy to transfer data from both the spreadsheet and database into the wordprocessor. In fact the only way to print information from the database is via the wordprocessor. It is even possible to select certain fields for printing, this makes the program very good for addressing letters or printing labels. It is this facility that allows you to add headers to articles. Simply leave room at the top of every page for the header when you print your text. Then set up your header as a database file, then put your paper back in the printer and tell the program to print the information in the database at the top of every piece of paper, clever huh!

As with Homepak a preview function is also available within the wordprocessor (this function is not present in Desktop) this prints out the text to the screen as it will appear on the printer. The 40 columns of the spreadsheet are a window over the larger 80 columns of the text.

The database or file manager is more of what I would call a record keeping program. Before you use the program you must set up a specific format for all entries, such as the one given earlier in this article. Information is then entered as requested by the program and stored on a disk for retrieval at a later date. Again no fancy icons or prompts in this program and it is a little awkward to use in places. But it does its job and is very handy.

Commands available allow the user to move to specified records, search for a specific piece of information, review records, update records and even copy records. It is possible to sort records using a specified field, it is even possible to do a sort on disk with up to three fields.

The expanded file manager, available from write file but without the wordprocessor present, offers even more facilities for the more advanced user. Examples of added commands are 'makekeyfield' and 'showkey' which make a specified field the main field in a record, speeding up all searching and sorting and print the contents of the key field respectively.

The Spreadsheet is not exceptionally large, 50 rows by 17 columns. This means that it is not suitable for use in a large business but is great for working out budgets or totalling expenses. Don't forget you can even get the wordprocessor to print out a letter taking information from the spreadsheet making printing bills very easy. In fact one very nice touch is the ability to have half of the screen displaying the contents of the wordprocessor and the other half the spreadsheet. This makes it very easy for you to see exactly what you are doing.

The manual for the suite of programs is written in such a way that even a beginner could get started without too much difficulty. All aspects of the programs are dealt with via lots of examples, for instance the section on the spreadsheet shows you how you could set up a budget sheet showing all the money that you have spent or saved.

Team-mate can only be described as a program that a lot of C64 owners have been waiting for. OK, so it has its limitations but there are ways to get around these. The fact that the programs you are going to need can be loaded into memory just the once and that data can be stored on one disk is superb. Load in the programs in the morning and that's it. Everything is at your finger tips. Now I've started using the programs I wouldn't be without them.
HAVING WATCHED COUNTLESS episodes of Star Trek, I always thought that Captain Kirk had things very easy commanding a space ship. Especially if you have a reliable crew to carry out your every order quickly and efficiently. Psi 5 Trading Co., from U.S.Gold seemed to be just the game I needed to prove my point. All I had to do was to select a suitable crew to enable me to deliver a cargo to some remote outpost of the universe and collect a handsome bonus. One hour into the game and I was a total wreck. My crew were tearing their hair out in despair and countermanding my orders, looters were stealing my cargo willy-nilly and I no longer knew whether I was coming or going.

Your first decisions are involved with crew selection and the success of your mission could well be put into jeopardy straight away if you get it wrong. There are five positions to be filled in the scanning, weapons, navigation, engineering and repair departments with six candidates for each job. A screen illustrating the candidates is displayed - they may be humanoids, alien robots or droids and you can call up details of each applicant before making your selection. From these resumes, you can learn about a character's qualifications, education, experience, strengths and weaknesses. For example, you may learn that whilst someone knows their job inside out, they fall to pieces under pressure, whilst a rival might be a loner and a poor communicator but won't bat an eyelid when the ship is under heavy attack.

Having agonised over your recruitment, it is on to the mission itself. The screen depicts your communication console with your current view displayed top left and the applicable crew member situated right. The bottom half of the screen gives various status reports whilst the central bars contain assorted indicators for you to monitor and a menu of your current choices.

Your initial menu allows you to read all the pending messages or contact a specific department. If you don't keep in touch with sections regularly, they will go off and do their own thing. Most of your decisions involve what the Americans call prioritizing. By laying out which orders take precedence. In the previous section it is more important to get the ship travelling at full speed or should you divert some power into defensive shields? Which items should be repaired first? Evidently, the department thinks that they should have priority. As things get worse, so the animated pictures of the crew show their feelings - totally laid back or giberpering. To give some idea of what you have to control, there is a quick look at the five departments and their various tasks.

The scanning department is in charge of the radars and will try and identify and track other spacecraft. In time, they can determine whether a craft is friend or foe, lock on to it and recommend which weapon is best to use against it.

Once an enemy has been identified, the weapons section can attack it with missiles, blasters, cannons and thermotes. By analysing various indicators, you can assess how efficient your crew is with each weapon type.

The navigation section will estimate the time of arrival at your destination and show you the risk involved with various routes. You can change speed and take evasive action if necessary.

All sections of the ship have various power requirements and allocating that power is the responsibility of the engineering department. It will take some time before your ship suffers damage and it is necessary to request the services of the repair section. Items can be operable (at a higher power cost), repairable or destroyed. There are several droids at your disposal and you will need to decide what needs to be done, who's available to do it and how long it will take.

Control of the game can be achieved via either joystick or keyboard. The game is very simple yet it is the decisions that are difficult. There is so much going on that it will take some considerable time to get to the hang of things. Graphically, the game is stunning so you can always sit back and watch as your ship is destroyed around you. A highly original and thoroughly excellent game.

G.R.H.

Tom Thumb
Aniorg C-16, Plus/4

You, taking on the part of that childhood hero Tom Thumb, have entered the tomb of the Pharaoh Manilo in order to find the treasure that was buried with him.

Evidently you know where the treasure is, at least the instructions say that you do, but in order to gain access to the treasure you must collect a number of keys that are scattered around no fewer than 178 screens. Yes, that's right, somehow Aniorg has managed to get a 178 different screens into the C-16.

You would expect that the screens would be very small in order to fit so many into the game. Well, they aren't.

Tom always stays in the same position on the screen. Whenever he moves around it is the background that scrolls bringing new sections of the playing area into view. An excellent bit of programming when you consider how simple many C-16 & Plus/4 games are.

Tom's journey around the tomb is hindered by all sorts of nasties. There are guards moving their spears up and down which Tom must jump over - just like the arcade game. There are monsters - spiders, snakes and collapsing floors. Tom certainly has his work cut out, even the flowers and plants scattered around are out to get him.

If you fancy a little adventuring then why not buy a copy and give Tom a hand.

S.C.
by weird looking bug-eyed monsters whose immaterial qualities allow them to pass through rock and appear when you are least expecting it.

You, a lone astronaut, are armed only with a pathetic laser gun which luckily has an inexhaustible power supply. Glares of music pings in your ears as you boost yourself through the maze of caves with the aid of your trusty jet pack.

Suddenly, you hit a laser force field and death comes quickly as your whole body is pulverised and you disappear in a puff of sulphurous bubbles.

Then comes the tedious bit. Since you are a normal human being, you possess only one life and must wait for the Game Over screen. To conclude several dissonant bars of music before you can send another unfortunate spacer to certain death.

The green force fields aren't too bad since they disappear every few seconds and you can nip through. Apparently there is away to deactivate the blue and purple ones but I never lived long enough to find out how to do it.

This is definitely one of Mastertronic's better offerings. Spend £1.99 and die as many times as you like.

M.C.

MUGSY'S REVENGE
Melbourne House C64

Mugsy file in the sleepy blue glow of the monitor. Colours flashed and I was transported back to the heady, dry days of 1917. As Mugsy blinked under the unaccustomed daylight outside the slammer, the Feds were clamping down on liquor. Through half-closed eyes the Boss dreamed of empire as my spirit slipped easily into his mind.

First we got the boys together and made a deal with the Canadian hoods across the Parallel. All the gin joints had been driven underground like warms in a drought and easy pickings were the harvest. All we needed were the booze, the speakeasies, the dames and the dough.

New Year brings resolutions, mine is to kick the rotgut for the duration and show a profit. I've hired the Pixel Brothers to record the high points in full colour. They even came up with a slick cartoon of 'Chalk' McCutagh getting his card marked down the Food Hall. I'll show it each New Year as a warning to any other creeps till they get bored with the message. Life is still as dull as the shine on felt spats. Even the shoot-outs are rituals of emptiness. Everything is the greyness behind a rainbow, a pig in a poke.

J.G.

BONGO
Anirogl C-16, Plus/4

As the night closed in, my hands tumbled with the black as a Mickey Finn dream. Cellophane and loaded the damsel can be rescued Bongo must collect 10 sparkling jewels (flashing dots) from around the screen.

Travel around the playing area is via a number of slides, chutes, ladders and teleportation chambers. Of course, movement around the platforms isn't easy as the ever-present boggle is out to stop you.

As well as collecting the jewels, Bongo can also get himself extra points by gathering the letters that are floating around the screen.

Ok, so there's nothing original so far. Even so the game has some interesting aspects. For a start all of the characters are extremely large and well defined, the colour facilities of the C-16 and Plus/4 being used to their full. This certainly makes a change from being chased around a screen by a single colour, one-character-high monster.

Secondly, Bongo comes complete with a built-in screen designer. Once you get fed up of running around the screens provided you have the option of designing your own.

Well done, Anirogl! A program that all games-playing C-16 and Plus/4 owners should not be without.

S.C.
CLOSER GUARDED COPYRIGHTS had to be skirted around in the production of this game, based around television's most successful science fiction series. The BBC seem pleased to be associated with the product but I suspect that the series creator decided that it was against the national interest to part with Micropower. No doubt royalty fees lie at the heart of this situation.

The result is reflected in the appearance of, dare I say it, Dalek-like creatures called Controllers who guard the TIRU machine which the Doctor must disable before the fabric of the time-space continuum is torn to shreds.

The TIRU (Tiny Instant Replay Unit) is a temporal editing suite. An instant in time can be recorded, edited and replaced for good or evil purposes by the use of this machine. It is therefore the real time equivalent of our humble VHS video system. The source of its power lies in a pod of Heatonite crystal which is only found in sufficient quantity on the planet Rijar. For obvious reasons this is where the TIRU has been built and it is now controlled by the Doctor's arch-enemy, the Master.

The pre-publicity claims that the game starts with the familiar Dr Who theme. Well, if this is true then I'm a toreador. Maybe, there were more copyright problems but judging by the voicing of the existing tune it appears that we haven't missed much. I strongly advise you play this game with the volume turned off.

The good old Police Box Tardis gradually materialises at the start of the game and out pops the Doctor and his new assistant Splinx, the robotic cat.

This white feline is an amazing invention of the Time Lords and it can wander at will through the ensuing unobserved by all except the Doctor. It is a secret weapon in every sense of the word and it is hoped will be impossible for the good Doctor to complete his mission to destroy the TIRU and recover the plans.

Splinx can be programmed to perform a range of tasks as long as it does not involve climbing! Whether it suffers from vertigo or not is not explained but the only way to persuade it to go up a ladder is to force the Doctor to carry it. It is nonetheless a very useful beast which can be sent to recover any item which is near one of the markers which the Doctor can throw around the place.

It is not long before Splinx's assistance is necessary. After a short exploratory walk around the Heatonite mine a dinosaurs-like creature, a Madrag, will be encountered. Normally this will be in the first form of Madrag eggs which hatch spontaneously as soon as a suitable food source comes near. Guess Who is suitable!

The eggs are also jealously guarded by mother Madrag and this is a useful key to the solution of the first forms of Madrag problems which must be faced.

The documentation with the game is superb, an area in which Micropower usually excels. Apart from the usual loading and playing instructions the pack also includes a sealed solution to the Madrag problem, a detailed breakdown of the main elements of the game, a map of part of the mining complex and a printout of the key or objects encountered in the game. The final card in the pack is vital because it gives the code used to recover the memory capsule containing the TIRU plans. By far the greatest challenge is an encounter with a controller. They are fast and persistent in their pursuit of an enemy. As long as they can see which way you went they will give chase. Fortunately, they cannot climb ladders or move off the grid floor which supplied their power.

The Doctor regenerates each time he is killed. This means that he returns to the TARDIS or the last Cryogenic Sleep Chamber (CSC) that he passed. All of the objects which have been found and tucked away in his copious pockets will be retained but he will always have to relocate Splinx. The CSC have a second, important purpose. By standing next to one of these the game can be saved until another day.

Graphically, the game is quite pleasant, the casual lope of the Doctor is particularly impressive and even the shielding is difficult but logical and, apart from the nagging music, I wholeheartedly recommend this game.

J.G.
The fire button moves the cursor around the eligible receivers starting with the one that you previously designated. As your finger is removed from the button, so the ball is thrown and the receiver comes under joystick control. He must then move to where he thinks the ball is going to land as he endeavours to catch it.

Instead of passing the ball, the offense may try to kick it, either attempting to score a field goal or simply punting to relieve their lines. Keeping the fire button pressed brings up a power scale showing the percentage of the maximum kick currently chosen. It is tempting to go for full range every time but this is wrong as the accuracy of a kick decreases with power.

The defense is somewhat more complicated to organise. Apart from choosing your initial formation from 3-4-4, 4-3-4, 4-2-5 and 7-1-3, you must also decide who is going to mark whom, which players are going to go for the opponent holding the ball and which offensive players will remain unmarked. Again, you can decide which player you wish to control in the ensuing move (number 73 'William. The Fridge' Perry is likely to be a popular choice).

Superbowl is the best American Football game seen to date. Based on this January's game in which the Chicago Bears thrashed the New England Patriots 46-10, it is an extremely credible situation. Devotees of the game need look no further. For people who know absolutely nothing about the game, why not try your hand before the new season starts on Channel 4.

G.R.H.
ARCHON II: ADEPT
Ariolasoft
£12.95, joystick required, C64

ARCHON WAS ONE OF THE most original strategy games ever written, justifiably winning several awards. Now Electronic Arts has released a sequel on the Ariolasoft label. Archon II, Adept sees you taking sides in an epic struggle between the Master of Order and the Mistress of Chaos in a game featuring both strategy and arcade elements.

The strategy takes place on a screen featuring the four concentric rings representing the classical elements of Earth, Water, Air and Fire. In addition, there are two neutral squares which represent the void and the home squares for each side – the Fortress of Order and the Temple of Chaos.

The aim of the game is to occupy six power points. Two of these are the void squares and the other four are the outer corners of the elemental bands. These four rotate in turn from band to band. You can also win by the total annihilation of the opposition’s forces.

You start the game with four adepts – one in each element. Each turn, they can either move or cast a spell providing that you have sufficient energy to carry out your choice. There are seven spells to choose from but the one that you will use more than any other is “summon”. This is used to bring another piece on the board.

The other spells available to you are; heal one of your pieces, weaken an opponent’s piece, imprison an enemy, release one of your imprisoned pieces, banish a hostile enemy or something called apocalypse which is a final battle used to put your adversary out of his misery. Casting spells costs varying amounts of energy depending on its potency. How much energy you have at your disposal depends on how many power points you occupy.

There are two types of pieces that can be summoned, demons and elementals. Both sides have the same demons at their disposal – juggernauts, warthogs, gorgons and chimerae whilst their elementals are different. Order can call on the services of a giant, kraken, thunderbird and salamander, representing earth, water, air and fire whilst Chaos has a behemoth, siren, itrit and firebird available to him.

All these characters have different strengths and weaknesses when it comes to combat. Sirens for example just have to sing and the opposition starts to die. Salamanders hurl fireballs, gorgons paralyse whilst wraths get stronger as you get weaker – they are also invisible most of the time and so make extremely formidable opponents. Not quite as bad as a juggernaut though which is best described as pure energy on wheels. It just steamrolls opposition out of the way.

Combat occurs when two pieces want to occupy the same square. The scene switches to the battleground where you must make instant decisions as you try to probe the opposition’s weaknesses and utilise your own strengths to their best advantage. Each piece’s strength is displayed as an energy bar down the side of the screen. This reduces for each successful wound inflicted. When the bar reaches zero, the icon dies leaving the victor in sole possession of the disputed square.

As might be expected, pieces fight best when in their home element e.g. krakens in the water band. After you have fired your thunderbolt or whatever, it takes time before you are allowed to fire your next. This time interval varies from piece to piece and the computer lets you know with a ping – high or low depending on which side you’re on. The battle ground has a number of barriers which must be dodged round or used strategically. The different elements have differing effects on missiles and icons. For example, fire wounds an icon but leaves missiles untouched whilst earth destroys missiles and slows icons.

Control of the game is entirely via a joystick. Spells are selected from a menu whilst movement is achieved by moving a square shaped cursor. Moving round the combat screen is straightforward. Aiming a missile involves pressing the fire button and moving the joystick in the desired direction. Adepts can move their missiles whilst in flight – a useful trick to know.

Archon II features a wide range of options to choose from: Which side you play, number of players and their skill levels. Be warned though, the computer plays a very mean game and you are likely to be thrashed in your first few games. I would strongly recommend that you watch the demonstration games a few times so that you can get some idea of the strategies and tactics required.

Archon II is an excellent strategy game and one that will take you a lifetime to master – then you can play with the other side and learn a totally new set of tactics. Whilst it doesn’t quite reach the exalted standards set by the original, that is no real criticism and the game can be unreservedly recommended.

G.R.H.
THE FINAL CARTRIDGE
THE FIRST OUTSIDE OPERATING SYSTEM FOR THE CBM 64 *

This new operating system built in a cartridge does not use any memory and is always there. Compatible with 98% of all programs.

DISK TURBO - 6 times faster loading & 6 times faster saving.

TAPE TURBO - 10 times faster, even with files - normal Commodore commands - compatible with standard turbo's.

ADVANCED CENTRONICS INTERFACE - compatible with all the well-known centronics printers and Commodore printer programs. Prints all Commodore graphics and control codes (important for listings).

SCREEN DUMP FACILITIES - of lowers Hi-res and multicolour screens!! Prints full page with 12 shades of grey for multicolour pictures even from games and programs like Doodle, Koala pad, Printshop etc. Searches automatically for the memory-address of the Picture. Special version available for the CBM 801 and 803 printers.

24K EXTRA RAM FOR BASIC PROGRAMS AVAILABLE: Two new commands "Memory read", "Memory write". They move 192 bytes with machine-language-speed anywhere in the 64K Ram of the CBM 64. Can be used with strings and variables.

BASIC 4.0 COMMANDS - like Dload, Dsave, Dspend, Datalog, etc.

BASIC TOOLKIT - with Auto, Runem (incl. Goto and Gosub), Find, Help, Old, etc.

* works with C128 in the 64 mode.

COMFORTABLE EXTENDED ML.
MONITOR: - with relocated load, scrolling up and down. Bankswitching, etc. - does not reside in memory.

RESET SWITCH: - resets to monitor; resets with old, resets to Hi-res printing; resets every protected program.

ON/OFF SWITCH - we hope you never need that one.

FREEZER:
Stops and continues almost every program and allows you to make a total back up to disk or tape automatically.

Specs: Creates one file on disk or tape. Pucks the program. Freezes 4 to 8 times faster than dedicated freezers.

Menu driven:
Freezer options include:
full page printing
fore- and background colour changes
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jumps to monitor or reset

Training mode:
kills sprite collision detection.

14 Days money back guarantee
if you are dissatisfied.
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U.K. ORDERS Available by the well-known Commodore Dealers or directly from
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Telephone: 0376 - 51 14 71.

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IT'S THREE O'CLOCK IN THE MORNING.
You sit at the computer keyboard having
just finished a marathon typing session
entering one of the superb programs
from Your Commodore. Your fingers
reach for the keyboard and press the
letters R, U and N. You sit back
expectantly and...nothing happens.

Well, I'm sure that we have all had
problem before now. When it does
happen it's a matter of spending hours
searching through the program for any
typing mistakes. No matter how long you
look or how many people help you, you
can usually guarantee that at least one
little bug slips through unnoticed.

Here, at Your Commodore, we pride
ourselves on the quality of listing that we
print. Unfortunately, this usually means
that they are also very long, thus taking
longer to type in and leaving more room
for errors. All of the listings in Your
Commodore are taken straight from a
printout of working programs. It is
therefore very unusual for errors to
appear in the magazine.

Because of the length of our programs
we do get a large number of requests from
readers who would like us to put specific
programs on tape or disk for them. Obviouisly this is very time consuming and
means that we can't spend as much time
working on the magazine as we would
like.

We are therefore proud to announce
the start of the 'Your Commodore Software
Service'. Most of the programs from
each issue of the magazine will now be
available on a single cassette for a price of
just £4.00. We will not be making disks
available since they would have to be a lot
more expensive and more difficult to
post. This shouldn't cause you any
problems though as none of the programs
will be protected and it will be a simple
matter to save the programs to disk
yourselves.

All programs on the cassette will be
saved using a tape turbo routine. However, we cannot guarantee that all
programs will work correctly with this
turbo routine present. We therefore
recommend that before you use any of
the programs you make a copy of the
programs on your own cassette or disk
and use this version of the program not
the original.

---

**PLEASE COMPLETE IN BLOCK CAPITALS**

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All cheques/postal orders should be made payable to:-

ARGUS SPECIALIST PUBLICATIONS LTD

I would like to order the following cassettes: (please tick box)

<table>
<thead>
<tr>
<th>Cassette</th>
<th>Code</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>UTILITY SPECIAL</td>
<td>YCMA862</td>
<td>£4.00</td>
</tr>
<tr>
<td>APRIL '86</td>
<td>YCAPR86</td>
<td>£4.00</td>
</tr>
<tr>
<td>MAY '86</td>
<td>YMAY86</td>
<td>£4.00</td>
</tr>
<tr>
<td>JUNE '86</td>
<td>YCJUN86</td>
<td>£4.00</td>
</tr>
</tbody>
</table>

I enclose a cheque/postal order for £

NAME

ADDRESS

POSTCODE

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YOUR COMMODORE SOFTWARE, READERS SERVICES, ARGUS SPECIALIST PUBLICATIONS,
WOLSEY HOUSE, WOLSEY ROAD, HEMEL HEMPSTEAD, HERTFORDSHIRE HP2 4SS.

Please allow at least 28 days for delivery.
When you are designing a game one of the longest jobs is designing the sprites. If you are good at art then fine, if not your next monster will probably end up looking like a square box with legs.

Now, Your Commodore comes to the rescue once again with Sprite Ideas. If you have designed any sprites for games and you don’t mind other people seeing your masterworks then why not send them into us. Each month we will be offering £10 for the best entries.

Your sprites can be anything at all (within reason), if you’ve designed a series of animated characters then send in the lot. We’d love to have a look at them.

So, next time you are after an Ogre to put in your new game, have a look in this section of the magazine and you may find just what you are looking for.

This month’s sprites are from Aman Khan from Hayes, Middlesex.

```
5 POKE53281.0:POKE53280.0:PRINT"ICLR"':REM SETS UP SCREEN COLOURS AND clears SCREEN
10 FORA=0TO1407:READQ:POKE1288+A,A:NEXT:REM POKEs DATA INTO 12288 ONWARDS.
20 REM ONCE DATA HAS BEEN READ IN ONCE TYPE \RUN 1200\ TO RUN THE PROGRAM AGAIN
100 REM FRAME ONE...SPIRTE ONE
105 DATA0.0.10.0.3.105.0.63.213.0.253.85.3.255.117.3.255.245.15.255.245.23.255
110 DATA213.21.255.85.95.117.85.253.85.253.85.95.255.21.255.23.255.213.255
120 DATA85.1.127.85.1.125.85.0.95.214.0.21.90.0.1.108.0.3.10.0
130 REM FRAME ONE...SPIRTE TWO
135 DATA160.0.0.213.192.0.93.252.0.125.127.0.65.255.192.87.255.192.87.255.240
140 DATA85.215.252.85.95.124.87.245.127.95.253.95.255.255.87.255.252.85.255
150 DATA220.85.127.80.85.127.64.85.93.64.85.93.64.85.170.64.0.160.0.0.0
200 REM FRAME TWO...SPIRTE ONE
205 DATA0.0.10.0.1.93.0.21.85.0.255.87.3.213.85.3.211.85.15.253.85.63.245.85
```
Listings will be much easier to enter with our new system.

COMMODORE LISTINGS ARE RATHER well known for the horrible little black blobs that always abound. Unfortunately, the graphics characters which are used to represent graphic and control characters do not reproduce very well and they are also difficult to find on the Commodore keyboard.

In future all control and graphics commands will be replaced by a mnemonic within square brackets. This mnemonic is not typed out as printed in the magazine, but rather the corresponding key or keys on the keyboard are pressed. For example [RIGHT] means press the cursor right key, you do not type in [RIGHT]. All of the keywords, what keys to press and how they are shown on the screen are shown below.

Any character that is accessed by pressing shift and a letter will be printed as [Letter].

<table>
<thead>
<tr>
<th>Mnemonic</th>
<th>Symbol</th>
<th>what to press</th>
</tr>
</thead>
<tbody>
<tr>
<td>[RIGHT]</td>
<td>![Symbol]</td>
<td>left/right</td>
</tr>
<tr>
<td>[LEFT]</td>
<td>![Symbol]</td>
<td>shift left/right</td>
</tr>
<tr>
<td>[UP]</td>
<td>![Symbol]</td>
<td>Shift &amp; up</td>
</tr>
<tr>
<td>[DOWN]</td>
<td>![Symbol]</td>
<td>up/down</td>
</tr>
<tr>
<td>[F1]</td>
<td>![Symbol]</td>
<td>f1</td>
</tr>
<tr>
<td>[F2]</td>
<td>![Symbol]</td>
<td>shift &amp; f1</td>
</tr>
<tr>
<td>[F3]</td>
<td>![Symbol]</td>
<td>f3</td>
</tr>
<tr>
<td>[F4]</td>
<td>![Symbol]</td>
<td>shift &amp; f3</td>
</tr>
</tbody>
</table>

If any characters are repeated the mnemonic will be followed by a number. This number is how many times you should enter the character. Any number of spaces over one will also be represented in this form [RIGHT10] press cursor right 10 times [C+10] press Commodore and + 10 times [SPC10] Press the space bar 10 times

Any other characters should be easily recognisable for example CTRL-N means press CTRL and N and LEFT-ARROW means press the left arrow.

Any number of mnemonics can be enclosed in brackets for example [SA10,SPC10,SA10] means type 10 shift A's, 10 spaces and another 10 shift A's.

<table>
<thead>
<tr>
<th>Mnemonic</th>
<th>Symbol</th>
<th>what to press</th>
</tr>
</thead>
<tbody>
<tr>
<td>[BLACK]</td>
<td>![Symbol]</td>
<td>CTRL &amp; 1</td>
</tr>
<tr>
<td>[WHITE]</td>
<td>![Symbol]</td>
<td>CTRL &amp; 2</td>
</tr>
<tr>
<td>[RED]</td>
<td>![Symbol]</td>
<td>CTRL &amp; 3</td>
</tr>
<tr>
<td>[CYAN]</td>
<td>![Symbol]</td>
<td>CTRL &amp; 4</td>
</tr>
<tr>
<td>[PURPLE]</td>
<td>![Symbol]</td>
<td>CTRL &amp; 5</td>
</tr>
<tr>
<td>[GREEN]</td>
<td>![Symbol]</td>
<td>CTRL &amp; 6</td>
</tr>
<tr>
<td>[BLUE]</td>
<td>![Symbol]</td>
<td>CTRL &amp; 7</td>
</tr>
<tr>
<td>[YELLOW]</td>
<td>![Symbol]</td>
<td>CTRL &amp; 8</td>
</tr>
</tbody>
</table>
THE CREATOR SERIES

Now you can let your mind go in a crescendo of creativity. You may think you are unable to program, you may know nothing about computing but now YOU are able to write stunning original machine code programs. ARCADE CREATORE, the first release in the CREATOR SERIES, allows you to program your own arcade games in the language you know best - English.

If you prefer the complex mind stretching world of the strategy program, then the second in the series, BATTLE CREATORE, is for you. Using simple commands you can devise your own brain buster, without busting your own brain in the process.

For the budding musician, the third in the series, MUSIC CREATORE, helps you to compose your own melodies and rhythms.

The Argus Press Software Group Ltd
Liberty House, 222 Regent Street, London W1R 7DB
Telephone 01-439 0666
Your Commodore Reader's Survey
1. Would you please tick the box against the statement which best describes how much of Your Commodore you normally read or look through:
   - Read or look through most or nearly all the articles/features
   - Read or look through some of the articles/features
   - Just read or look through the occasional article/feature

2. With regard to the advertisements in Your Commodore, do you:
   - Read or look through most or nearly all of the advertisements?
   - Read or look through some of the advertisements?
   - Just read or look through the occasional advertisement?
   - Very rarely/never look at the advertisements?

3. Thinking specifically about the advertising content of Your Commodore, would you please rate the two main types of advertising matter - Display and Classified - in terms of usefulness (please tick one against each type):
   - Display
   - Classified
   - Very useful
   - Useful
   - Not very useful
   - Not at all useful

4. Have you ever ordered or bought equipment/products after reading an advertisement in Your Commodore?
   - Regularly
   - Occasionally
   - Never
   If the answer to Question 4 is yes, what was the last item you purchased in this way and what was its value?

5. Does anyone else read your copy of Your Commodore?
   - No
   - 1 or 2
   - 3 or 4
   - More than 4

6. Do you keep your copies of Your Commodore for:
   - One month?
   - Three months?
   - Six months?
   - A year or more?
   IF KEPT, PLEASE ANSWER THE NEXT QUESTION.

7. How often do you refer to back issues of Your Commodore?
   - Once a week or more often
   - About once a month
   - Once every three months
   - Less often
   - Never refer to back issues

8. What magazines other than Your Commodore's competitors do you read?

9. What Daily newspaper do you regularly read?
   - Daily Mail
   - Daily Express
   - Daily Mirror
   - The Sun
   - Today
   - The Guardian
   - The Times
   - The Daily Telegraph
   - Financial Times

10. What Sunday newspaper do you regularly read?
    - Sunday Times
    - Sunday Telegraph
    - The Observer
    - Sunday Express
    - Mail on Sunday
    - News of the World
    - Sunday People

11. Name the three television programmes you view most regularly.

12. Which computer(s) do you own?
    - C16
    - Plus/4
    - C64
    - C128
    - Vic 20
    - PET
    - Spectrum
    - Amstrad
    - BBC
    - Electron
    - Atari

13. Do you own one of the following disk drives?
    - 1541
    - 1551
    - 1570
    - 1571

14. Do you own any of the following printers?
    - Commodore printer
    - Epson-compatible printer
    - Other

15. Do you own any of the following peripherals?
    - Joystick
    - Lightpen
    - Mouse
    - Graphics pad

16. How long have you had a Commodore computer?
    - Less than three months
    - Three to six months
    - Seven months to one year
    - One year to two years
    - Over two years

17. Do you use your computer for the following:

<table>
<thead>
<tr>
<th>Original programmings</th>
<th>All the time</th>
<th>More than half the time</th>
<th>Sometimes</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typing in games listings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Typing in utility listings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Playing games</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educational uses</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business uses</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
21. How much do you normally spend in a 12-month period on the following types of software?

<table>
<thead>
<tr>
<th></th>
<th>Games</th>
<th>Business Software</th>
<th>Educational Software</th>
<th>Utilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>£0-£50</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>£51-£100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>£101-£200</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>£201-£300</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>£301-£500</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

22. Do software reviews influence your buying?
Yes  ☐  No  ☐

23. Do Software Charts influence your buying?
Yes  ☐  No  ☐

24. Please tick the box which best describes you:
- New reader (within the last 3 months)  ☐
- Established reader  ☐
- Occasional reader  ☐

25. Were you previously a regular reader of Your 64?
Yes  ☐  No  ☐

26. Were you previously a regular reader of Your Commodore before we incorporated Your 64? Yes  ☐  No  ☐

27. Were you previously a regular reader of BOTH Your Commodore and Your 64? Yes  ☐  No  ☐

28. Since we incorporated Your 64, do you think that Your Commodore is:
- Better  ☐
- Same  ☐
- Worse  ☐

29. What do you think about the balance of articles in Your Commodore?
- More  ☐
- Right  ☐
- Less  ☐

30. Which listings do you type in?
- Games  ☐
- Utilities  ☐
- Some  ☐
- None  ☐

31. Which other computer magazines do you regularly buy?
- Commodore Horizons  ☐
- Commodore User  ☐
- Commodore Computing International  ☐
- Zzap 64  ☐
- Compute Your Computer  ☐
- Popular Computing Weekly  ☐
- Personal Computer World  ☐
- Other  ☐

32. Are you aware of Your Commodore's scheduled publication date?
- Yes  ☐
- No  ☐

33. If you answered yes to Question 32, do you attempt to purchase the magazine on that day?
- Yes  ☐
- No  ☐

34. Do you normally obtain your copy by:
- Casual purchase  ☐
- Newsagent home delivery  ☐
- Newsagent shop collection  ☐
- Subscription  ☐

35. If you do not obtain your copy by subscription, is it due to one of the following?
- Good availability through local newsagent  ☐
- Subscription too expensive  ☐
- Other  ☐

36. If you do not subscribe, from which type of newsagent do you most often obtain your copy?
- High Street shop  ☐
- Estate shop  ☐
- Travel Point  ☐
- Corner shop  ☐

37. Are you a member of a computer club?
- Yes  ☐
- No  ☐

38. Please tick the box which represents the annual total of your NET income (i.e. after tax, National Insurance, pension contributions, etc):
- £11690+  ☐
- £11680 to £11690  ☐
- £116680 to £11680  ☐
- £116480 to £116680  ☐
- £116280 to £116480  ☐
- £116080 to £116280  ☐
- £115880 to £116080  ☐

39. Name  ☐
- Address  ☐

PERSONAL DETAILS

Marital status  ☐
- Sex  ☐
- Age  ☐
- Occupation  ☐
- Number of children  ☐

We would like to thank you very much for your help. The information will be regarded as confidential and will be used solely for the purpose of the survey.
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Gordon Hamlett explores the complexities of US Gold's Ultima IV.

Since the menace of exodus was destroyed, Lord British is looking for someone to improve the quality of life throughout the land of Britannia. This involves finding or achieving something called Avatar about which everybody has heard and nobody appears to know anything.

How you came to be volunteered for this quest is an interesting story. Whilst walking in the countryside, you see a bright light and hear a strange noise. From then on, things get curiouser and curiouser and you are inexorably lured by some music into a gipsy caravan. There, an old woman asks you some questions based on honour, valour, justice and other virtues. Depending on your answers, your character is assessed and your profession determined. This may be one of eight types including fighter, mage, druid and ranger.

The land of Britannia is a large and varied place. There are eight major towns, each one specialising in one of the eighth professions. The people inside are friendly and you will need to talk to everyone you meet, trying to glean useful scraps of information. There are castles and villages to be explored too - if you can find them. Outside of the towns, the land is more hostile - wandering bands of orcs, rogues, trolls and two-headed ettins etc. roam the countryside intent on trying to kill you. The land itself can also be hostile - marshes give off poisonous gases that can rapidly deplete your strength although there are healers in several of the towns who will cure you - for a price.

There are dungeons to be discovered and explored, and shrines to be sought out. Travel is usually on foot although you may be able to beg, steal or borrow horses to speed up your journey. You will certainly need a ship to visit the islands, not all of which are on your map and you will have to learn how to use the moongates efficiently. There is also rumoured to be a balloon or something similar hidden away.

As you travel the land and talk to the people, you can try and persuade them to...
join your party. Up to seven others can join - one from each of the other profession types - paladin, bard, tinker and shepherd being the others. Some will only join you when you prove yourself worthy to a certain degree. Experience points are awarded for killing an enemy. Visit Lord British and he will promote you when you have gained sufficient points. Magic plays a crucial part in the game. There are 26 spells to be mastered but before you can think about casting one you need to know the ingredients and mix them in their correct proportions. There are six main ingredients that can be bought at any good herb shop but all the powerful spells require mandrake or nightshade which are not so easily come by. The spells range in power from simple ones, such as healing wounds or casting a magical light, through fireballs and assorted protections to kill and jinx - a jolly little trick that causes your opponents to attack themselves instead of you. Everybody except fighters and shepherds has some magical ability although how much depends on your job and experience level. There is a lot of fighting to be done if you are to attain your quest. Combat takes place on a variety of tactical displays and you can move, attack or cast spells for each of your characters in turn. How the battle goes depends on what weapons and armour your party owns and how you deploy your forces. The use of slings and bows, especially by the members at the back of your party is recommended. The monsters - over 20 different types - fight intelligently and will run away if hard pressed leaving behind a treasure chest, although this is frequently trapped as you try to open it.

So what of the quest itself? The first part involves attaining a partial Avatarhood in the eight virtues - honour, valour, humility, sacrifice, honesty, compassion, justice and spirituality. The seer Hawkwind keeps you informed as to your progress and should be visited frequently. At the appropriate time, you have to go and meditate at a shrine - provided that you have found the correct rune to gain you admission and have learned the appropriate mantra to chant. Only then will you be granted a vision. Apart from that, you will need to find some coloured stones - I found the red one on the eight level of Dungeon Dystard. After that, I don't know apart from the fact that there will be some final conflict in a place known only as the Abyss.

Other things to look out for are secret passages (which abound in castles and dungeons) and the guild where you will need to purchase magical keys and gems (very useful for mapping dungeons). A sextant will also be an essential purchase - if you can find someone to sell you one. Above all, you gain information and write everything down. The amount of work and expense that you have to put into gaining even the smallest clue is phenomenal.

The display is in three main boxes. A large map displays your current position (line of sight vision only). The top right hand box displays the statistics for you and your party whilst the bottom box is used for command entry and as a general information box. Everything in the game is controlled by single keystroke commands apart from conversations which usually only require a single word. The game comes beautifully packaged with two large books, a map and a reference card.

Ultima IV is a superb game and streets ahead of any of its rivals. To date, I have played it for well over 60 hours and still feel that I have only scratched the surface of it. If you only buy one game this year, make sure it's Ultima IV.

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Allen Webb explores the complexities of medium-res graphics.

Everyone rabbids on about high resolution graphics and how they can be used for brilliant effects and works of art. I am equally guilty having in the past discussed their use (January issue). For some applications, however, it may be possible to settle for a lower resolution system.

The C64, in common with most other micros, has a resident set of standard characters. Amongst these are a number which represent squares one quarter the size of a normal character. These squares can be used to plot lines or dots. Using this system you can achieve a resolution of 80 points across and 50 points up. Whilst you may not consider this too much of an idea, I recently saw two superb pictures drawn in this resolution. This emphasises that artistic ability can overcome system limitations. Remember, also, that Jeff Mintz’s excellent Psychedelia uses this sort of resolution.

The routines given here give complete control over the drawing of lines and dots and the manipulation of screen areas.

The commands have the following syntax:

1) Dots
   SYS 51712,X1,Y1,X2,Y2,MODE, COLOUR
   X1,Y1,X2,Y2 are the co-ordinates of the dot.
   MODE decides how the dot is drawn:
   0 — erases the dot
   1 — draws the dot
   2 — flips the dot i.e. sets it if it’s clear, clears it if it’s set.
   COLOUR specifies the colour of the dot. Values of zero to 15 change the colour. A value of 16 leaves the colour unaltered.

2) Lines
   SYS 51715,X1,Y1,X2,Y2,MODE, COLOUR
   X1,Y1,X2,Y2 are the co-ordinates at the ends of the lines.

3) Area manipulation
   SYS 51718,XC,YC,WI,HI,COLOUR,MODE,[CHARACTER]
   XC,YC specify the position of the top left hand corner of the area.
   HI is the width of the area.
   WI is the height of the area.
   COLOUR acts in the same way as the previous commands.
   MODE has the effects:
   0 — EOR’s the area i.e. changes it to reverse field. Repeating the command restores the area.
   1 — fills the area with the character specified.

CHARACTER is only required if MODE equals one. A syntax error is generated if it is omitted when MODE=1 or if it is added when MODE=0. The character value is the POKE value so that a value of 32 erases the area and a value of one fills the area with the letter A.

This command acts on a 40 by 25 resolution and, as before, out of range values are ignored.

I’ve included a simple demonstration which shows some ways of using these commands. The first uses shades of grey and dotted lines to give a 3D effect. The second is just pretty and uses the area command to EOR the pattern.

MODE has the following effects:
   0 — erases the line.
   1 — draws-the line.
   2 — flips the line.
   3 — draws a dotted line.

COLOUR is the same for both the dot and line commands.

Both the dot and line commands use the 80 by 50 resolution with the origin in the bottom left corner of the screen. All out of range values are ignored.

<table>
<thead>
<tr>
<th>PROGRAM: LOW RES LOADER</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000 FOR L=0 TO 54:CL=0</td>
</tr>
<tr>
<td>1 FOR D=0 TO 15:READ R</td>
</tr>
<tr>
<td>a CL=CL+POKE 51714,L+16</td>
</tr>
<tr>
<td>D:R:NEST 0</td>
</tr>
<tr>
<td>2010 READ A IF A=CX THEN PR</td>
</tr>
<tr>
<td>INTERVAL IN LINE?;</td>
</tr>
<tr>
<td>2040+([L]+10):STOP</td>
</tr>
<tr>
<td>2020 NEXT L:END</td>
</tr>
<tr>
<td>2040 DATA 76,9,202,76,99,204</td>
</tr>
<tr>
<td>76,193,204,32,12,203,141</td>
</tr>
<tr>
<td>135,3,32,169</td>
</tr>
<tr>
<td>2050 DATA 12,203,141,136,3</td>
</tr>
<tr>
<td>32,12,203,141,136,3,201,2</td>
</tr>
<tr>
<td>240,6,169,1638</td>
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<tr>
<td>2060 DATA 1,56,237,3,141</td>
</tr>
<tr>
<td>136,3,32,12,203,141,137,3</td>
</tr>
<tr>
<td>72,152,1465</td>
</tr>
<tr>
<td>2070 DATA 72,138,72,169,0</td>
</tr>
<tr>
<td>141,132,3,141,133,3,133</td>
</tr>
<tr>
<td>252,173,134,3,169</td>
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<tr>
<td>2080 DATA 133,251,201,50,144</td>
</tr>
<tr>
<td>5,76,247,202,173,135,3</td>
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<tr>
<td>201,80,144,3,2046</td>
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<tr>
<td>2090 DATA 76,247,202,169,49</td>
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<td>56,229,251,135,251,78,135</td>
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<td>3,46,133,3,2061</td>
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<td>2100 DATA 70,251,46,133,3,6</td>
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<td>251,6,251,6,251,165,251,6</td>
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<td>251,35,1985</td>
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<td>2110 DATA 252,6,251,38,252</td>
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<td>24,101,251,135,251,133</td>
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<tr>
<td>253,165,252,109,134,2607</td>
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<td>2120 DATA 2,135,252,174,133</td>
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<td>3,169,1,141,133,3,224,9</td>
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<tr>
<td>240,6,14,1628</td>
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<table>
<thead>
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<tr>
<td>2130 DATA 133,3,202,144,246</td>
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<tr>
<td>172,135,3,177,251,182,0</td>
</tr>
<tr>
<td>221,252,202,240,2843</td>
</tr>
<tr>
<td>2140 DATA 5,232,224,16,144</td>
</tr>
<tr>
<td>248,76,247,202,173,153,5</td>
</tr>
<tr>
<td>201,1,240,20,2169</td>
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<tr>
<td>2150 DATA 201,2,240,8,136,13</td>
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<tr>
<td>133,3,24,170,144,21,158</td>
</tr>
<tr>
<td>77,133,3,1448</td>
</tr>
<tr>
<td>2160 DATA 24,170,144,15,173</td>
</tr>
<tr>
<td>133,3,73,255,141,133,3</td>
</tr>
<tr>
<td>138,45,133,5,1894</td>
</tr>
<tr>
<td>2170 DATA 170,189,252,202</td>
</tr>
<tr>
<td>172,135,4,154,255,56,169</td>
</tr>
<tr>
<td>216,237,136,2,141,2476</td>
</tr>
<tr>
<td>2180 DATA 138,3,165,251,133</td>
</tr>
<tr>
<td>253,24,165,252,109,138,3</td>
</tr>
<tr>
<td>133,294,173,137,2331</td>
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<tr>
<td>2190 DATA 3,201,16,240,2,145</td>
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<tr>
<td>253,104,104,168,104,96,32</td>
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<tr>
<td>126,123,97,1814</td>
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<tr>
<td>2200 DATA 124,226,265,236</td>
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<tr>
<td>108,127,98,252,256,251</td>
</tr>
<tr>
<td>254,160,32,253,174,32,2807</td>
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<tr>
<td>2210 DATA 138,173,32,247,183</td>
</tr>
<tr>
<td>165,20,96,72,152,72,136</td>
</tr>
<tr>
<td>72,165,1,141,1871</td>
</tr>
<tr>
<td>2220 DATA 136,5,173,139,3</td>
</tr>
<tr>
<td>201,80,144,5,76,247,202</td>
</tr>
<tr>
<td>173,140,3,201,1924</td>
</tr>
<tr>
<td>2230 DATA 80,144,3,76,247</td>
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<tr>
<td>202,173,141,3,201,50,144</td>
</tr>
<tr>
<td>3,76,247,202,1923</td>
</tr>
<tr>
<td>2240 DATA 173,142,3,201,50</td>
</tr>
<tr>
<td>144,3,76,247,202,173,140</td>
</tr>
<tr>
<td>5,36,237,139,1989</td>
</tr>
<tr>
<td>2250 DATA 3,141,143,3,173</td>
</tr>
</tbody>
</table>

TO DRAW
Welcome to the Machine

Allen Webb takes you one step further in your quest to master machine code.

Last month we started to look at the various ways of moving data about. While we concentrated on the screen, the principles apply equally to movement of data anywhere. I hope you found the homework easy. With the material we covered last time, you should be able to come up with two or three solutions to each problem.

First, I wanted a routine to put a row of stars along the top of the screen. Here is one solution:

10 ASSEMBLE 100,1
100 REM **=5C00
110 REM LDA $19
120 REM JSR $FDF2
130 REM LDY #0
140 REM LDA $42
150 REM .LOOP: JSR $FDF2
160 REM INY
170 REM BNE .LOOP
180 REM RTS
190 REM J

This uses the print character routine in ROM to print asterisks to the screen at the current cursor position. Lines 110 and 120 print HOME (CHR$19). I used this method since there is no need to worry about updating the colour matrix. Those of you with old ROM 64s will have noticed that when you set the cursor colour, the colour matrix is not updated. That means that if you move data direct to the screen memory, you will not necessarily get the colours you want. New ROM 64s have had this fixed.

The second problem asked you to print the character set on the screen. Here is my solution:

10 ASSEMBLE 100,1
100 REM **=5C00
110 REM LDY #0
120 REM .LOOP: TYA
130 REM STA $0400, Y
140 REM LDA $13
150 REM STA $0800, Y
160 REM INY
170 REM BNE .LOOP
180 REM RTS
190 REM J

In this routine, I have used simple indexing to put characters at the start of the screen memory. Since I don't want to change the address indexed, indirect indexing is unnecessary. There are 256 characters with POKE values ranging from zero to 255. I use this fact in line 120 by using the Y register to update the character to be POKEd. Lines 140 and 150 take care of the colour matrix for old ROM routines. The Basic equivalent to this routine is:

10 FOR I = 0 TO 255
20 POKE 1024+I, I
30 POKE 55296, I
40 NEXT I

Line 170 acts in a slightly different way to the looping we've used previously, but I'll cover that shortly.

There is one more addressing mode which you should be aware of. This is an infrequently used mode called Pre-Indexed Indirect Addressing. This mode uses the X register to look for an address in a table and act on the address. The mnemonic for this mode has the form:

ADDRESS

where address is a zero page location. Here are some examples:

100 REM LDA ($FB,X)
110 REM STA ($AA,X)

Its operation takes a little understanding, but here is what it does. Imagine that you have a table of 16 bit addresses stored as a table in zero page starting at $AA.

$AA low byte address 1
$AB high byte address 1
$AC low byte address 2
$AD high byte address 2
$AE low byte address 3
$AF high byte address 3

and so on...

If X contains the value zero, the instruction LDA ($AA,X) does the following:

1) Adds the contents of X (i.e. zero) to the address $AA to give $AA
2) the accumulator is loaded by the contents of the address held in the resulting byte pair

$AA and $AB

Similarly, if X contains two, then the accumulator will be loaded with the contents of the address pointed at by $B$, $A$, $S$, $A$. This is not an addressing mode that you will use often, but it's worth knowing about, in case you have a need for it one day.

Last month, I introduced the use of conditional branching. At that time, it was simply to allow us to make progress and I made no attempt to discuss it at length. It is now necessary to look at it in some depth.

In the microprocessor is a register called the Status Register. This eight bit register is used to hold seven flags, each using one bit. The flags held are as follows:

1) The Carry Flag (C)
This flag is used to carry information on which arithmetic operations are performed. If, for example, two numbers are added to give a result greater than 256, the carry flag is set so that you can take appropriate action. We'll discuss this when I deal with 16 bit arithmetic.

2) The Overflow Flag (V)
Only the first seven bits are used for holding data. the eighth being a sign bit. Hence only numbers in the range +127 to -127 are used. If an operation attempts to store greater than +127, then the overflow flag is set. Again, we'll discuss at a later date.

3) The Negative Flag (N)
This is set if an operation results in a negative answer.

4) The Decimal Flag (D)
This is set if you wish to work in the decimal (BCD) mode.

5) The Interrupt Flag (I)
Set if an interrupt is in progress.

6) The Zero Flag (Z)
Set if an arithmetic operation gives a zero result.

The branch instructions test the status of a flag and act accordingly. The instructions provided are:

- BCS — branch if carry flag is set
- BCC — branch if carry flag is clear
- BEQ — branch if zero flag is set
- BNE — branch if zero flag is clear
- BMI — branch if negative flag is set
- BPL — branch if negative flag is clear
- BVC — branch if overflow flag is clear
- BVS — branch if overflow flag is set

You will generally use these instructions directly after an arithmetic operation. The most usual are:

- CMP — compares the accumulator to data or the contents of a location.
- CPY — compares the Y register to data.
- CPX — X analogue to CPY.
These three instructions perform a non-destructive comparison by subtracting the data from the register and updating the status flag accordingly depending on whether the result is zero, positive or negative.

Register = Data — set carry flag
Register = Data — set zero flag
Negative register is changed by the sign bit.

So to detect various results, you use:

Register = data — use BCS, e.g.
CMP E
BCC LOOP
branches of LOOP if accumulator holds four or more.

Register = data — use BNE, e.g.
CPY $10
BCC LOOP
branches to LOOP if Y register holds less than $10.

Register = data — use BEQ, e.g.
CPX $6
BEQ LOOP
branches if X register holds six.

Register = data — use BNE, e.g.
CMP $3
BNE LOOP
branches if accumulator does not hold three.

If you now look back at last month's examples you will see how these tests are used.

Arithmetic instructions such as INX, INY, INC, DEY, DEX, DEC change the negative and zero flags depending on the result. (INC and DEC increment and decrement a memory location by one.)

My answer to question two from last month's homework uses this effect. Line 160 increments the counter. When it reaches 255, adding one more will result in zero. Since this signifies that we have finished, I use BEQ in line 170 to detect this situation.

Now we've collected together the basic tools, let's start writing some decent routines. In the last part, we discussed the use of NOP instructions to create delays. To achieve more substantial pauses we need to use more complex routines. Here is a simple delay routine:

```
100 ASSEMBLE 110J
110 REM *=$C000
120 REM LDY $310
130 REM .LOOP1: LDY $310
140 REM .LOOP2: DEX
150 REM BNE LOOP2
160 REM DEX
170 REM BNE LOOP1
180 REM RTS
```

This routine uses a pair of nested loops to wait a short time. The values loaded into the X and Y registers in lines 120 and 130 decide the delay. Lines 140 and 150 count down the Y register to zero. This process is then repeated the number of times in the X register. The Basic equivalent of this routine would be a pair of nested loops such as:

```
FOR X=0 TO 10: FOR Y=0 TO 10: NEXT Y,X
```

An alternative method is to call the routine at SEEB3. This routine generates a one millisecond delay.

Let's use this delay routine to generate a synapse tweaking pattern. Consider the routine:

```
100 ASSEMBLE 110J
110 REM *=$C000
120 REM LDA $3A0
130 REM STA 998
140 REM LDA $330
150 REM STA 999
160 REM LDY 0
170 REM .LOOP3: LDA $42
180 REM STA 50400,Y
190 REM LDA $1E
200 REM STA 5D000,Y
210 REM TYA
220 REM JSR DELAY
230 REM TYA
240 REM LDA $32
250 REM STA 50400,Y
260 REM TYA
270 REM JSR DELAY
280 REM TYA
290 REM LDA TABLE,Y
300 REM BNE FINISH
310 REM STA 50400,Y
320 REM TYA
330 REM JSR DELAY
340 REM TYA
350 REM INY
360 REM BNE LOOP3
370 REM FINISH: RTS
380 REM .TABLE: EB:25,15,21,
390 REM .DELAY: LDY 998
400 REM .LOOP2: LDA 999
410 REM .LOOP1: DEY
420 REM BNE LOOP1
430 REM DEX
440 REM BNE LOOP2
450 REM RTS
460 REM ]
```

You'll immediately recognise lines 250 onwards as being our delay routine. The delay parameters are held in locations 998 and 999 rather than being loaded as direct values. The line 120 to 150 set up the delay parameters. The core of the routine is lines 160 to 210. It is an infinite loop which changes the colour of the border, delays a bit and then loops back. The subroutine call in line 19 tests the RUN/STOP key. If this key is pressed, then the Z flag is set. Line 200 checks this and stops if the flag is set. Try messing about with the delay values and see the effect. If you use a bit of care and possibly the odd NOP to fine tune it, you may be able to get some stationary coloured bands in the border.

The next, and last example, is a little more useful:

```
100 ASSEMBLE 110J
110 REM *=$C000
120 REM LDA $3A0
130 REM STA 998
140 REM LDA $330
150 REM STA 999
160 REM LDY 0
170 REM .LOOP3: LDA $42
180 REM STA 50400,Y
190 REM LDA $1E
200 REM STA 5D000,Y
210 REM TYA
220 REM JSR DELAY
230 REM TYA
240 REM LDA $32
250 REM STA 50400,Y
260 REM TYA
270 REM JSR DELAY
280 REM TYA
290 REM LDA TABLE,Y
300 REM BNE FINISH
310 REM STA 50400,Y
320 REM TYA
330 REM JSR DELAY
340 REM TYA
350 REM INY
360 REM BNE LOOP3
370 REM FINISH: RTS
380 REM TABLE: EB:25,15,21,
390 REM .DELAY: LDY 998
400 REM .LOOP2: LDA 999
410 REM .LOOP1: DEY
420 REM BNE LOOP1
430 REM DEX
440 REM BNE LOOP2
450 REM RTS
460 REM ]
```

Again the delay routine uses two locations to hold the parameters. This routine simulates a device rather like the "vidiprinter" used on the Saturday afternoon football results service on TV. A message is slowly printed across the screen with a flashing asterisk cursor. The routine is quite simple.

Line 160 zeros the Y register which will act as our counter. Lines 170 and 180 print an asterisk in the top left hand corner of the screen. Lines 190 and 200 update the colour matrix for you folks with old ROM machines. The next three lines force a delay. The TYA and TAY either side of the call to the delay loop save the contents of the Y register since it is used in the delay. Lines 240 and 250 erase the asterisk with a space and we wait a while longer. Finally, lines 290 and 310 take a letter from the table and put it on the screen. Line 300 checks for a zero value in the table. This is used to mark the end of the table so that the routine stops at the end of the message. Line 350 increments the counter and provided that we don't go over a value of 255, line 360 sends us back for the next character.

I'm spending a lot of time explaining how the routines work. As we progress, I will make briefer comments since you should soon be able to suss things out for yourselves.

OK, homework time. First, I want a routine which will fill the entire screen with a specified character. I don't expect the best solution but I've told you enough for a crude but effective routine.

Secondly, I want a routine which will more a block of data from the top line of the screen to, say, the 20th line. A single line of data will suffice but you can easily move u to 256 bytes. This sort of routine is frequently used in a range of situations.

Finally, how about a routine which will scroll the top line of the screen one step to the right with the leftmost character replaced with a space?

Next month we'll explore eight and 16 unsigned arithmetic.
Margaret Webb browses
through some readily
available educational
software.

The supply of new educational software
seems to have dried up, so I decided to
look around the local shops to see what
was on offer. The answer seems to be, very
little. The reasons for this could be
threefold:
1. My hometown is poor for shops selling
software.
2. The storeowners are very cautious
about stocking educational software.
3. There may genuinely be little software.

I suspect that notwithstanding the
claims of the value of computers for
education, the reality is that education is
poor business. Much more money can be
made by selling games. The majority of
games only require good programming
whilst educational material requires
detailed teaching knowledge as well as
programming ability. These rather
disappointing facts of life were only too
evident at the last PCW show where a
number of exhibitors stated that they
were no longer interested in educational
software since it had no future. This is all
rather sad since quite a lot of
the important pre-school spade work can be
carried out with computer assistance with
the software acting as a type of expert
system (parents aren't always teachers).
For the older children, software can be
used to provide revision material and to
support conventional didactic methods.

While rummaging through the shops
however, I did see an interesting item.
Not a new product, this is a triple pack of
Hill MacGibbon software for a touch less
than the original price of one. Hill
MacGibbon is an interesting company in
that it has produced software for most of
the popular computers. In some of these
packages there has been collaboration
with well known companies such as
Collins and Pan.

In light of this, this is a good time to
take a look at which packages are
available for the C64. The triple pack
contains Ballooning, Car Journey and
Secret Agent. Between them they provide
quite a comprehensive package, each
coming with a colour booklet dealing with
diverse aspects of the topic and ideas for
further work.

Ballooning

The title is self explanatory. The booklet
deals with the historical aspects of
cri"ography, the capital cities of Europe
and a little information on real life spies is
given. It covers geography, reading,
lateral thought and some mathematics.

Hill MacGibbon also offers a number of
packages covering more specific subjects.
Teaching the mechanics of reading isn't that much of a problem
since children generally soon grasp the
form of words. What is more difficult to
grasp and contributes most to the
subtleties of English is punctuation.

Punctuation Pete is a program intended
to help in this area. The child is presented
with a graded piece of text which has had
all punctuation and capital letters
removed. The child must read the text and
attempt to punctuate it so that the
meaning is clear. When he feels that all is
finished, the program marks the result
showing any mistakes. Surprisingly,
finding the correct punctuation is quite
tricky.

Technically, the program is slick with
large legible text and the use of an
animated man as the cursor. I highly
recommend it.

The last two programs are for the
younger child. Firstly there is Picture
Builder. As the name suggests, this
program allows the manipulation of basic
shapes such as squares, circles and
triangles for the creation of pictures.
The shapes can be stretched, shrunk, rotated
and painted to give the required effect.
Multicolour mode is used to allow up to
four colours. For those of you with
printers, there is a hard copy facility
nicely done and easy to use.

Finally, we have Run Rabbit Run. This
is a simple game played on a matrix of
squares, rather like a board game. You
must guide a number of rabbits to their
homes and away from the hungry fox. The
game tells you how many squares your
rabbits may jump on each move. These
jumps must be distributed between the
rabbits. There are bushes in which the
rabbits can hide. If the fox isn't there first
the game ends when all rabbits are home
or have been eaten.

This game is quite tough and forces the
child to use a little logic, lateral thought
and some counting skills.

The impressive features about Hill
MacGibbon software are that a high
standard of programming is used and there
is a decent level of content. Unlike
some educational material, there is
evidence of real teaching input.

Special Agent

This package puts you in the shoes of a
budding James Bond searching Europe
for the dastardly enemy agent who's daily
killing off your operatives. The game
centres around a map of Europe showing
the major cities. From time to time
intelligence reports flash up at the foot of
the screen. Some of these are in code
presenting additional problems. You must
act on the received information and
travel from city to city. You must choose
your trains and planes from timetables.

As usual, the booklet covers subjects
connected with the central theme. You are
introduced to the elements of
THE NEW GENERATION OF BACKUP METHODS IS NOW EVEN BETTER!

"Freeze Frame" has enjoyed immediate success for the past few months. Sales lists in the U.K. and abroad have been very good and thousands of satisfied customers are using the

Continental Software has decided to launch an improved version of the product that improves a few useful improvements PLUS it is even more powerful. At the end of January we launched a new version called "Freeze Frame" which could not handle. This includes all the new software updated up to 4th March, 1985.

OPERATING "FREEZE FRAME"

"Freeze Frame" is simply used to stop. It is a cartridge based so it is simply plugged into the cartridge port when the computer is switched on. A message is displayed "RETURN" will clear the memory and return to the normal amount of space. Software can now be loaded from tape or disk completely as normal. The latest version of "Freeze Frame" will, to the best of our knowledge, allow ANY software to load and completely run in full operating mode.

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2. Pressing "3" will run the same as "D" except that the release will be at standard facilities (Also suitable for U.S. spec. machines, 4040 drivers, fast load cartridges, etc.)

3. Pressing "T" will save a working version of the program in tape to tape. This incorporates a high speed reload at approx. 2600 baud.

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P Green brings you

some hints on saving
time and memory.

TIME AND MEMORY CAN BE wasted when a Basic program contains a lot of numerical data statements. This article suggests ways in which you can save both, even on programs copied from magazines.

The Facts and Figures

If you have a lot of numerical data to be stored, there is a fairly quick and easy way to save time and memory. Save the block of memory straight on to the disk or tape and get the Basic program to load this data straight into memory instead of POKing it in.

Time is saved by this method because when you use data statements within a program, you must first load the data in Basic form and then run the program to POKE the data into memory. This takes 12 seconds for the first half of the operation and six for the second half for each 1K of memory when using a disk drive. Alternatively, to transfer the data straight into memory from disk takes only five seconds for each 1K of memory. Of course, the saving is much greater if you are using tape since tape loading is a much more lengthy process.

Memory can be saved, both in the computer and on the disk or tape. In the computer, 1K of directly entered data, of course, takes up just 1K of memory. On the disk or tape, it takes up just over 1K of storage space. On the disk, this is five blocks. In the case of Basic data statements, besides occupying the 1K of memory once the program has been run, the Basic data also takes up memory - just under 3K. All together, this method actually uses just under 4K of memory. On the disk or tape, it takes up well over 3K of storage space - that is, 15 blocks on the disk.

Saving the Data

So, firstly, how can we save a block of memory? And secondly, how can we get our Basic program to load it again?

This can be done in two ways. You can use a machine code monitor to save an area of memory. To do this you'll have to get the start address of the block of memory that you wish to save and then calculate the end address and add one.

Your machine code monitor, of course, must not occupy the same area as the memory which you wish to save.

The procedure should be as follows:
1. Load and run the Basic program, or at least the part which POKEs the data into memory.
2. New the Basic program and load the machine code monitor.
3. On most machine code monitors, the instructions to save a block of memory is something like:

   S "filename",C000,C200,08

   This will save the block of memory from $C000 (the start address) to $C200 (the end address) on a disk drive with the device number of 8 or 08 hex (01 for tape) with a filename "SPRITE". (You choose the filename although you do not actually need one for files saved on tape.)

   All you need to do for this is to repeat instruction three for the new block of data, bearing in mind that for disks you will need a different filename.

   Another and possibly easier method is to alter certain pointers in the zero page of memory so that you fool the machine into thinking that the block that you wish to save is a Basic program. The locations to note are 43 to 46 inclusive. Locations 43 and 44 are the low and high bytes of the start of Basic which are normally one and eight respectively. (256+1 = 2049 = start of normal Basic area). Locations 45 and 46 are the low and high bytes of the start of variables which is normally the end of the Basic program Plus one.

   The procedure is as follows:
1. Calculate the start and end of the block of memory, which you wish to save, not forgetting to add one to the end.
2. Calculate the high and low bytes from these figures in decimal.
3. Run the Basic program, or the section of it that POKEs the data into memory.
4. In direct mode, POKE in these figures into locations 43 to 46.
5. Save the block of memory by typing in SAVE "filename",8,1 or SAVE "filename",1,1
6. Repeat this for other blocks of memory if necessary.

The Basic Loader

Now that you have saved your block of memory, how do you get your program to load it again automatically? There are two ways in which you can do this. The first is to write a short machine code routine to load the block of memory and the second is to add one or more lines to the beginning of your Basic program. The machine code method requires an understanding of how the KERNAL load routine works and would take too long to describe here. Instead, I will concentrate on describing the Basic method.

It is actually very easy to get your Basic program to do the loading for you. The most important thing to remember is that once the first block of memory has been loaded, the program will start again from the beginning and if you do not do something to prevent it, the same block will be loaded again and again.

The first thing to do is save a copy of the full program, data statements and all, in case something goes wrong, and keep it safe. Next, remove the data statements and the READ-POKE routine and any error traps, and save the program again.

The first line of the program can be used to load the block of memory by using a line such as:

10 X*X+1: IF X=1 THEN LOAD "filename",8,1

This filename is the same as the one you used to save the block of memory. If a tape is used, then first change the eight to a one, and then, don't use a filename. The figure one after the eight or one is required so that the block of memory goes back to whence it came.

If there is more than one block of memory to load, another line needs to be added, as follows:

20 X*X=1: IF X=2 THEN LOAD "2nd filename",8,1 etc.

or, in the case of tape, the first line can become:

10 X*X+1: IF X=3 THEN LOAD "3rd filename",1,1

Do not use a filename. This will load the first two blocks of memory found on the tape.

The way in which the loader works, is as follows:
1. When the program is run, X=0.
2. At line 1, X becomes 1 and the first load takes place.
3. After the load, the program starts again at line 10 but the variable X is still 1. Therefore X becomes 2 and since this is not equal to 1, the program continues to the next line.
4. This will go on until all the blocks of memory have been loaded and the rest of the program can continue.
Evelyn Mills looks at a new product from Impex.

THE FONT FACTORY (FF) IS APTLY named and works hard for you, doing overtime at your request!

Firstly, the requirements are a disk drive, printer and word processor. The printer should, for preference, be the Commodore Vic 1525/MPS 801 although directions are given for using a printer interface emulating the MPS 801 or 803. It is claimed that FF will work with most word processors with open sequential files and I have used Easyscript throughout with no problems; however it would be worthwhile doing a double-check with the distributors before purchase if you have another word processor as some do not link up.

Noticeably there is no manual supplied with FF; instead the program gets to work right away printing out full instructions using the directions given. The resulting 16 page manual is in two parts - one for Font Factory and one for Signwriter 64. Both are very well written and the full concepts of the programs are easily understood - no hidden complaints here!

Before using FF, create a file document with your word processor and save this to disk. There is no necessity to use the commands of your processor other than direct typing mode. However - and this is most important - your MUST enter 'ffin' at the beginning followed by (return). Should you wish to use a different font in the middle of your document, insert a new 'ffin' header, followed by (return). FF has eight in-built fonts with which to play around.

Having saved your file to disk, load FF and let it take over. Initially I suggest that you use option three to print your document (there are plenty of screen instructions to help you along). Essentially FF will ask you to define your first font by selection from a list of eight; this will then be processed for you. The second font style will then be requested and FF gets back to work. When you have defined the number of fonts in your document, a simple (return) will exit you to the next option. If you select the parameters given on the screen (a good idea initially) insert your document when told to do so and FF will print your letter in the fonts selected, very simple indeed and very effective.

There are eight in-built fonts including Micro, Bold, Roman, Gothic and, most important of all, the Descender. The latter gives you 'true type face' of a high quality as its name implies.

FF is full of options using normal or double width letters and has a very comprehensive list of embedded commands for centering, setting line width, left and right margins, optional page numbering and line spacing. All these commands are speedily screen controlled. Fonts may also be changed within your document (did I say versatile?).

More to come. You may define your own fonts, if desired, or edit existing ones. The whole process is extremely easy to use and 15 fonts may then be accessed at any one time within your document, including the in-built fonts. Instructions are clear, concise and readily handled.

In effect you can create an entire character set or change characters from an existing set; if you do not like the A in Gothic font then change it! If you want to design the Greek alphabet - do it!

FF also has a signwriter program which may be loaded independently. Here again instructions are readily handled, when complemented with the manual. This functions independently of a word processor, character widths are Normal, Skinny or Double width and the output has two options; one selects print according to the printing characters in your slogan while the other selects solid line printing (note - the word cat in normal width prints a banner around two feet long!) F5 will stop the printer if you have been too enthusiastic.

As in FF, fonts may be changed and stored on disk. There is one Standard font in signwriter.

I see no problems in this program, consider it excellent value for money and doubt if you will be disappointed with its performance.

A really professional tool, agreeably priced and certainly "user friendly".
This month we are pleased to print three short utility programs. The first of these comes from Steven Freeman from Orpington and is a list utility. How often have you tried to list a program on the screen of your C64 only to have the line that you want scroll off the top of the screen before you can read it? OK so you can slow this listing down with the CTRL key, but the program still scrolls. Steven's handy routine alters the speed of the LIST command by changing the list vectors so that it jumps to a short machine code routine in spare memory (locations 679 to 702). Line 30 of the Basic loader contains the POKE that alters the speed of the list, you can change this if required. The other controls are:

1 To pause the listing
2 To slow down the listing

For all of those people who have stored machine code programs on tape only to forget where they load in memory, Mr K Peppin from Little Neston has provided an extremely handy Tape Reader program. The routine is very handy for locating a machine code program and giving its length. This routine is reliant on a machine code call to the Kernel ROM which searches for any header to a program. The information is then stored in

```
5 REM PROGRAM FOR THE PLUS/4
10 SAY"(CLR) (RST) (RED) ### MASTER TAPE PROGRAM CATALOGUE ### (OFF) (BLK)"
15 PRINT$00
20 PRINT:READI:FORI=1TOX:READA:PRINT"A":NEXTI
25 PRINT"(DOWN) WHICH PROGRAM?":PRINT"(DOWN) ENTER THE PROGRAM NUMBER":INPUTA
30 IF A(10A) THEN 25
35 POKE 0,7
40 PRINT$1:" (DOWN) (DOWN) PRESS THE FAST FORWARD BUTTON*:PRINT"(DOWN) THEN PRESS ANY KEY"
45 POKE 239, 0
50 IF PEEK(1239) THEN 50
55 IF PEEK(64784) THEN 40
60 PRINT"(DOWN) PLEASE WAIT FOR PROGRAM TO BE FOUND"
65 POKE 15, 11$:PRINT$000000$:B=16-T110
70 IFI/60 THEN 70
75 POKE 0,7
80 PRINT"(CLR)";PRINT$:PRINT":PRINT"(DOWN) (DOWN) PRESS THE STOP BUTTON ON THE CASSETTE"
85 VOl=SOUND1; 50; 20;FORT=1090;NEXTT=SOUND1; 50; 20
90 IF PEEK(64784) THEN 100
95 GOTO 90
100 PRINT$:PRINT"(DOWN) YOU ARE NOW READY TO ";PRINT$"(DOWN) LOAD/SAVE "
105 RESTORE:FORI=1TOA+1:NEXT:READA:NEXT
110 PRINTA$:POKE 0, 15
115 POKE 239, 0
120 DATA 10:E REM NUMBER OF PROGRAMS
125 DATA"PROGRAM 1: 
130 DATA"PROGRAM 2: 
135 DATA"PROGRAM 3: 
140 DATA"PROGRAM 4: 
145 DATA"PROGRAM 5: 
150 DATA"PROGRAM 6: 
155 DATA"PROGRAM 7: 
160 DATA"PROGRAM 8: 
165 DATA"PROGRAM 9: 
170 DATA"PROGRAM 10: 
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**Our readers provide more handy routines to add to your collection.**

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COMMODEOR 64
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WIZARD SOFTWARE (Dept. L) 59 THE MARLES, EXMOUTH, DEVON EX8 4NE
WELCOME BACK TO THE saga of the Frog. This month we will be adding the routine which controls the status panel at the bottom of the screen, and the routine which kills the Frog. Although the latter will not function until the checking routines are added in the next issue.

### Info

The routine begins by printing the value of LIVES onto the status panel. ONLY indicates whether the frog is dead or alive and if dead (ONLY = 1) then we exit from the routine.

The next four instructions print the values in FOOD and FOOD+1 and the following seven use the X register as an index to point to the five digits of METRES and SCORE and to place them correctly on the screen.

One of the features of the game is that it becomes more difficult as you progress, and this is achieved by increasing the speed of the BIRD and the FLY. Their speed is increased by a small amount every time another 100 points is scored. The next two lines store the current digit in the 100 column of the score into NXTHUN. The code which carries out the increase in speed appears later in the routine.

Lines 10010 to 10100 decrease the two byte delay METDEL and METDEL2 to check whether another metre has passed. If not then we jump to FOD, which simply returns from the routine.

The next eight lines use the X register as an index to increase the METRES value. If the digit being increased reaches nine-plus-one in value, (i.e. 10), then that digit is set to zero, and the next highest digit is increased. METSPD contains the value which is placed back into

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<thead>
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<th>1430 TARMOV</th>
<th>.WORD MOVE1,MOVE4,MOVE5,MOVE6,MOVE2</th>
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</table>

**METDEL2**, so by changing this value (line 1360) you can adjust the distance that must be travelled before the value of METRES is increased.

The same principle used for increasing the metres is used next to decrease FOOD and increase SCORE.

Which brings us to OK24. If the value of NXTHUN is different to the current value of SCORE+2, then it is time to decrease the delays which control the speeds of the BIRD and FLY, BRDSPD and FLSPD. Finally, they are checked to ensure that their values have not decreased too far.

**Dead**

This routine prints the dead frog and decreases the value of LIVES.

The first step is to check whether the variable DED has been set by the collision routines which we will add next issue.

Lines 10820 to 10850 set up the sprite definitions to point to the correct sprites for a dead frog. 10860 to 11010 simply set up the correct X and Y co-ordinates of the frog (he would look pretty silly hovering in mid air!). Next the colours are set up in lines 11020 to 11040.

Now the interesting bit! Remember the interrupt handling routine, 'HANDLE' that we added in the second article? Well, unless we stop this from being called, the dead frog will continue moving (actually the background would move, not the frog).

To stop this from happening, we point the interrupt vector at 50314 and 50315 to the end of the routine, thus executing no code.

The rest of this section is simple to follow, and does this: Decrease Lives, pause, re-print status panel, pause, set up interrupts, refill FOOD, re-set Bird and Fly positions, re-set Cycle position.

The last pieces of code from line 11250 onwards, are simply delay loops used by the previous routine.

Next issue - collisions!
C IS AN APPLICATIONS LANGUAGE. That is, it's used by programmers to write a variety of programs such as text editors, programming utilities and such like. It is also the 'flavour of the day' in the micro world. Partly because of the popularity of the UNIX operating system (of which C is the language) and partly because of other features such as its compactness, portability and speed of execution.

The good thing about C is that it is a language for programmers. Many programming languages get designed by committee, but not C. C has gained its popularity not because of any hype or backing from a government (as the USA has backed ADA), but because programmers LIKE C.

So what is C, what can you do with it, and how good is it?

Why C?

C has many virtues. It is a modern language which incorporates modern control features. It is also a compact language; C can be installed on small micros - such as the 68 - and the code that it produces is compact and fast. Another benefit of C is that it is portable. We have all heard claim that this or that language is portable, only to discover that a major rewrite is necessary before a program can be run on a different system. But with C it really is portable between different computers. If any changes to the source code are necessary, it usually means altering a few lines in a 'header' file which can accompany the main program.

For those of you who are interested in the 'real' work of programming, it is worth noting that C is the programming language of the UNIX operating system. UNIX is already an accepted operating system in the PC world, and the EEC have decided to adopt it as their official operating system.

C is a compiled language. The program (referred to as source code) is first written using a text editor or word processor. The source code is then submitted to the compiler, which, providing there are no errors, will compile the program into machine code and store it as a file which is called the object code.

The steps in developing a C program are a bit more complex than what was mentioned above, but it should give you a rough idea.

C BASICS

Here is a small C program:

```c
#include <stdio.h>

main () /* This is a demo */
{
  int num;
  num = 1;
  printf("I am a simple");
  printf("computer. \n");
  printf("My favourite number is %d because it is first. \n",num);
}
```

This will print to the screen:

```
I am a simple computer.
My favourite number is 1 because it is first.
```

On a line analysis, this is what the program does (note line numbers are not part of C). Line one tells the compiler to incorporate information found in the file stdio.h. Every C program must incorporate at least one function, and line two identifies the function called main (the parentheses are there to identify main as a function). The open curly bracket identifies the beginning of the function body. Line four is a declaration statement, here the variable num has been declared of the type integer. In line five num has been assigned with the value one and lines six to eight print the output. Line nine indicates the end of the function.

The '\n' instructs the micro where and in what form the value held in num is going to be displayed. The ' \n' means new-line carriage-return.

In next month's article I shall explain data types and control structures.

C Power V2.4 by Pro-Line Software Ltd

To the best of my knowledge, the C Power package is the only C compiler available in the UK so far. By the time you read this a cheaper package called Super C should be available from first software. The reason for this longer-than-normal review is to give you an idea of what the package offers and is capable of, as it is not the cheapest available!

On with the review! C Power is a complete C development package that will enable the user to produce stand-alone C programs. Most language packages available for the 68 fall into one of two categories: educational or development. Educational packages (such as the ADA tutorial) do not offer a comprehensive package that can be used to develop software. Instead, emphasis is on introducing the user to the language. Development packages on the other hand (such as OCS and Orpheus Pascal) offer an excellent package, but are not too good when it comes to documentation. I was therefore surprised with C Power, because it is a very 'full' compiler offering lots of facilities as well as providing an excellent tutorial book that used in conjunction with the compiler will enable beginners to learn the language.

The package itself consists of a double sided disk which contains the compiler, shell, libraries and example programs. A 44 page user guide gives details on the compiler and very little else. The big plus is the C Primer Plus book that is also supplied with the package, and which can be regarded as a complete tutorial to C.

Implementation Details

One of the benefits of C is its portability - the ability to run C programs that were written on other machines. Because of this compatibility it is an important factor when developing a C package. Pro-Line
has got a very compatible package with C Power, but of course, there are some differences.

In brief, the omissions from standard C are: no bit field manipulation; static pointers may not be initialised except for character points initialised with strings; certain operators under certain conditions will not work unless the expressions are parenthesised. Most of these omissions are not serious, and can be got round quite easily.

The following table lists the size, in bytes, of all data types supported by the compiler:

<table>
<thead>
<tr>
<th>Type</th>
<th>Size</th>
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<tbody>
<tr>
<td>char</td>
<td>1</td>
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<tr>
<td>int</td>
<td>2</td>
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<td>long</td>
<td>2</td>
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<td>unsigned</td>
<td>2</td>
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<td>float</td>
<td>5</td>
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<tr>
<td>double</td>
<td>5</td>
</tr>
<tr>
<td>pointer</td>
<td>2</td>
</tr>
</tbody>
</table>

Looking at the table, you can see that types short, int and long are the same, as are float and double. This practice is not uncommon in micro implementations of C, but it is a strange one. For a package of this price I would have expected to see long and double supported.

The library supplied with the C Power compiler is quite standard. However, it would have been a good idea to include functions dependent on the 64, such as some sound and graphics functions.

**Documentation**

The user manual is supplied as sheets of paper which is stapled near the top.

<table>
<thead>
<tr>
<th>TABLE 1 — COMMANDS SUPPORTED BY THE SHELL</th>
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<tr>
<td>l</td>
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<td>ls</td>
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<td>rm</td>
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<td>ced</td>
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<tr>
<td>cc</td>
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<tr>
<td>link</td>
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</tbody>
</table>

NOTE: All the commands are followed by arguments such as file names, drive or device numbers.

Punch holes enable the manual to be fitted into a ring binder, which is a good suggestion as my copy started to fall to bits after a short while. The manual itself makes no attempt to teach or introduce the user to C — that’s left to the tutorial book. Instead the manual provides information on the implementation of C Power and descriptions of the editor, compiler, linker and so on. One section lists the functions provided with the library that is part of the package. The majority of functions are listed with name, number, order and types the function takes, description of the function and an example. A good idea this, as it will enable the user who wishes to port C source from another machine, to check up on functions to see if they are compatible.

The book ‘C Primer Plus’ by Waite, Prata & Martin (Sams, $19.95, ISBN 0-672-22090-3) is supplied with the C Power package. Quite simply it is the best language tutorial book I have ever read! This hefty tome (331 pages) takes the reader from the concept of programming right up to detailed discussion on C I/O. What’s more, it is well written in a friendly (and amusing) manner with plenty of illustrations, summary pages and so on. Even if you don’t intend to get the C Power package get this book!

**C Power in Use**

The user manual suggests that the system disk should be backed up. To do this, the shell, editor, syntax checker, linker and so on should be copied on to one disk. Another disk should be used to copy the flip side of the system disk; this contains the Stotlib.1 and Syslib.1 function libraries.

The compiler itself is copy protected (not very well though) so once working copies are made, three disks should be at hand: One containing the shell etc; another the libraries; and the third being the master disk.

The SHELL is the first program that is run when using C Power. SHELL itself is a minicommand interpreter. It supports command line arguments and I/O re-direction along with the compiler and other programs that are designed to work under it. The nearest comparison would be Basic’s screen editor, which can be used to develop, edit and run programs as well as issue I/O commands (such as disk directory, opening files etc). The command available from the shell are listed in Table 1.

Entering some C source code first requires the editor to be loaded and run. This is simple done by entering ‘ed’ (optionally followed by a file name if an existing file is to be amended). The editor is a very comprehensive bit of code that provides numerous commands for moving about the text buffer. Once the code is written it can then be saved to disk. A syntax checker is also provided which does what its name suggests — checks the syntax of a C source file. The program is listed as it is being checked, and will stop if an error in syntax is found.

If this is the case, a couple of key presses and you are back into the editor at the place where the error was found. Needless to say that the editor, syntax checker and all the other Shell commands are written in C!

The next stage is to invoke the compiler by entering cc filename. This loads and runs the compiler which produces an object code file.

The first stage is to load and run the linker. This will produce a runable file and three options are available. First it is possible to produce a C program that will run under the Shell (just like the Shell commands). It is also possible to specify a starting address, this means that the C program will have to be loaded and a SYS call made to the starting address. The third option is to produce a file that starts at the start of Basic.

**Summary**

Without a doubt C Power is a very powerful package. It is quite feasible that it can be used to develop commercial programs, and its numerous features give the user a great deal of flexibility.

The only drawback with C Power is its price. It’s a very expensive package, and I would have expected such things as more C64 dependent functions, long integers and double precision floating point.

Having said that, its pros far outweigh the cons, and I would recommend the C Power package to the novice as well as the professional.
Simply type it in as you would any other program and 
run it. When you run it, any typing errors in the data will be 
found and the line of the error given. Correct any offending 
lines and run again until the program runs without any 
errors. Do not attempt to use 
the program before all errors 
have been found or you could 
cause your machine to crash.

Once the program is in 
memory you can get rid of the 
loader by typing NEW. Then 
type SYS 49152 to initialise 
Better Matrix. A 3D title/menu 
page should be displayed 
showing you the simple 
controls that are needed to use 
the program.

**Trying It Out**

When everything is working 
type in the short program 
in Figure 2. Now press function 
key 3, which will give a blue 
border around the program. 
Not very nice is it?

Now press function key 1, 
which will give a cyan border, 
and run the program again. 
This time the letters will have 
descenders.

Better Matrix should there- 
fore give a better appearance 
to many of your printouts. 
However, as each word-
processor is different it is 
impossible to say whether it 
will work with them loaded 
into your machine. At the 
moment Better Matrix sits at 
memory location $C000 (49152), 
so it will definitely not work 
with programs that use this area 
of memory.

**The COMMODORE MPS 801** 
is an extremely popular printer 
because of its cheap price. If 
you are only after the 
occasional computer listing then 
it is quite adequate. 
A problem arises however if 
you wish to use the MPS 801 to 
produce quality text output as 
one of the lower case letters 
have descenders. This means 
that a letter 'l' would simply sit 
on the same line as a letter 'd'. 
This makes it very difficult 
to read large amounts of text.

If you want to enter the 
word world of word-
processing and are thinking of 
trading in your MPS 801 and 
purchasing a more expensive 
printer then wait a minute. 
Before you take any money out 
of your depleted bank account 
take a look at Better Matrix.

Show how it works? Well 
Better Matrix uses a similar 
method of printing as the more 
expensive near letter quality 
(NLQ) printers. First one part of 
the letter is printed then the 
printer goes back over the 
letter and adds the missing 
parts of the letter to the page.

By implementing this on the 
MPS 801 we can obtain an 
acceptable print resolution 
of 14 dots by 76 dots. Obviously 
this does not improve the 
definition of the character, as 
proper NLQ does, but it does 
allow you to print characters 
with descenders. Take a look at 
figure 1 which shows the 

normal printout of the MPS 801 
compared to that of the newer 
Matrix.

However, printing in this 
manner does have a disad-
vantage. As the printer has to go 
over each line of text more 
than once it takes a lot longer to 
print any text, this is not 
only common to the MPS 801 
but all NLQ printer suffer in 
the same way. On the MPS 801 the 
speed is reduced from 50 
characters per second to 20 
characters per second.

**Getting It In**

Better matrix is quite short 
and the program is in machine 
code but is presented here 
in the form of a Basic loader.
I HAVE BEEN ACCUSED OF DOMINATING Communication Corner with M'Net/CNET blurb. Well, as promised, here is a refreshing change. This month the subject is bulletin boards.

A bulletin board (BB from now on) can best be compared to a community bulletin board. A BB is usually run by a hobbyist in his/her own spare time on a home micro with disk drive and auto-answer modem. A BB will allow one user at a time to browse through the files stored on the board. These can include messages from other users, general information, special lists, etc., names it can put in on a BB.

Compared to Micronet or Compunet (I knew I would mention them sometime) BBs are not technically brilliant, but they are by no means crude. One of the best things about using different BB's (board-walking) is that they are not bureaucratic, official or run by money makers and that makes a difference!

What Type?

The UK currently has over 200 BBs that operate at regular times, and the number is growing. There are basically two types of BB from which to choose. First there is the traditional scrolling type of BB. To access this, you will need terminal emulation (often referred to as dumb terminal) software. Most comms packs include this type of facility. In case you are a Viewdata (Prestel) user who does not have this type of package, Dialsoft on page 60/67/150 at £1.50 will do the job. Compunet users can purchase TTY which is at £14/00/7 for £4.99.

This type of software does not give you any colour or graphics, but enables you to log on to most types of BB.

The second type of BB operates on Viewdata (Prestel-like) standards. This type of board presents information with colour and low-res graphics in a page format. Micronet-Prestel subscribers will not need to buy any additional software, but Compunet subscribers will need the free Viewdata proggy at 2020. Again, as with the dumb terminal software, most comms software has a Viewdata mode.

Which Modem?

Most of the BBs are run at 300 baud. This means you'll need a modem such as the Voyager 7, Nightingale or Multi modem from Miracle Technology. All three modems will also allow you to access boards at 1200/75 Prestel and scrolling formats. CBM modem owners need not feel hard done by. Many boards now allow access at 1200/75 baud, and some even operate at 1200/1200.

What's There?

Each BB has its own unique character. But most have an E-Mail (Electronic Mail) option that enables you to send and receive messages. These messages can be private, i.e. to another user, or be posted on the general board for everyone to see.

Other features on BBs typically include free downloadable software. Downloading is done in several ways, but by far the most popular is the X-Modem format, so check to see if your comms package has this option. Another common feature to be found on BBs are the SIGs - Special Interest Groups. These are areas which contain information on one particular subject such as a micro, comms, politics or whatever.

There are many other features to be found on BBs. Some even have on-line adventures that you can play.

When using a BB, it is well worth remembering that the service which you are using is two-way. That is, it is up to you, the user, to help supply the board with information. Have you got any software (or your own)? Then why not upload it for everyone to use. How about asking the System Operator (SYSOP) to set up an SIG dedicated to Commodore machines if there is not one there already?

The List

Opposite is a very small selection of BBs that are currently in operation. All the boards listed operate on a 24 hour basis. V/Data means that you will need Prestel type software to access the board. 1200-75 means that you need scrolling type software and a modem, such as the one from CAM, to access the service. Finally, 300 means 300-300 baud access which needs scrolling software. CBM modem users will NOT be able to access this type of board.

All the boards listed have a section which contains phone numbers for other boards. Have fun!

What About the 64?

To the best of my knowledge, there are only three bulletin boards which are run on the Commodore 64. One is in Aberdeen, one in Dublin and the third in Denmark. No doubt there are quite a few in the good ole' US of Reagan which I shall check out next month. I also understand that there is some public domain (free) BB software knocking about in Ireland which I shall also track down. As you can see below, running a Bulletin Board on a C-64 is perfectly feasible.
Below is a printout of part of a session on SBBS Aberdeen which is on 24 hrs a day, at 300 baud on 0224 781919, eight bits no parity. SBBS is run on a CT128 with a 5141 disk drive. The 24K of software was written by Noel Gaddo, the Sysop using the Blitz Basic compiler, not bad eh!

The time is 04:33:15 One moment loading.
SPACE BAR=move/pause, CTRL X=quit
SBBS Main Menu (1)
B-News/Bulletin Board Info
G-Goody/Log-off
H- Help with this section
M- Messaging Area
U- User log
Y- Yell for SYSOP
2-Goto Main Menu (2)
? Print this menu again
G,H,M,L,U,Y,2 or ? for menu : g

The time is 04:33:35 One moment loading.
SPACE BAR=move/pause, CTRL X=quit
SBBS Messaging menu
G-General messages
H- Help with this section
P-Pen-pal messages
S-Sysop messages to/from
1-Goto Main Menu (1)
2-Goto Main Menu (2)
? Print this menu again
G,H,P,S,Y,1,2 or ? for menu : g

The time is 04:33:55 One moment loading.
SPACE BAR=move/pause, CTRL X=quit
SBBS General messages
C-Check Mail
D-Delete a message from file
H- Help with this section
M- Message categories
Q-Quick scan of messages
R-Read message(s)
S-Send message
1-Main Menu (1)
2-Main Menu (2)
G,H,M,Q,R,S,Y,1,2 or ? for menu : g
One moment loading

First message £ 1 Last message £ 34
Message number: [From]-[To] <CR> = Exit
1:34-34

One moment loading.
Message 34 [general] section.
MESSAGE TO: ALL
MESSAGE FROM: FERGUS MCDONALD
SUBJECT: ANOTHER CBM BBS!!
DATE: THURSDAY 20/2/86
USER IS A: NON MEMBER.

Hi folks! I have set up a BBS in Dublin, Ireland, running on a Commodore 64 with W52000 and 2 disk drives. I am a heavy CBM fan. The BBS software (by me) is called SBBS. It is an interpreter - no menus! And it is all in machine code. Give it a ring and you will see. It is QUITE different. It is refreshing to see another BBS running on a Commodore 64. Also, what does All think of the new SFD 1001 CBM disk drive with 1MB per disk? Anyway, the board (run by moi for the Irish Amateur Computer Club) is called the IACCBBS, and rings Dublin 903341 (24 Hours) on 8 bits, no par, 1 stop, 300 baud.

C,D,H,M,Q,R,S,Y,1,2 or ? for menu : g
One moment loading

Last but not Least

Well that's it for another month. I shall be reviewing at least two modems and some comms packages. Finally, a special mention to Richard James (CNET RB12) who wanted his name to appear in THE magazine in THE column. Null said! Don't forget to drop me a line on Compuserve ID: DJANDA or Prestel 91999/2677.
Lewis Tilley gives you the update from across the Atlantic.

HAS THIS BEEN FOR COMMODORE the "winter of discontent", or just a winter of the big freeze? In the US programs like Freeze Frame from Cardco, and Isopic from Starpoint Software, seem to reflect in their names the low point reached by Commodore's stock. By midwinter it had dived to its lowest level ever of six, down from an all time high of 50 on the NY Stock Exchange.

Is this great company on its way out? How can a company that has sold over four million units of the C64 be in such trouble? Even this past Christmas it is rumoured that 60% of the sales were of the old reliable, that the C128 was so sluggish that an artificial shortage in the C64 was created by holding back supplies of them in the east coast. Other guesses were that the C64 was "warehoused" in order to raise its price and/or to re-introduce it in a new case with some fancy new touches. The above rumours, incidentally, are through the courtesy of Felix Rivera who writes in what is perhaps the outstanding computer support group publication in the US, "The New York Commodore Exchange Network News" is published monthly in newspaper format. To subscribe, write Brian A Glover, Editor, 420 Clinton Avenue 5F, Brooklyn, NY 11236 USA. Its cost in the US $12.00 a year. Cheap, cheap, cheap.

My contact with user groups was greatly expanded by attendance at the 1985 West Coast Commodore Association "Commodore Show III" this February in San Francisco. At least a dozen groups were represented. Leading the field was the grand daddy of them all, The Toronto Pet Users Group, followed by such US giants as the Oregon based US Commodore Users Group, P.O. Box 2370, Roseburg, Oregon 97470 USA, and the above mentioned NYC conglomerate. No less than nine smaller California groups were listed in the show catalogue.

What's a BIG West Coast computer show like? Jammed packed with people and programs! The people were a little older on the average than those I've seen attending the shows at Earl Court or the International Commodore Show in London last year. But they were definitely not like the three-piece suit, business types that I ran into in San Francisco at an IBM compatible software show that was being held at the same time.

For the programs which I mentioned earlier, Freeze frame by CARDCO, Inc., 300 S Topeka, Wichita, KS 67202 will quietly sit inside your computer, totally transparent to any other programs you may wish to load and use. Then when you want to make a screen dump, you call it with two key strokes and voila!, the frame is frozen and sent to your printer. You then continue to run whatever you may have as your main program.

Don't confuse two different programs coming from the US both called Snapshot. One is a utility from COMPUTE!s Gazette magazine written in machine language which can store whatever you have on the TEXT screen (up to 53 screens) and then retrieve it for display or for printing. The other is a cartridge named Snapshot 64 which comes from those fine people at CSM Software, Inc., P.O. Box 563, Crown Point, Indiana 46307 who developed the best of the 1541 Disk Drive Alignment Programs (buy the Version 2.0 at $44.95 plus shipping).

Snapshot 64 is touted as the "ultimate" backup utility since you are able to "stop..." any program after the protection check and then resume...totally bypassing the protection check." Price on this utility is $49.95 plus shipping costs.

Remember the exciting advertisements from Starpoint Software of Gazelle, CA 90634? They announced a utility called STARDOS which would do everything (even makes great coffee). Well, they were blocked from releasing it by a lawsuit slapped on them by SKYLES Electric Works, 231E South Whisman Road, Mountain View, CA 94041. Skyles says that it was too much like their cartidge 1541 FLASH (559.95 - on sale, plus $15.00 UK shipping charge) which was developed by the same computer expert.

Starpoint is delivering one of the bargains of the year. They are marketing a 256K RAM board for the Amiga functionally identical to the Commodore 1050 RAM board for $99.95 + $6.00 shipping outside the USA.

Isopic, which is also a Starpoint product at $64.95, is a combination hardware and software package that closes this little survey of new utilities. It "deprotects" by capturing and saving the protected program as it runs in the 64's memory. "This 'snapshot' [so help me, they advertise this one as a 'snapshot', too] becomes accessible to the user for complete inspection and alteration." The quotation is from Starpoint's advertisement.

The midnight modern madness continues. Commodore associated QUANTUM LINK is giving away a 300 baud autodial modem if you subscribe for four months at $9.95 monthly. Viewtron charges you only $49.95 for a 300 baud Volks 6420 by Anchor Automation. They throw in a first hour on Viewtron for free. Playnet gets a bit tricky in its combination offer of a magazine subscription to Amiga User Library, a Playnet $1000 Sublogic, and a modem if you subscribe to Playnet for three months and pay a first time membership fee of $19.95.

The thaw has certainly come to Amiga. Hardware prices are falling and software is flowing from the developers like a flood from October. Macungie Electronic Arts Deluxe Paint program begins to really show what this amazing machine can do in presenting visual ideas. What's more it integrates with the Deluxe Graphics, Music and Printing modules of the same company. The games have arrived too. First Simulator from Sublogic, NAPoleon and QuantumLink are available now. Well, Eliza, Adventure and Life from EA are available now.

The C128 is less fortunate in the issuance of new programs designed especially for it. True, some very fine old programs are being updated such as Vizwrite and SuperScript. And now that Commodore has issued a new version of CP/M for the 128, which really works this time, all those wonderful old CP/M business programs are there for the taking.

I may be including a mention of the PC 10 in upcoming columns if the announcement by a PR (that's Public Relations in US English) man for X-PRESS Information Services is true. Commodore is going to try and hit the business world with a wire service which is compatible with IBM machines. They'll distribute the PC 10 in the US to clients who want the service compatible with IBM and may even offer a free Plus/4 to the less fluent businesses who want to try their service. This will all be tied in with QuantumLink to give a truly total service as well as find a use for all those great (and unsold) PLUS/4s.
Joe Nicholson continues his look at the C-16. This month — clocks and timers.

IN THIS ARTICLE I SHALL ATTEMPT to explain some of the techniques involved in timing, interrupts and so on. I shall start with the keyboard interrupt as this is the easiest to explain. Every 1/50th of a second the computer interrupts its normal processing to execute a 'service routine'. This updates the clock and reads the keyboard, putting any new keys pressed into the keyboard buffer. It then resumes processing. The address contained in bytes $0314 and $0315 are the low and high bytes of the indirect values for the location of the interrupt. These values can be redirected in order to make the C-16 jump to your own machine code routine. This method was used in the play routine and the synthesiser article explained last month. After the user routine has been completed the program can then jump back into the service routine to update the counter etc. Alternatively it is possible to jump straight back into processing.

The interrupt is normally on. The machine code instruction SEI turns the interrupt off and CLI will turn it on again. The following routine will set the interrupt vector.

```
SEI   interrupt off
LDA low byte
STA $0314
LDA high byte
STA $0315
CLI   interrupt on
RTS   return
```

Similarly to restore the original interrupt:

```
SEI   interrupt off
LDA $05
STA $0314
LDA $0315
RTS   return
```

Note that most of the programming associated with interrupts has to be done in machine code for speed, for instance it is not possible to disable the interrupts from Basic. At the end of the user interrupt routine use the instruction JMP $C506 to return to the service routine. To jump back from the user routine to continue processing, ignoring the C-16's service routine, use the instruction JMP $C86 (IRQ exit). I won't include a demonstration of this type as the play command published in the December 1985 article on sound, and the sound synthesiser article published last month serve as fitting demonstrations.

Internal Timers

There are three internal 16 bit timers in the C-16. The timers operate at a frequency of 885 KHz on our PAL system machines. It therefore takes on 0.0741 seconds to count all the way from 65535 to zero. Time spent in the facility of being able to activate an interrupt upon reaching zero. Each timer is arranged as two eight bit registers in memory, using the normal protocol of high byte (i.e. multiples of 256) last, preceded by the low byte (remainder 0-255).

The registers are arranged in memory as follows:

```
$F000 Timer #1 low byte
$F001 Timer #1 high byte
$F002 Timer #2 low byte
$F003 Timer #2 high byte
$F004 Timer #3 low byte
$F005 Timer #3 high byte
```

The registers are arranged in memory as follows:

```
LDA $05
STA $0314
LDA $0315
CLI   interrupt on
RTS   return
```

The Interrupt Status Register

This byte (at $5FF0 or 65280 decimal) records which interrupt has interrupted. It is important for the interrupt system to know just which interrupt has been used so that it knows how to act. The arrangement of bits in this register is the same as the interrupt mask register (e.g. Bit four is the timer #3 interrupt bit). Strangely, to set a bit 'on' in this register, write that bit with a zero. Similarly write the bit with a one to reset that bit. Any interrupts from the C-16 are recorded by the C-16 setting the appropriate bit of this register.

Timer Interrupts

It is interesting to note that these three timer interrupts can still be used even when the raster and interrupt requests have been disabled with the SEI command. This is the technique used in the saving and loading of programs in the C-16. The routine at $E364, for instance (Figure 1) is used before loading/saving a block/header in the C-16. The routine at $E378, shown in Figure 2, is the opposite of the routine of $E364 and is used after loading/saving a block/header.

However it is not always necessary to perform timing exercises using the method.
The Clock

The registers $0312 and $0313 are the low and high byte pointers for the 'update clock' routine which is called every 1/50th second by the C-16's service routine. This is usually set to $E2EA but can be redirected to go to a user routine. Figure 3 shows the assembly text for a clock which displays its time continuously in the top right hand corner of the screen. It also has an alarm with sound and a facility to jump to a machine code routine upon the event of an alarm. The clock redirects the pointers $0312 and $0313 (786 and 787) to a new service routine stored at $0660. The whole machine code program is 306 bytes long and resides between $0600 and $0728, a free area of memory in the C-16. To type this in use the C-16 Assembler published in the June 1985 copy of Your Commodore. Alternatively Figure 4 shows the code for this program in data statements with a machine code loader at 10000 to POKE the bytes in. The time and the alarm time can all be set with Basic commands. The routine is stored at $0600 (156 decimal).

Description of Clock Program

Lines 10120-10220 initialise the routines own variables.

Lines 10300-10380 turn off the clock by relocating the 'update clock' routine to its original value.

Lines 10500-10580 turn on clock; diverts 'update clock' routine to new service routine.

Lines 10600-10700 set time. To set the type, time: SYS1577.12:43:23. The latter three numbers are the time in minutes, seconds and hours.

Lines 10960 then turns the clock on.

Lines 10800-10910 set the alarm. This works in the same way as the 'set time' routine. It is located at $103D (4157 decimal), so SYS1601.12:43:23 sets the alarm and initialises it so that it sounds for 30 seconds when the alarm time is reached.

Lines 11000-11990 - clock service routine.

Lines 11060-11990 count each 1/50th second jumping to $E2EA if the next second has not been reached.

Lines 11200-11340 update seconds.

Lines 11400-11500 update minutes.

Lines 11550-11690 update hours, switching back to 00:00:00 after it reaches 23:59:59.

Line 11700 calls the routine which handles the alarm sound if it is on.

Line 11710 calls the routine to print the time on the screen.

Lines 11800-11860 check to see if the alarm time has been reached by comparing the time ($D9$F0) and the alarm time ($D9$F0) by byte by byte.

Lines 11900-11990 the alarm has been reached. Line 11910 calls the alarm sound subroutine which starts the alarm sound if it is required.

Lines 11950-11980 call a machine code routine whose address is stored in bytes $E2 and $E3, if $E6 is set.

Lines 12000-12200 - Alarm routine. This handles the 30 second bleeping alarm if it is on.

Lines 12105-12200 are concerned with the bleeping.

Lines 12500-12680 initialise alarm sound. If an alarm has been reached and the register $14 is > 0 to signify that the alarm sound is enabled, an alarm sound is generated in voice 2.

Lines 12550-12570 set the duration to 30 seconds.

Figure 5 shows a list of all the system variables used in the program.

Note that the machine code jump routine cannot last for any longer than 1/50th second. At the end of the routine a JMP $E2EA should be used to exit the routine.

In conclusion, to use the clock, first of all initialise by typing in SYS1536.

To set the time: SYS1577, 12:23:36.

To set the alarm: SYS1601, 07:35:26.

To turn off the clock: SYS1551.

Program 1: Clock Code

10000 A=1536:DO:B=0:FOR D=1TO 11700
Line 16:READ Dt IF Dt = -1 THEN PRINT I K.
10100 B=3:DO DPKA, D;bA=1:LINE T:READ
10200 IFDx=8 THEN PRINT E R D R = LINE, P E E K (163) + 256: P E E K (164) + 1: END: ELSE: D O P I
20000 DATA 169, 1, 133, 225, 169
20100 DATA 163, 231, 169, 0, 133, 229, 15
20200 DATA 201, 96, 120, 210, 186
20300 DATA 169, 66, 141, 18, 3, 67, 208, 141, 19, 3, 88, 96, 162, 32, 115, 4, 149
20400 DATA 209, 1214
20500 DATA 232, 138, 201, 8, 208, 245, 32, 28, 6, 32, 115, 4, 169, 0, 133, 208, 1759
20600 DATA 96, 162, 0, 32, 115, 4
20700 DATA 149, 217, 223, 138, 201, 8, 208, 2
20800 DATA 45, 169, 1, 1977
20900 DATA 5050 DATA 133, 228, 32, 115, 4, 96, 255, 0, 255, 0, 255, 0, 255, 0, 2, 11500 DATA 55, 0, 1883
21000 DATA 2060 DATA 230, 208, 165, 208, 2, 01, 50, 240, 0, 76, 46, 206, 162, 48
21100 DATA 169, 58, 169, 2250
21200 DATA 0, 133, 208, 230, 216, 196, 216, 208, 56, 134, 216, 230.

Program 1: Clock Text

40 GOTO 9000
100 E=0:For I=1To E=**
110 DO 4164(16, 41) IF D=80 THEN RD=** THEN RETURN
112 IF D=** THEN R=2 THEN E=0+1:End E THEN R

Figure 5 shows a list of all the system variables used in the program.

Note that the machine code jump routine cannot last for any longer than 1/50th second. At the end of the routine a JMP $E2EA should be used to exit the routine.

In conclusion, to use the clock, first of all initialise by typing in SYS1536.

To set the time: SYS1577, 12:23:36.

To set the alarm: SYS1601, 07:35:26.

To turn off the clock: SYS1551.
Bill Bremner begins a series designed to help you get the most out of your disk drive.

Before I try to explain how the 1541 Disk Drive works, let us discover what brought about its unique design and unravel some of its peculiarities.

Most modern computers employ an all-singing all-dancing (albeit expensive) Floppy Disk Controller or FDC to connect up to a disk drive. A software package called a Disk Filing System (DFS) or Disk Operating System (DOS) is then loaded into RAM or plugged in as ROM and manages the controller, to perform such tasks as formatting, reading, and writing. Of course, the more complex the DFS or DOS required, the more space is taken up inside the computer (the BBC micro uses the plug-in ROM method, Apple and Atari both load their software into RAM). There are quite a few advantages in using this type of system: fast loading and saving, and a variety of increasingly complicated and fashionable drives. However, the restraint on memory usage restricts the

---

![Diagram of the 1541 Disk Drive](image-url)

**Figure 1:**

- TO AND FROM COMPUTER
- 6522 VIA SERIAL BUS INTERFACE
- 6502 CPU
- DATA BUS
- ADDRESS BUS
- WRITE LOGIC
- ADDRESS DECODER
- 16K ROM
- 2K RAM
- R/W

![Diagram of the Data Block](image-url)

**Figure 2:**

- (NOT TO SCALE)
- HEADER BLOCK
- DATA BLOCK
- NEXT SECTOR

---

"6522 VIA TO AND DISK CONTROLLER FROM DISK INTERFACE"
versatility of supporting software, data storage is, on the whole, less efficient, and incompatibility problems often arise with third party and tape software.

The 1541 Disk Drive evolved from the 1540, which was designed for the Vic-20, and, because of the limited amount of memory in the Vic, Commodore had to find a way around a memory based DOS. So was born the 1540, an intelligent bus device which controlled all its own formatting, reading and writing, as well as intricate sequential and random-access file handling. Unfortunately, it was serial (sloooooooow), not parallel (fast), and it had quite a few bugs (it sometimes thought it was a dual drive, but, after all, anything was better than tape). When the 64 arrived on the home computer scene, it was decided a new disk drive should follow with it, but as the Vic was still selling, the new drive would have to be compatible with that too. So was born the 1541, still slow, still with bugs, but relatively cheap, quite efficient, and pretty reliable.

Because the drive is intelligent, and thus self-supporting, there is no need for either disk controller or dedicated disk software inside the 64. The control unit inside the 1541 is a 6502 based computer much like the Vic or 64, with RAM, ROM and interface chips. This means that at the end of your serial lead is a fast storage device, which, with a little understanding, can be programmed much the same as the host computer it is attached to.

Inside the 1541

If you are prepared to open up the 1541 you will find relatively little inside that looks like a computer. The circuit board, sitting atop the mains transformer and the drive mechanism, contains the control electronics at the front end, and the actual computer circuitry at the back. This is much more Spartan than the Vic or 64 boards, as it needs neither audio nor visual related chips. Two 6522 Versatile Interface Adaptors handle serial bus communication and control the drive mechanism, as well as supplying timing and interrupt facilities for the processor. The Disk Operating System software is held in two 8K ROM chips, and 2K of RAM not only provides the necessary workspace for the 6502, but is also used as buffer storage. A handful of other support chips, including an address decoder, complete the quota.

1541 Block Diagram

The 16K of DOS is split into two sections: the Interface Processor or IPF for short, which manages the host computer related functions such as file manipulation and serial bus communications, and the Floppy Disk Controller or FDC which controls the Read-Write head and data storage. The 6502 Processor has to share time between the FDC and the IPF, which often reduces the effective operating speed of the 1541. The FDC, IPF and Interface Chips will all be elaborated on individually as the series progresses, together with a full RAM memory map.

Disk Format

In order for the DOS to find its way around the disk a format routine is used to divide the disk surface up into tracks and sectors. 35 tracks are formatted in all, track one being the first and outermost, and track 35 the innermost, with the directory on track 1. Each Track is further divided up into 8 or more 256 byte sectors, numbered zero upwards. To pack as much data into the available space, Commodore adopted a scheme where the number of sectors on a track increases the further out, and thus longer, the track is. However, this method by itself would not have worked because even if the Read-Write head is positioned on track one or 35, it still takes the same amount of time for the disk surface to rotate once. The larger the track, the higher the velocity it has when it passes under the head, so to counter this the drive is actually written and read to and from the disk at a faster rate depending on how far out the track is. The data bits are “clocked” in and out at approximately 300,000 bits/sec on the outermost tracks and 250,000 bits/sec on the innermost. The track layout is divided into four different zones:

<table>
<thead>
<tr>
<th>Zone</th>
<th>Track No.</th>
<th>Sector Range</th>
<th>Sectors/Track</th>
<th>Clock Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1-17</td>
<td>0-20</td>
<td>21</td>
<td>307,692 bits/sec</td>
</tr>
<tr>
<td>2</td>
<td>18-24</td>
<td>0-18</td>
<td>19</td>
<td>285,714 bits/sec</td>
</tr>
<tr>
<td>3</td>
<td>25-30</td>
<td>0-17</td>
<td>18</td>
<td>266,667 bits/sec</td>
</tr>
<tr>
<td>4</td>
<td>31-35</td>
<td>0-16</td>
<td>17</td>
<td>250,000 bits/sec</td>
</tr>
</tbody>
</table>

Data Encoding Scheme

Commodore again opted for a more space-efficient recording method to store the individual bits on the disk. The most commonly-used storage scheme is FM (Frequency Modulation) which involves writing a stream of clocking bits, with a data bit occurring in between if a “1” needs to be written. This is expensive in data storage space and so the 1541 was designed to use a self-clocking method called Group Coded Recording, GCR for short (Apple micros also use GCR). Prior to being written on to the disk, every data byte is converted into a format which can neither be confused as a sync mark nor affect reading accuracy. This is achieved by splitting the byte into two halves, or four bit nibbles, and using a look-up table in the GCR to convert each half into a five bit result.

For example, to convert the eight bit byte $A5 (10100101) to GCR, the byte is first split into two four bit half-order nibbles 1010 and 0101. Using the conversion table these nibbles now become 11010 and 0111 respectively, and so our completed GCR byte is 1101001111. Using Group Codes Recording, no combination of any five bit GCR nibbles will ever produce nine consecutive binary ones (used as a sync mark), and no more than two consecutive binary zeros will appear in a 10-bit GCR byte or combination of bytes (this is for speed accuracy when clocking bits back into the 1541 during a read). However, we now have a problem when manipulating this data. The 6502 can address only one eight bit byte at a time, whereas our new byte is now 10 bits long. Therefore the conversion routine inside the DOS actually converts four bytes at the same time. This is the minimum number of bytes that can be converted by an eight bit processor (4 x 10-bit bytes = 40 bits = 5 * 8-bit bytes). Thus, when writing data, four eight bit bytes are collated and then converted into four GCR 10-bit bytes.
bytes, and written as five eight bit bytes. This all sounds a bit confusing (if you'll pardon the pun) so I'll show you an example:

4 8-bit bytes: $08, $AA, $01, $01
in Binary: 00010000, 10101010, 00000001, 00000001

4-bit nibbles: 0000, 1000, 1010, 1000, 0001, 0001, 1001, 1001
in 5-bit GCR: 01010, 01010, 11010, 11010, 01010, 01011, 01010, 01011.
in 8-bit GCR: 01010100, 01110101, 10001000, 10101010, 00010110, 00010001, 00010000, 00010001
in hex: $52, $75, $A5, $2D, $4B.

Thus our original four eight bit bytes $08-$AA-$01-$01 are actually written on to the disk surface as $52-$75-$A5-$2D-$4B. Reading GCR bytes off the disk is merely the process reversed.

5 GCR bytes: $52, $75, $A5, $2D, $4B, in 8-bit GCR: 01010010, 01110101, 00010110, 00010001, 00010001, in Binary: 00010000, 10101010, 00000001, 00000001, 00000001, 00000001, 4 8-bit bytes: $08, $AA, $01, $01

Simple, really!

**Sector Format**

Each sector on a track is comprised of two main parts: the Header Block, or ID Field, which supplies information on the position of the sector, and the Data Block of data. Preceding each of these fields is a unique synchronisation Field or Sync Mark, used to identify the beginning of the block and immediately following the block is a short gap which gives the FDC breathing space to allow for fluctuations in drive speed. The sector header is written only once, during formatting, but the data field, including its sync mark, is re-written every time data needs to be recorded on the disk.

**Header Block**

a) Sync Mark: Written as five eight bit GCR $FF$ bytes (40 consecutive one bits) the sync mark is a flag to tell the DOS that a block is coming up next.
b) Header Block ID: This is the Block Identifier Byte which informs the DOS that this is a header field. Its value is always $08.
c) Header Block Checksum: This is the header field checksum byte created by FORing together the track number, sector number and the two IDs.
d) Sector Number: Numbered consecutively from zero upwards.
e) Track Number: Position of the track on the disk.

f) ID2 and ID1: These are the formatting IDs specified in the instruction "ID2(ID1,ID)" where ID1 is ID1 and ID2 is ID2 (Note: ID2-ID1 is the correct order as written on the disk). These are the IDs that the DOS uses the initialisation and during all read and write operations, not the "cosmetic" IDs found in sector 100.

h) $00$ Bytes: These are filler bytes used as padding when the DOS is converting the header from or into GCR (Remember: the DOS uses four eight bit bytes at a time for GCR conversion). These bytes are never referenced again by the DOS after formatting.
i) Header Gap: Eight eight bit GCR $55$ (01010101) bytes providing the DOS with breathing space between the header and data fields.

**Data Block**

k) Sync Mark: Warns the DOS a block is coming up.
l) Data Block ID: Informs the DOS that this is a Data Block. Its value is always $07.
m) Data: 256 Bytes of user data.
n) Data Block Checksum: This the data field checksum byte created by FORing all the 256 Bytes of data together.
o) $00$ Bytes: Filler bytes used as padding during GCR conversion.
p) Inter-Sector Gap: This is also known as the Tail Gap, and its size varies between four and 12 eight bit GCR $55$ bytes, supplying the DOS with space between each sector to allow for fluctuations in drive speed. Its size is determined during the format sequence, which contains a routine which times how long the disk takes to rotate once. The gap size is calculated from this timing, and so explains not only why the format routine takes so long, but also why "Fast Formatters" are occasionally unreliable. Commodore used fixed gap formatting on earlier drives but found that the last sector on the track sometimes over-wrote the first slightly. Fast Formatters use fixed-gap formatting (usually eight bytes long).

Our sector is now larger and much more complicated than at first sight. Its actual size is calculated like so:

### Data Block

<table>
<thead>
<tr>
<th>Section</th>
<th>8-bit Hex</th>
<th>8-bit GCR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sync Mark 1</td>
<td>8 bytes</td>
<td>5 bytes</td>
</tr>
<tr>
<td>Header</td>
<td>10 bytes</td>
<td>8 bytes</td>
</tr>
<tr>
<td>Header Gap</td>
<td>8 bytes</td>
<td>5 bytes</td>
</tr>
<tr>
<td>Sync Mark 2</td>
<td>325 bytes</td>
<td>4-12 bytes</td>
</tr>
<tr>
<td>Data Block</td>
<td>260 bytes</td>
<td></td>
</tr>
<tr>
<td>Data Gap</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL**: 357-65 bytes long
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SO YOU'VE WRITTEN SOME PROGRAMS?

SO WHY HAVEN'T YOU SUBMITTED THEM TO US?

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You may not have written any software yourself, but you may have very firm opinions about the world of Commodore and all its attendant industries and products. If you do, then put your views or questions on paper and post them to us again at the address below - you might even get paid for airing your views!

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...why would anyone play anything else?
Stuart Cooke takes a look at a new range of disk based budget software.

If you've ever wanted to buy a wordprocessor, database or any other type of business software for use with your Commodore computer then you will have been amazed at the price. It is not unheard of for over £100 to be asked for a wordprocessor. A few companies, notably Supersoft and Mastertronic, have produced a few cheap, 'professional' programs at around the £15 mark. Now a new range of disk based budget software is set to hit the streets at a price of only £7.99. This makes it far cheaper than a great deal of software that is available on cassette.

So what's the drawback? A disk for only eight quid must have at least one fault. Well, there are a few corners cut in getting this software out so cheaply. There is no fancy packaging. A clear plastic pack is used so that the disks can hang on pegs in shops. There are no manuals with the software, the instructions on the packet simply tell you how to load the program. Finally, most of the programs are in Basic.

Don't let any of the above factors put you off the software though. The lack of instructions is usually - I say usually because one important program has no instructions - overcome by very clear help options within the program. Even though many of the programs are written in Basic, they all work extremely well and do what they should. In fact many of the programs in the range work better and look better than their more expensive competitors.

The name of this new range of software is Load 'N' Go! The range is imported over from America. In the States the programs sell extremely well in supermarkets with a price tag of around $8. Who knows, we may soon be able to buy a Wordprocessor at the same time as our cornflakes.

Load 'N' Go! software falls into a number of different series. The series that is being marketed over here at the moment is the 'Home Management Series'. A lot of this range of software could be put to good use in either a small business or at home; its main purpose is to make life easier for you.

So what's the software really like? The best way to answer this question is to have a look at some of the packages individually.

Love Letters

At £7.99 Master Word must be the cheapest wordprocessor available. It has many of the functions of its dearer companions such as search and replace and the ability to set line spacing and margins. It does however lack the more 'up market' fancy bits such as page numbering and headers and footers. Another

Wordprocessor is due to be released at a later date that will have all of these facilities plus many more.

As wordprocessors go this one isn't particularly fancy. It will however regurgitate your latest masterpieces without complaining at all. In fact if you're not too good with the old pen a selection of Business letters (You're fired etc), Home letters (birthday etc) and love letters (Yuck!!!) are provided on the disk.

Adding it up

Another program in the series is 'Personal Spreadsheet'. This one is a little disappointing. For a start there are no clear instructions anywhere. There are no help functions, except with the different types of calculation. This means that the only way to figure out what the package does is to actually use it. If you have never come across a spreadsheet before then I suggest that you find out what one is and how it works before you look at this program. If you have already used a spreadsheet then you will more than likely be disappointed with this package.

Basically 'Personal Spreadsheet' is a glorified calculator. You can store numbers in the columns and rows and then perform simple calculations on them. You cannot set up formulae in locations as you can on other spreadsheets. Since a spreadsheet is supposed to help you if you have a lot of formulae to work with, I think this program is the biggest let down of the pack. A normal calculator will perform the same job as this program, and a lot quicker.

On Time

If, like me, you are always forgetting appointments or forgetting what time you are supposed to be somewhere, you will find 'Electronic Scheduler' a must.

This program is used for recording all appointments. You are asked for the name of the person who the appointment is for, this means that you could put the whole office appointments into this program. What time and date the appointment is for, who the appointment is with, where it is and any comments that you need.

Once you have entered the data you can search for all meetings for a certain person after certain dates. You can list all
meatings between dates. It is even possible to print details of all meetings at a certain place or with certain people.

How on earth did I ever manage without this one?

Money Matters

A couple of financial organisers are included in the series. These are 'Pro Financial Organiser' and 'Home Finance Organiser'. Both disks offer checkbook and address list programs while the financial organiser also has a calendar and the Home finance package has a budget program.

One very nice feature in the Mail List manager on the Pro disk is the ability to code names and addresses, with say an 'F' for friend or 'B' for business. When you want to print out your labels you can then print them out for just one group.

A very nice 'extra' is the Christmas card list. For each record you must specify whether you want them on your Christmas card list or not. You can then get a count of how many Christmas cards you will need and then get the computer to print out all the labels.

The calendar is one of those silly 'PLEASE GIVE ME THE YEAR' type of programs. You know, you give it the year and the month and it prints out a calendar for you. One extra feature is the ability to highlight a specific date. This would be great if you could highlight all dates with say birthdays of friends but since you can only highlight one day in every month this is probably out of the question. What a silly fault!

The titles explain the functions of the other programs on these disks and I don't think that I need say anything more about them apart from that they work well. In fact if you used either of the chequebook programs you would know exactly how your finances were at any time.

Both disks are good in certain areas. If you want addresses then go for the Pro finance pack, if you want budgeting and cheques then I think that the Home finance pack is a little better.

The packs are so cheap that it may well be worth buying both.

More Info

If you require more information with your adress file then you could have a look at the Home and Business Card File disk.

This is very similar to the address programs that are mentioned above but it also allows fields for business and telephone numbers. I did have a few problems with this program. For a start there wasn't enough room for many of the addresses that I tried to enter and secondly they are in the American format of City, State and Zip. Since the programs are in Basic it would only have been a simple task to turn these formats into 'English'. It may even be possible to make the changes yourself.

Even better than this is 'g' base. This is a proper database program. By proper, I mean that you can define your own fields for data entry. This means that if you wanted to make an address list you aren't stuck with ZIP etc. If you wanted you could even use the program to keep a catalogue of your records or stamps. In fact 'g' base can be used to store information about anything that you could put on a card. Having the information on computer means that it is a simple task to find specific details or print out a list etc.

Keeping Tabs

Obviously with disk software becoming so cheap the number of disks in your collection is bound to grow. How on earth are you going to keep track of them all?

Well, 'Disk Utilities' will solve this problem for you. This program will store information on up to 300 disks. You can search for a specific program and you will be told what disk it is on. You can get a print out of the directories of all your disks. I even possible to print out a list of all the IDs that you have used. As you are probably aware the Commodore disk drive uses a two digit ID to identify each disk. If two disks have the same ID, the disk drive may not know if you swap the disk, thus messing up the contents.

The list of used IDs is printed in the form of a grid with letters and numbers being across the top and edge of the grid. It is now easy to mark off new disks as you format them.

As well as the catalogue program there is also a utility program. This will allow you to backup disks (not protected ones), format disks etc.

At a price of only £7.99 this disk is a must for any disk drive owners.

Verdict

Most of the programs available are around the same quality as a good magazine listing. There are all functional and do what they set out to do without any frills.

At £7.99 this software should make a very big impact on the home/small business market, perhaps with the same sort of impact that Mastertronic made when it launched its £1.99 tapes.

Who knows, good software at this price may make people start to use their computers for something other than games, this wouldn't be such a bad thing.
Eric Doyle has been trying out a real hardware bargain.

WHEN I READ THAT THE IBICO LTR-1 printer claimed letter quality printing and that the price was less than £100, my immediate reaction was, to say the least, one of disbelief. After unpacking the beast I remained unimpressed, the printer head looked very Mickey Mouse-ish but when I tried printout my attitude changed.

Surprisingly, the machine does produce letter quality and it does so in a very novel way. The printer head resembles an office date stamp. You know the kind, rotate the wheels to get the correct date, then ink the rubber-faced letters on a pad and stamp away. In this novel little printer the characters are carried on a cylinder which carries four bands of characters. At the back of the wheel is an inked cylinder which brushes against the letters as they rotate and each character is pressed against the paper when required to produce very high quality letters. High-tech still has a place for the good old principles pioneered by Guttenberg!

The limitation of the printer lies in the fixed roller idea. The characters you get are the ones you’re stuck with. No graphics screen dumps or characteristic Commodore symbols, just plain and simple alphanumerics and punctuation.

The paper is friction fed through the printer with no facilities for tractor feeding. This means that as a cheap printer for wordprocessing applications it can use high quality, headed paper. Indeed, a good wordprocessor would be a boon to anyone owning this machine because it doesn’t have a ‘paper out’ indicator. When the printer reaches the bottom of a page, the platen loses its grip on the paper and the head carries on printing to and fro across the same line. A wordpro with the facility to stipulate a page length would overcome this fault.

For most people the main application they would look for is the ability to print out listings of their latest project for a leisurely debugging session. Obviously the problem here is that most listings fill more than a sheet of A4 paper and estimating how many lines to a page would be a nightmare. I found that normal A4 tractor feed paper would not fit the platten mounting but you can buy paper which is A4 width including the perforations and this is fine for most purposes as long as the paper doesn’t slip in the platten rollers.

Control of the printer is limited to the basic character codes of the Commodore. For example, CHR$(10) followed by CHR$(13) will initiate a line feed and home the printer to the beginning of the next line. CHR$(28) sets the printer to normal line spacing and CHR$(29) will allow double spacing for extra clarity.

The number of characters available is limited to 126. This includes all the alphabet to that of a daisywheel. Because the printer face has to move up and down the paper frequently, this means that a speed of 10-12 characters per second is the maximum that can be achieved. In real terms this means that a 60-line page of A4 text will take about five minutes to print which is not too bad considering the quality.

The total size of the printer is about 12 inches by nine by two, which means that it takes up very little room on a desk and the only control is the paper advance and the on/off switch so it is not too complex to use.

My only qualms about this machine are the tendency of the friction feed to slip and the problem of what happens when the print head wears down. To be
David Gartrell helps you get your finances in order with the help of your C64.

If you're tired of wondering just how much money you've got in the bank and whether you're going to last until your next pay packet comes through, then look no further. This program can be used to monitor all of your incoming and out-goings so that you, and not your bank manager, are the first to know where you stand, financially speaking.

Introduction

Using Budget 64 you can divide your bank account into a maximum of 20 separate categories, each covering a different section of your finances, e.g. gas, electricity, etc.

Before we delve into the workings of the program, there are one or two things to remember. The structure of the program is such that, when it is working at full capacity, it uses nearly all of the available memory. Only 2-3k remains. Also, from time to time, pauses will occur. This does not mean that the computer has crashed. Just wait for a few seconds and it will carry on. The delays are caused by the complexity of the program, the many variables used and the amount of memory involved.

When the program is first run, you are presented with a title screen and a question: 'LOAD OLD FILE Y/N', if you are starting afresh, then type 'N'. Details of loading your file will be explained later.

Next the computer will ask you how many categories you want. These are the different sections of your bank account. Enter the number you want plus one, then enter their names.

The first category is pre-set as 'MASTER SHEET' and combines all the others to give a grand total.

Once all the names have been entered, the main menu is displayed. Pressing a key will display up to three pages of transactions for each category. You have the choice of display on the screen, the 1520 Printer Plotter or a standard printer. The printer used when this program was written was a Star SG-10C dot matrix printer. However, using other printers should cause no problems.

Included in the display are reverse characters to identify the origin of each transaction. Press the key followed by the character of the transaction which you wish to identify.

At the bottom of the main menu is 'OTHER OPTIONS'. These are:

**ACTIVATE ACCOUNT:** Enables you to add or subtract from any of your categories. The process is straightforward and simple.

**SAVE A FILE:** Will save your file on tape. The option of an access code is included to prevent other people from loading your file.

**ENTER WAGE:** This option can be used if, for instance, you wanted to divide £100 between different categories. Enter the total amount deposited and press return. The amount will be displayed on the other options menu and any other areas where this could be useful. As you spread your money between the categories, the amount you entered will decrease. When it reaches zero it will disappear.

Options E and F work together with option D. If you remove the messages from the screen, the amount will remain the same until you bring it back.

**RE-NAME CATEGORY:** Choose the category which you wish to rename. Make sure that it is empty of money as its memory will be cleared when you rename it.

**MONEY TRANSFER:** Enter the two categories involved, then proceed as for 'ACTIVATE ACCOUNT'.

**ADD A CATEGORY:** Type in the name of the new category.

**PERFORM CALCULATIONS:** If you want to do any arithmetic you can use this option.

Finally to load your file, press 'Y' at the start. Then enter your access code if you have one.

---

**PROGRAM: BUDGET64**

```plaintext
1 PRINT CHR$(14):POKE 33280,9:POKE 33281,11
2 PRINT"ICLEAR,C1,RVSON,SPC16,RVSOFF,YELLOW,SB,SO,SG,ST1-64(RVSON,C1,SPC15)"
3 GOSUB 7000
4 PRINT"LOAD4,YELLOW,SFC7,SNRITTEN BY:SGC,SOJAVO(SGC,6GARTELL"
5 PRINT"NOWN4,YELLOW,SFC7,SNRITTEN BY:SGC,SOJAVO(SGC,6GARTELL"
6 PRINT"LOAD4,YELLOW,SFC7,SNRITTEN BY:SGC,SOJAVO(SGC,6GARTELL"
7 A=**"GET A:IF A=""THEN 7
8 IF A=""THEN OPEN 1,1:5OTO 24
9 IF A=""THEN 7
10 PRINT"ICLEAR,C1,RVSON,RPC15,RVSOFF,YELLOW,SB,SO,SG,CIC"
11 OPEN 1,1,8,AC=101,DIM A(21),D(21,50),DE(21,50)
12 PRINT"LOAD4,YELLOW,SFC7,SNRITTEN BY:SGC,SOJAVO(SGC,6GARTELL"
13 GET C:IF C=""THEN 13
14 IF C=CHR$(13)THEN 16
15 AC=AC+AC:PRINT"*:16OTO 13
16 AC=AC+AC:PRINT"*:16OTO 13
17 OPEN 1,1,8,AC=101,DIM A(21),D(21,50),DE(21,50)
18 PRINT"LOAD4,YELLOW,SFC7,SNRITTEN BY:SGC,SOJAVO(SGC,6GARTELL"
19 PRINT"(HOME,DOWN)"FOR I=1 TO 20:PRINT"(SPC39)"NEXT 20 INPUT"A
21 FOR B=1 TO A:INPUT1,AB(B):INPUT1,R(1,B)
22 FOR B=1 TO R(1,B)-1:INPUT1,DA1(B,B)
```

---

The introduction continues with detailed instructions for using the program, how to add categories, transfer money, and perform calculations. It also includes a sample code snippet for loading the program. The code is written in Basic, with specific instructions for loading and manipulating data.
22 INPUT#1,DE(B,B):INPUT#1,MI(B,B):INPUT#1,BA(B,B)
23 :INPUT#1,XX(B,B):NEAT BB,B
24 PRINT"(CLEAR, C1, RVSON, SPC16, YELLOW, RVSOFF, S6, SU, SE, SS, SE, ST3-14C1, RVSON, SPC15)" 25 GOSUB 7000
26 PRINT"ICDOWM, BLACK, THE MAXIMUM NUMBER OF CATEGORIES YOU CAN"
27 PRINT"UP HAVE IS TWENTY." 28 PRINT"IDOWN2, CYAN, SM0. OF CATEGORIES" : INPUT A
29 IF A < 1 OR A > 20 THEN PRINT"UP, SPC12, UP", : GOTO 28
30 DIM A(1), DA(21,50), DE(21,50), WI(21,50), BA(21,50), RO(21,50), XX(21,50)
31 A(1)="ISMASTER SHEET": FOR B = 1 TO A:ROX(B)=1:NEXT
32 PRINT"IDOWN2, SCATEGORY 1 HAS BEEN AUTOMATICALLY SET AS:" 33 RVSON, SMASTER SHEET" 34 IF A = 1 THEN 35
35 PRINT"IDOWN2, C63": FOR B = 2 TO A:PRINT"(SCATEGORY B:" 36 = (IDOWN2, C71): INPUT A(B)
37 PRINT"UP, SPC15, UPS, C63":NEAT
38 PRINT"ICLEAR, C1, RVSON, SPC16, RVSOFF, YELLOW, SM, SA, SI, SN,
39 SPC, SM, SE, SE, SU, RVSON, C1, SPC15)"
40 PRINT"RED, UP, CT46, WHITE3": 41 DEF FN(KL)=INT(KL/100.5)/100
42 S=1:GOSUB 112
43 PRINT TAB(11)"(C63"CHRM(A+65)=" OTHER OPTIONS."
44 PRINT"WHITE, RVSON, SG, SH, S0, SS, SE, RVSOFF):=" 45 IB=1:GET BI="THEN 41
46 X=ASC(B1)-64:IF X < 1 OR X > 1 THEN 41
47 IF X=1 THEN 114
48 PRINT"CLEAR, DOWNZ, SWITCH PAGE :=, 2 OR 3" 49 GOSUB 355:PRINT"IDOWN, SCURRENT PAGE :=:"A1
50 GET A1:IF VAL(A1S) < 1 OR VAL(A1S) > A THEN 46
51 GOSUB 250
52 A3=215:IF ROX(X)=A3 THEN A3=ROX(X)-1
53 PRINT"CLEAR, DOWNZ, DISPLAY ON:" 54 PRINT"IDOWN3= SCREEN":PRINT "4 =SPC, SPIRINTER"
55 :PRINT "= ISPRINTER(ISPILOTTER"
56 GET VS:IF YE="THEN 51
57 IF Y=4="THEN CLOSE 1:OPEN 1,4,7:PRINT1,CHR$(14)
58 :GOTO 57
59 IF Y=3="THEN GOTO 57
60 IF Y=2="THEN 51
61 CLOSE 1:OPEN 1,6
62 PRINT06,1:OPEN 2,6,1
63 GOSUB 287
64 IF Y=3="THEN PRINT1:
65 PRINT:PRINT1,CHR$(13):CLOSE 1
66 GOTO 68
67 PRINT1="BLACK, UP1, SPC23DETAILS(SPC43DEPOSIT)
68 PRINT2="SPC23WITHDRAWAL BALANCE"
69 PRINT1="END" :PRINT1,CHR$(13)
70 IF Y<>4="THEN PRINT1,CHR$(13):CLOSE 1
71 PRINT1,CHR$(15):CLOSE 1
72 GOTO 68
73 FOR P=1 TO ROX(X):DA$(X,P-1)=DA$(X,P)
74 DE(X,P-1)=DE(X,P):WE(X,P-1)=WE(X,P)
75 BA(X,P-1)=BA(X,P)
76 XX(X,P)=XX(X,P):NEAT
77 RETURN
78 FOR B=A2 TO A3
79 PRINTUP,CR", :FOR B=0 TO A3:B=CHR$(B+64)
80 PRINTTAB(11)CHR$(B+64)" = A$"
113 NEXT: RETURN
114 PRINT"CLEAR, RVSON, C1, SFC1, RVSOFF, YELLOW, SO, ST, SH, SE, SRI, ISO, SF, ST, SI, SO, SN, SB, RVSON, C1, SFC121"
115 GOSUB 7000
116 IF WS<1 AND Y=8 THEN WS=0
117 IF WS=1 THEN LK=Y+Y+GOSUB 24:PRINT"UP, YELLOW, RVSON, SWAGE LEFT" :- ="BA"
118 PRINT TAB(8)"DOWN,C8, SPC1A =ISPC, SCAITIVATE ACCOUNT." :PRINT TAB(8)" B =SPC,S SAVE A FILE.",
119 PRINT TAB(8)" C =ISPC, SRRETURN TO MAIN MENU." :PRINT TAB(8)" D =ISPC, SRETURNT-wage."
120 PRINT TAB(8)" E =ISPC, SCONJACE WAGE MESSAGE." :PRINT TAB(8)" F =ISPC, SNAME WAGE MESSAGE.",
121 PRINT TAB(8)" G =ISPC, SNAME CATEGORY." :PRINT TAB(8)" H =ISPC, SD MONEY TRANSFER."
122 PRINT TAB(8)" I =ISPC, SD MONEY CATEGOR."
123 PRINT TAB(8)" J =SE-2-RUN PROGRAM." :PRINT TAB(8)" K =SPC, SEXECUTE CALCULATIONS." ,
124 PRINT TAB(8)" L =SPC, SPRINT ACCOUNTS.
125 PRINT"WHITE, DOWN, RVSON, SC, SH, SO, SS, SE, RVSOFF, SPC1:" :PRINT"WHITE, DOWN, RVSON, SC, SH, SO, SS, SE, RVSOFF, SPC1:" :- ="BA"
126 GET BS: IF BS=":" THEN 126
127 X=ASC(BS)-64: IF BS<6 THEN 156
128 GOSUB 207
129 IF WS<1 AND Y=8 THEN WS=0
130 IF WS=1 THEN LK=Y+Y+GOSUB 24:PRINT"UP, YELLOW, RVSON, SWAGE LEFT" :- ="BA"
131 PRINT TAB(8)"DOWN,C8, SPC1A =ISPC, SCAITIVATE ACCOUNT." :PRINT TAB(8)" B =SPC, S SAVE A FILE.",
132 PRINT TAB(8)" C =ISPC, SRRETURN TO MAIN MENU." :PRINT TAB(8)" D =ISPC, SRETURNT-wage."
133 PRINT TAB(8)" E =ISPC, SCONJACE WAGE MESSAGE." :PRINT TAB(8)" F =ISPC, SNAME WAGE MESSAGE.",
134 PRINT TAB(8)" G =ISPC, SNAME CATEGORY." :PRINT TAB(8)" H =ISPC, SD MONEY TRANSFER."
135 PRINT TAB(8)" I =ISPC, SD MONEY CATEGOR."
136 GET BS: IF BS=":" THEN 126
137 X=ASC(8S)-64: IF BS<6 THEN 156
138 GOSUB 207
139 IF WS<1 AND Y=8 THEN WS=0
140 IF WS=1 THEN LK=Y+Y+GOSUB 24:PRINT"UP, YELLOW, RVSON, SWAGE LEFT" :- ="BA"
141 LK=BS(RVZ1X)+1:GOSUB 24
142 PRINT"DOWN,C8, SD MONEY ACCOUNT : ="BA"
143 :PRINT"DOWN,C8, SD MONEY ACCOUNT :
144 PRINT"WHITE, DOWN, RVSON, SC, SH, SO, SS, SE, RVSOFF, SPC1:" :- ="BA"
145 BS=":" GET BS: IF BS=":" THEN 145
146 IF VAL(8S)<1 OR VAL(8S)>3 THEN 145
147 IF BS<1 THEN Y=TS=IYELIWH, RYSON, SA, SE21:
148 IF BS<1 THEN Y=TS=IYELIWH, RYSON, SA, SE21:
149 IF BS<1 THEN Y=TS=IYELIWH, RYSON, SA, SE21:
150 IF BS<1 THEN Y=TS=IYELIWH, RYSON, SA, SE21:
151 PRINT"DOWN,C8, SD MONEY ACCOUNT : ="GOTO 168
152 PRINT"UP, RED, C748, C8, DOWN4"
153 CLOSE 0
154 PRINT"DOWN2, 8887 YOU WANT TO HAVE AN ACCESS CODEISPSC, SVY/SNF*"
155 GET WS: IF WS=":" THEN 155
156 IF WS=WS THEN 159
157 PRINT"RVSON,C6, SEINTER ACCESS CODE =ISPC, C31;"
283 PRINT CLEAR, C1, RVSON, SPCl2, YELLOW, RVSOFF, SBE NAME CATEGORY [RVSON, C1, SPCl3]
284 GOSUB 7000
285 PRINT "DOWN, WHITE, PRINT CURRENT CATEGORY ""/#"" IS "":
PRINT "RVSON, C1"
286 PRINT "DOWN3, GREEN ENTER NEW CATEGORY ""/#"":"
1: INPUT A4(X):GOSUB 1104
287 PRINT CLEAR, C1, RVSON, SPCl4
288 LEN(A4(X):GOSUB 7000:RETURN
289 PRINT CLEAR, C1, RVSON, SPCl5, RVSOFF, YELLOW, SM1
    ONE#Y TRANSFER [RVSON, C1, SPCl3]
290 GOSUB 7000
291 S=2:GOSUB 112:PRINT "ST10 TRANSFER FROM CATEGORY "":INPUT C6#
292 IF C6#="" THEN 114
293 P0=A6C1C:64:GOSUB 260
294 C=A6C6(1)/4:IF BA(1, RO2(1)=1) THEN 219
295 PRINT "CLEAR, DVNS, YELLOW, RVSON, RIGHTS, SN, SO, SP, SM, SN, SE, SY, SP, SF, SM, B, BR, BA, SA, SN, SS, SF, BR, S1'
296 FOR T=1 TO 1500:NEAT:GOTO 114
297 PRINT CLEAR, C1, RVSON, SPCl7, RVSOFF, YELLOW, SM1
    ONE#Y TRANSFER [RVSON, C1, SPCl3]
298 GOSUB 7000
299 S=2:GOSUB 112:PRINT "ST10 TRANSFER FROM CATEGORY "":INPUT C6#
300 IF C6#="" THEN 114
301 IF BA(C, RO2(C)) THEN 219
302 PRINT "CLEAR, C1, RVSON, SPCl8, RVSOFF, YELLOW, SM1
    ONE#Y TRANSFER [RVSON, C1, SPCl3]
303 GOSUB 7000
304 C=A6C(C)=64:CC=A6C(C)=64
305 PRINT "DOWN, WHITE, PRINT CURRENT CATEGORY "":PRINT "RVSON, A6C1C"
306 VX=A6C6(1)/4:IF BA(C, RO2(C)) THEN 219
307 PRINT "CLEAR, DVNS, YELLOW, RVSON, RIGHTS, SN, SO, SP, SM, SN, SE, SY, SP, SF, SM, B, BR, BA, SA, SN, SS, SF, BR, S1'
308 FOR T=1 TO 1500:NEAT:GOTO 114
309 PRINT CLEAR, C1, RVSON, SPCl9, RVSOFF, YELLOW, SM1
    ONE#Y TRANSFER [RVSON, C1, SPCl3]
310 GOSUB 7000
311 S=2:GOSUB 112:PRINT "ST10 TRANSFER FROM CATEGORY "":INPUT C6#
312 IF C6#="" THEN 114
313 IF BA(C, RO2(C)) THEN 219
314 PRINT "CLEAR, C1, RVSON, SPCl5, RVSOFF, YELLOW, SM1
    ONE#Y TRANSFER [RVSON, C1, SPCl3]
315 GOSUB 7000
316 C=A6C(C)=64:CC=A6C(C)=64
317 PRINT "DOWN, WHITE, PRINT CURRENT CATEGORY "":PRINT "RVSON, A6C1C"
318 VX=A6C6(1)/4:IF BA(C, RO2(C)) THEN 219
319 PRINT "CLEAR, DVNS, YELLOW, RVSON, RIGHTS, SN, SO, SP, SM, SN, SE, SY, SP, SF, SM, B, BR, BA, SA, SN, SS, SF, BR, S1'
320 FOR T=1 TO 1500:NEAT:GOTO 114
321 PRINT CLEAR, C1, RVSON, SPCl9, RVSOFF, YELLOW, SM1
    ONE#Y TRANSFER [RVSON, C1, SPCl3]
322 GOSUB 7000
323 S=2:GOSUB 112:PRINT "ST10 TRANSFER FROM CATEGORY "":INPUT C6#
324 IF C6#="" THEN 114
325 PRINT CLEAR, C1, RVSON, SPCl4, RVSOFF, YELLOW, SM1
    ONE#Y TRANSFER [RVSON, C1, SPCl3]
326 GOSUB 7000
327 C=A6C(C)=64:CC=A6C(C)=64
328 PRINT "DOWN, WHITE, TRANSFER FROM "":PRINT "RVSON, A6C1C"
329 VX=A6C6(1)/4:IF BA(C, RO2(C)) THEN 219
330 PRINT "CLEAR, DVNS, YELLOW, RVSON, RIGHTS, SN, SO, SP, SM, SN, SE, SY, SP, SF, SM, B, BR, BA, SA, SN, SS, SF, BR, S1'
331 FOR T=1 TO 1500:NEAT:GOTO 114
332 PRINT CLEAR, C1, RVSON, SPCl5, RVSOFF, YELLOW, SM1
    ONE#Y TRANSFER [RVSON, C1, SPCl3]
333 GOSUB 7000
334 S=2:GOSUB 112:PRINT "ST10 TRANSFER FROM CATEGORY "":INPUT C6#
335 IF C6#="" THEN 114
336 PRINT CLEAR, C1, RVSON, SPCl8, RVSOFF, YELLOW, SM1
    ONE#Y TRANSFER [RVSON, C1, SPCl3]
337 GOSUB 7000
338 C=A6C(C)=64:CC=A6C(C)=64
339 PRINT "DOWN, WHITE, TRANSFER FROM "":PRINT "RVSON, A6C1C"
340 VX=A6C6(1)/4:IF BA(C, RO2(C)) THEN 219
341 PRINT "CLEAR, DVNS, YELLOW, RVSON, RIGHTS, SN, SO, SP, SM, SN, SE, SY, SP, SF, SM, B, BR, BA, SA, SN, SS, SF, BR, S1'
342 FOR T=1 TO 1500:NEAT:GOTO 114
343 PRINT CLEAR, C1, RVSON, SPCl9, RVSOFF, YELLOW, SM1
    ONE#Y TRANSFER [RVSON, C1, SPCl3]
344 GOSUB 7000
345 S=2:GOSUB 112:PRINT "ST10 TRANSFER FROM CATEGORY "":INPUT C6#
346 IF C6#="" THEN 114
347 PRINT CLEAR, C1, RVSON, SPCl4, RVSOFF, YELLOW, SM1
    ONE#Y TRANSFER [RVSON, C1, SPCl3]
307 IF LEN(W$)=5 THEN G$="ISPC41"
308 IF LEN(W$)=6 THEN G$="ISPC51"
309 IF LEN(W$)=7 THEN G$="ISPC21"
310 IF LEN(W$)=8 THEN G$=" "
311 IF LEN(B$)=4 THEN R$="ISPC1"
312 IF LEN(B$)=5 THEN R$="ISPC31"
313 IF LEN(B$)=6 THEN R$="ISPC41"
314 IF LEN(B$)=7 THEN R$="ISPC21"
315 IF LEN(B$)=8 THEN R$="ISPC51"
316 IF LEN(B$)=9 THEN R$=" "
317 IF LEN(B$)=10 THEN P$="ISPC41"
318 IF LEN(B$)=11 THEN R$="ISPC31"
319 IF LEN(B$)=12 THEN R$="ISPC51"
320 GOTO 78
321 PA$=" AAAAAAAAA:PE$="ISPC0"AAA"
322 FB$="ISPC11399999.99"
323 FC$="ISPC21399999.99"
324 FD$="ISPC31399999.99"
325 FE$="ISPC9393A"
326 OPEN 5,1:OPEN 6,4,6:OPEN 10,4,10
327 OPEN 2,4,2
328 OPEN 1,4,7:PRINT 1,CHR$(14)
329 PRINT,CHR$(14):RETURN
330 PRINT"[BLACK,CLEAR]"
331 INPUT"[BLACK,CLEAR]":CL
332 : 
333 PRINT"[DOWN,C5,RVSON,SC,SH,SO2,SE,SE]

> (RVSOFF, BLACK)"
334 PRINT"[ISPC,SAID]:PRINT"2 =ISPC SSUBTRACT"
335 PRINT"3 =ISPC,SMULTIPLY":PRINT"4 =ISPC,SDIVIDE"
336 PRINT"5 =ISPC,6ANSWER:DOWN2"
337 IF C$="THEN 335
338 IF C$="THEN GOTO C2
339 IF C$="C1=C1:C2=GOTO 322
340 IF C$="C1+C2=GOTO 322
341 IF C$="C1=C1+C2=GOTO 322
342 LI=C1:505UB 264:PRINT"[CC, RVSON, SA, SH, SO, SE, SR, SP]"
343 GET CS:IF C$="THEN 331
344 IF C$="THEN 344
345 IF C$="THEN 331
346 IF C$="THEN 331
347 IF A$="A THEN 331
348 IF A$="A THEN 331
349 IF A$="A THEN 331
350 IF 401X=18 THEN A1=1:RETURN
351 IF 401X=32 THEN A1=2:RETURN
352 IF 401X=32 THEN A1=3:RETURN
353 RETURN
354 PRINT"[DOWN,C5,RVSON,SC,SH,SO2,SE,SE]
355 IF 401X=18 THEN A1=1:RETURN
356 IF 401X=32 THEN A1=2:RETURN
357 IF 401X=32 THEN A1=3:RETURN
7000 PRINT"[UP,RED, C740]":RETURN

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