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JUNE 1986

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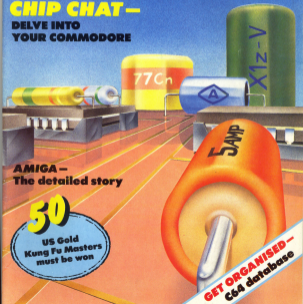
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Editor:
Stuart Cooper

Assistant Editor:
Marie Curry

Advertisement Manager:
John McGarry

Advertisement Copy
Control:
Laura Champion

Group Editor:
Dave Bradshaw

Group Managing
Editor:
Wanda Palmer

Managing Director:
Peter Walker

Originator:
Elbury Typesetting

Design:
Argus Design

Editorial & Advertisement Office
16-17 Gordon Square,
London WC1H 9AB
Telephone: 01-437 0555
Telex: 981189B

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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 programs available and you have to congratulate the software houses on the ingenuity of their staff.

Artisoft Info

Artisoft is making headlines and moving this month. Did you ever think that you could play at being Master Spellbinder with the aid of your IBM Model 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 40 frames 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 love your friends with them - if you feel that way inclined.

It's on two disks and costs £16.95.

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

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

Paragames 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 Photon laser. Get the laser and get the crystal. Easy, huh?

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

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

DelawarePoint is an incredible graphics program which allows the beginner to explore the Amiga's capabilities while 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.

DelawarePrint is a sister program with 10 formats for easy customisation of print outs - in colour or black and white. The formats include greetings-cards, business cards, stationery, calendars, letterheads, posters and more, more.

DATA STATEMENTS



▲ Amiga rings from Artisoft

▼ Artisoft, Electronic Arts and the Amiga



DeluxeVideo brings another dimension to computing. Make video slide shows, animation, business presentations. Find out about wages, taxes, and discounts. Also compression of images, control of the foreground and background and much more.

Artisoft'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're saved up for your Amiga!

Activision — Out of Time!

WANTED — DEAD OR ALIVE SAM HARKER, that's you, a wanted man. Your gun 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 buns you've put away behind bars during your suspicious career.

Interested? Activision's latest adventure — Borrowed Time — puts you in the position of both hunter and prey. There are 26 serious suspects who are out of your blood. Track the murderer down before it's too late.

People including getting shot at, lured, assassinated, beaten up, strung up, sentenced to life imprisonment, logged on the board, 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 AMBIVALENTER ON SCORE Edmund's ridiculous Late Lute Breakout Show, then you'll know the background to his Pastover. Now Masterforce has jumped on the bandwagon yet again to bring you Big Mac — 2 which features the character immortalised in the hilarious TV spoof. It's on the C-16 and is in the £3.99 range of course.

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

It's one of those games in which, once again, you play the part of an intrepid spaceman-caring to the end 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 spaceship is in computerised animation at this point), and finally the destruction of the germbugs so that they won't reappear and infect the globe. £7.95 on the C-16, and available now.

Also 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.



Come see the show when cappy games had cappy names. Now's new release is for the C16, priced at £2.99 and is undashedly entitled Shoot 'Em Up.

Generally Speaking

IN THIS HIGHLY TECHNICAL CIRCULAR BUSINESS, the Japanese are still the people who are often first with the newest ideas. Now Casio has brought another Japanese invention to this country in the form of the Access IC card.

Basically, 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 36 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: ROOM, Market ROOM, EPROM and RAM.

Casio claims that they are totally reliable and durable and are unaffected by electromagnetic/interference conditions, extreme temperatures, humidity and ozone scratches. It is also an added protection against software piracy.

Adapters for the cards will be available for the C16 and C128.

Casio 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 mirrors, programmable printers, process control, alarm systems. And this is only the tip of the iceberg. Look out for them.

The Access Integrated Circuit Card





Mike Maloney and Tony Crowther

After a sabbatical of two years, Games programmer Tony Crowther has returned to Allgate 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 Allgate is promising some exciting releases in the near future.

If you've bought an A/T game recently or in the past there is new service being 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 0646 8700 447111. There's also been an announcement from A/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 Maccade has come up with an original idea. It has launched a software/audio cassette. It combines theme tunes in full, karaoke style dance mix from some popular games - namely Rambo, Nerveending Man, Ghostbusters, Crazy Cab and Hyper sports - with a database called Job of word which should help you organise a reference system for your programs, games, or mixed references.

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

On Line

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

A unit called Job Eye, who became non-verbal in the result of an accident several years ago, let Micronet know, via mailbox, that communications services had made an incredible difference to his life.

His comments created a lot of interest amongst other users, John lives at Hatchford Park School in Guildford and an appeal put up on Micronet to raise £200 for 70 other non-verbal residents was greeted with a fantastic response.

Not only did members donate over £200 in 24 hours, but also fourth Race of Modern Means offered all the required modern toys.

Hard Lines

COMMODORE 128 OWNERS WHO have had trouble finding a suitable monitor for their computer (other than Commodore's own product) could feel 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 TRX1 monitor is expensive and people who already own a Microvix probably feel that this is a high price to pay.

Cascade has come up with an interface which provides a full RGB 80 column display via the RGB 128 input. Microvix's 14" dual mode monitor can now provide full 80 column composite video and 80 column RGB with simple switching between modes, thus allowing full use of the 128's three operating modes.

At £79.95 it could be a worthwhile investment.

Musical computer owners will be intrigued by Commodore's new Complete Music System. It costs £30 including a C64 and the Music Expansion system priced at £49.99 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 Show, the products should be in your local shop now.

Rock Walkerman tackles Commodore's Music System



COMPETITION

Marital arts without pain can
be yours if you enter our US
Gold competition

SINCE KUNG FU IS AN EVER POPULAR topic for computer games, we've decided to give you the chance to win your own copy of US Gold's excellent kung fu master.

We've got 50 copies for the readers who pick out the differences between the two cartoons, and get their names picked out of the bag first.

What are you waiting for?

How to Enter

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 1AB. Write the number of differences you found on the back of your envelope.

The Rules

Entries will not be accepted from employees of Argus Specialist Publications or US Gold. This restriction applies to employees' families and agents of the company.

The How to Enter section forms part of the rules. The editor's decision is final and no correspondence will be entered into.



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Age Micro

TRC 001 4/85

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

CHIP CHAT

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, 2B, C64, C-16, Plus/4 and C128.

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

The microprocessor in Commodore micros is a one of several derivatives of the Motorola 6800 series microchip. This processor is the master cracker inside which are the registers that exist in all of the computer's mathematical operations. Diagram 1 shows the basic architecture of all 6800 range microprocessors.

As far as the processor is concerned 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 as a large, pigeon hole internal mailing system. Each hole 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 so 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 present up it reserves certain parts of RAM for storing the transient values generated as its routines are executed.

Processing

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 commanded to execute a copy 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 executing 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 5 or 6 registers or in the accumulators.

If the operator is a finite address the address buffer is given this value and the data bus reads accordingly. If the value is an offset address, the finite address has the value of the 5 or 6 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 mostly 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 decoded 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?

PROGRAM LISTING 1

```

10 G=0:G=000000
20 LL=PEEK(0)+1:PEEK(0)=G:G=
  G
30 L=0
40 LL=PEEK(0)+PEEK(0)+1:G
  =PRINT:G=LL:G=LL*2:G=
  G*2
50 L=L+1:G=000000:IF L<=10
  THEN
60 G=0:G=000
70 PRINT:G=LL:G=000:G=000:PL
  =G:G=0:G=0
80 G=0+1:IF PEEK(0)=0:G=0:PEEK
  (0)=G:G=0:G=0
90 G=0:G=0
100 PRINT:IF P=0 THEN IF
  ACC=0
110 G=0:G=0:IF G=0 THEN G=
  0
120 G=0+0
130 LL=PEEK(0)+1:PEEK(0)=G:G=
  G
140 LL=PEEK(0)+1:PEEK(0)=G:G
  =PRINT:G=LL:G=LL*2:G=LL*2
  **G=0:PL=0
150 L=L+1:G=000000:IF L<=10
  THEN G=
160 PRINT:G=LL:G=LL*2:G=LL*2
  **G=0:G=0
170 V=**L+0 AND (255:G=0:G=0
  
```

```

0
180 L=L+1:G=LL:G=000000
190 G=0:G=0
200 IF L=0 THEN G=0:G=0:G=0
  **G=0:G=0
210 V=0:G=0:G=0:G=0:G=0:G=0
  **G=0:G=0
220 G=0:G=0
230 LL=PEEK(0)+G+1:PEEK(0)=
  G+2:G=0
240 PL=L:G=0:G=0:G=0:G=0:G=0
  **G=0:G=0
250 PRINT:G=0+G+1:PEEK(0)=G+
  2:PEEK(0)=G+2:G=0:G=0:G=0
  **G=0:G=0:G=0
260 PRINT:G=0:G=0:G=0:G=0:G=0
  **G=0:G=0
270 G=0:G=0
280 G=PEEK(0)+G:G=0:G=0:G=0
  **G=0:G=0:G=0:G=0
290 IF G=0 AND PL=0 THEN PL
  =**G:G=0
300 IF G=0 AND PL=0 THEN PL
  =**G:G=0:G=0:G=0:G=0
310 IF PL=0 AND G=0 AND G=0
  THEN PRINT:G=0:G=0:G=0:G=0
  **G=0:G=0:G=0
320 PRINT:G=0:G=0:G=0:G=0:G=0
  **G=0:G=0:G=0:G=0:G=0
330 PRINT:G=0:G=0:G=0:G=0:G=0
  **G=0:G=0:G=0:G=0:G=0
340 G=0:G=0:G=0:G=0:G=0:G=0
  **G=0:G=0:G=0:G=0:G=0:G=0
350 G=0:G=0
360 PRINT:G=0:G=0:G=0:G=0:G=0
  
```

Down to Basics

When the computer is switched on the program counter automatically loads the value it finds at \$FFFF which causes the processor to run the BIOS machine code routine for power reset. This organizes the memory ready for Basic and ends by printing READY on the screen. The routine then loops around until a keyboard input is used.

After typing in or loading a program, the command BLIN 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 fields, the program storage area and within the actual contents of the memory locations to the screen. The first character 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:

- Write down the first of the two bytes and then in the second byte after it (e.g. 3C 01 becomes 312C).
- 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. 349999 + 112560 + 27696 + 31) = 368100. Remember that 4 = 16, 8 = 16².

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 line link and they help the operating system to find a particular line quickly when GOTO and GOSUB are entered or when DATA is being READ in. In other words the line links always point 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

```

DOWN DOWN DOWN RIGHT RIGHT
RIGHT11 VIC 30 CLS:PRINT
M PRINT RIGHT RIGHT RIGHT
VIC 30 ENDOWN
END PRINT DOWN RIGHT RIGHT
RIGHT1 CLS:PRINT DOWN
RIGHT RIGHT RIGHT4 CAPTURE
M DOWN RIGHT RIGHT RIGHT
CLS:PRINT 4
END INPUT HOME WHICH MACKIN
C 11-21-78
END DOWN DOWN DOWN
  
```

PROGRAM LISTING 2

```

30 REM IN THIS WILL NOT WORK
ON UNPARSED WORD .....E
END
30 REM IN FOR VIC-30 OWNERS
1 LINK LISTED THE SCREEN IS
30 TO 30 COLUMN
30 REM IN OWNERS OF VIC-30
SHOULD USE THE REMARK INSTRO
CTORS
40
50 FORM=1000:READA:NEXT
60 REM*(RIGHT RIGHT RIGHT)
RIGHT RIGHT RIGHT RIGHT RIGHT
RIGHT RIGHT RIGHT RIGHT RIGHT
RIGHT RIGHT RIGHT RIGHT RIGHT)
60 RIGHT)
70 PRINT "CLM"
80 FORM=(10+8888888888888888
90 "*****
90 REM 444 ON VIC-30 MUST BE
0
100 PRINT "DOWN DOWN DOWN
PROCS SPACS-888"
110 CLS:PRINT:PRINT "THIS IS A
120 PRINT "DOWN DOWN DOWN
1300 ON VIC-30 USE PRINT%
CLR")
140 REM*(DOWN DOWN DOWN)
DOWN DOWN DOWN DOWN DOWN
DOWN DOWN DOWN DOWN DOWN
DOWN DOWN DOWN DOWN DOWN
DOWN DOWN DOWN DOWN DOWN
150 ON(11) GOTO (DOWN)
160 DOWN(1) GOTO 150
170 11) GOTO 150
180 11) GOTO 150
190 11) GOTO 150
200 11) GOTO 150
210 11) GOTO 150
220 11) GOTO 150
230 11) GOTO 150
240 11) GOTO 150
250 11) GOTO 150
260 11) GOTO 150
270 11) GOTO 150
280 11) GOTO 150
290 11) GOTO 150
300 11) GOTO 150
310 11) GOTO 150
320 11) GOTO 150
330 11) GOTO 150
340 11) GOTO 150
350 11) GOTO 150
360 11) GOTO 150
370 11) GOTO 150
380 11) GOTO 150
390 11) GOTO 150
400 11) GOTO 150
  
```

```

400 178-1 THEN D=404:PRINT
879,0:END
410 178-178:PRINT:PRINT:PRINT
8,0:END
420 178-178:PRINT:PRINT:PRINT
1,0:PRINT
430 178-178:PRINT:PRINT:PRINT
8,0:PRINT:PRINT:PRINT
440 END
450 178-178:PRINT:PRINT:PRINT
1,0:PRINT
460 RETURN END
  
```

```

500 80+1 GOTO (DOWN)
600 1 GOTO (DOWN)
700 1 GOTO (DOWN)
800 1 GOTO (DOWN)
900 1 GOTO (DOWN)
1000 1 GOTO (DOWN)
1100 1 GOTO (DOWN)
1200 1 GOTO (DOWN)
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4200 1 GOTO (DOWN)
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9200 1 GOTO (DOWN)
9300 1 GOTO (DOWN)
9400 1 GOTO (DOWN)
9500 1 GOTO (DOWN)
9600 1 GOTO (DOWN)
9700 1 GOTO (DOWN)
9800 1 GOTO (DOWN)
9900 1 GOTO (DOWN)
  
```

this note that the green figures are calculated keywords. Yes, a word like PRINT is converted into a single figure when the line is executed but a variable such as 58 would occupy two bytes corresponding to the CHR\$ for 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 quoted they are not given their special status and are just evaluated as normal ASCII characters.

Slow Motion

Now back to the operation of how a program is RUN.

First of all the operating system causes the processor to check if there is a program in memory. If the first two bytes of any BASIC 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 stored away elsewhere in BASIC.

After the line number the system expects to find a command of the same sort. Evaluation of the token value representing the command (reserved word) is found by storing the value in the processor's accumulator and comparing this value with a list of values stored in Basic BASIC. If so match is found 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 loading 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 IN LINE message is printed on the screen by loading each letter into the accumulator and moving it into screen display BASIC. Next, the line number stored in BASIC is dragged out, converted into a decimal value and printed after the message. If the system has detected a

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Francis Jago goes deep into
the insides of the
Commodore Amiga.

AMIGA

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 Amiga 1000, at less 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 128k 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 7 $\frac{1}{2}$ " double sided disk drive. Expansion port for up to 3 external disk drives with either 5 $\frac{1}{4}$ " or 5 $\frac{1}{2}$ " double sided.

Fully programmable serial port.

Fully programmable parallel port.

Two button mechanical mouse.

Two 9 pin D type controller ports.

Detached 88-key keyboard with numeric keypad, 58 function keys and cursor sections.

Ports for analog or digital RGB output, as well as composite video.



Left and right stereo audio output ports. Expansion connector that allows you to add RAM, hard disks, or other peripherals.

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 disks 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.

Once in the Workbench, most people will immediately recognise the Macintosh-esque windows and icons; however this time they are in colour! Workbench is provided for two real reasons; first it lets you control the

computer's functions via a mouse, and secondly it lets each individual user 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. On the more technical side, Preferences allows you to set hard 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 icons. On selecting a disk with the mouse, a new window will appear, giving you another selection of icons to choose from. Icons can be described as small pictures which appear on the screen, representing tools, projects, disks, drives and the Trashcan. Windows let you see the contents of projects, drives, disks, and the Trashcan. Windows can be altered both in size and position.

On the current version of the workbench disk (v1.3) there are four drives — Desktop, Utilities, System and

the detailed story



Impy, Demos are three different programs which show well how efficient a multi-tasker, the Amiga really is. Utilities gives you an in-voice calculator and notepad, a file manager, and System produces a disk copier. The Impy'd disk 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, then that 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 AGAU, DEMAN, 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 x 200, 320 x 400, 640 x 200, and 640 x 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 interlacing. This allows the programmer to utilize the unused space 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 (Half 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 recognizable 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 Transferer), and although this is by no means limited to graphics, it can be used to move large amounts of graphic 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 synthesizers.

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 removing 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 (I think 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!


```

34,173,200,20,20,150
2340 DATA 0,20,20,174,21,
100,173,20,20,100,100
2370 DATA 160,20,20,40,140,
1,20,20,170,20,207
2380 DATA 20,20,174,20,150,
170,20,247,100,160,1407
2390 DATA 20,20,1,20,174,210,
170,104,160,24,20,1407
2400 DATA 240,20,16,104,5,
130,20,160,204,130,2025
2410 DATA 200,160,40,130,200,
160,4,130,200,160,1074
2420 DATA 40,130,10,104,114,
130,21,160,130,1000
2430 DATA 160,104,170,130,
140,104,170,210,140,1000
2440 DATA 200,170,20,104,160,
200,200,140,210,200,1071
2450 DATA 200,204,200,21,200,
140,104,204,214,7,1000
2460 DATA 200,21,170,210,

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140,210,170,20,140,160,
1070
2470 DATA 200,170,130,200,
240,16,104,10,130,210,1000
2480 DATA 160,40,130,210,160,
5,130,210,160,204,1400
2490 DATA 130,200,160,130,
20,160,170,130,21,1000
2400 DATA 160,40,130,160,160,
204,130,214,160,1071
2410 DATA 170,210,140,210,
130,20,140,200,200,
1070
2420 DATA 240,210,200,210,
204,210,21,210,140,204,
2020
2430 DATA 200,214,7,200,21,
130,210,140,210,170,1000
2440 DATA 20,140,160,200,170,
100,200,240,16,1407
2450 DATA 000

```

```

PROGRAM FPA4.MEM
8 OPEN INPUT#1:"C:\DBASE\1\DATA1.DAT"
1 OPEN OUTPUT#2:"C:\DBASE\1\DATA2.DAT"
3 OPEN OUTPUT#3:"C:\DBASE\1\DATA3.DAT"
4 OPEN "C:\DBASE\1\DATA4.DAT"
5 OPEN INPUT#4:"C:\DBASE\1\DATA5.DAT"
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10 PRINT"CLEAR,DOWN,WHITE"
11 OPEN "C:\DBASE\1\DATA1.DAT"
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200 PRINT"DBASE"
201 OPEN"DATA1.DAT"
202 PRINT"DATA1"
203 OPEN"DATA2.DAT"
204 PRINT"DATA2"
205 OPEN"DATA3.DAT"
206 PRINT"DATA3"
207 OPEN"DATA4.DAT"
208 PRINT"DATA4"
209 OPEN"DATA5.DAT"
210 PRINT"DATA5"

```

The Format Program

The format program can be used by selecting option eight of the main menu of *Microsoft Plus*. It 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 "FPA4.MEM" which can be loaded into the main program again by 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 *CRAM* commands exist in *CBM Basic* to control variable storage when a new program is loaded in.

When the program is run, you are asked how many fields you will need from one to nine (the 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 *CBM Basic* should be taken through, since use of the insert can cause the whole screen to move down a line which can mess up your design. Apart from colon and comma keys which cause the world "Extra ignored" message, all other characters are acceptable including graphics, also colon and comma 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 (Edit) 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're finished designing your screen, press RETURN. The new screen will be stored instantly, saving 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 data type, 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 last 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

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 'Y' 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, i.e. the actual records of data or the format data. The format data takes a while to load/save even with disk since it is built up into two halves. Firstly, the format parameters are saved to field length, range, etc. and then the screen layout data which takes the time to load, being the data as two separate files map record storage but it creates a very flexible system. For example, if you select load from tape and a format is already present (if not then program automatically assumes you wish to load a format), finally, 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 untested since I have no printers and also there are many different types, but provision has been made for a subroutine. If present the menu will just be listed again. My suggestion is to place the subroutine starting at line 4200 which means the third line number (80) in the O/N. GOLOS at line 35 must be altered. To help you - the 'c' at 4803 will fix all the records found by a search. Also look at the view option. Finally, the

```

3040 IF P(1) THEN 10-10-000
4070-0010
3041 REM CHECK FOR EDIT FLAG
3042 IF 0=0 AND 0=0 THEN Y
+1-0010-0010
3050 0011,0012,0013 OF LEFT=000
10,10,11,12 THEN PRINT C
001001-0010
3060 :
3070 REM CHECK IF INPUT IS
IN RANGE
3200 0L=VRL(0011,0010)
+0=0104(0011,1,2,3)
+0=VRL(0012,10)
3210 IF 0=0 THEN 0L=VRL(0010)
0011,0012,0L,0010 THEN 000
00 0000-0010
3220 IF 0=0 THEN 0L=VRL(0010) 0
L,0011,0012,1111 THEN 0000
0000-0010
3230 IF 0=0 THEN 0L=VRL(0010)
0011,0012,0013 THEN 000
00 0000-0010
3240 0011,0012,0013 PRINT C=0011
0010-0010
3250 :
3260 REM PRESS ENTER ROUTINE
3265 0=0=0010(0011,0012) BY 000
PRINT 0L(0010)
FOR P=1 TO 0L
+000 0000+,0010(0010)
P,10
3270 0010 0000+P,10 NEXT
FOR P=1 TO 0010(0010)
FOR P=1 TO 0L
+000 0000+P,10 NEXT
0010
3280 :
3285 REM 0000 0/0
3290 0011,0012,0013,0010=0
+0000 0010 PRINT L0,1+1-1
0L=00000 0010 PRINT L0
0010
3295 :
3300 REM 0010 0/0
3310 PRINT TAB(10) "L0,00,00,
0010 C0,0L,00,00"
PRINT TAB(10) "0001"
PRINT TAB(10) "000011 -
0010,00100 000000.
3320 PRINT TAB(10) "000011:
-0010,001000+1,0010,0010,
+0 PRINT TAB(10) "000011:
0010,001000+1,0010,0010,
3330 PRINT TAB(10) "000011:
-0010,001000 DELETE.
PRINT TAB(10) "000011:
0010,001000+1,0010,0010,
3340 0000 0000 IF 0=1 THEN
0010 THEN 0000
3350 IF 0=0 THEN RETURN

```

area 00 holds the format data and 001 field number (row) contains the name of each field and records are held by 001 in the form 001 field number, record number).

The third option - Update - allows the updating of the file in 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: (F1) 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; F2 (EDIT) this allows the user to retype the previous field, while deleting any data that has been typed on the current field; F3 (Memory) displays on the bottom line the number of free bytes remaining, this may take a few seconds and is due to DOS(8) and not to my program. The number will remain 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 functions. 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 functions. The top right shows the record currently being displayed using the inequality keys (<, >, 1). You can look at other records going backwards/forwards and when you have definitely found the record you wish to edit, pressing 'C' will delete the whole record, 'Y' 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 keys, you can select the field to alter when you have it, pressing RETURN will change the prompt again for the third and final time asking you to select the 'Edit' option. 'D' will delete all the data in the


```

3104 SW AT,4,3:INPUT$=R
3200 HL,%SW(IF SW) OR
SW=0-1 THEN SW=0
3108 SW=1:SW=0,CF,SPCT,
WRITE,SP,SP:SW=4 KEY
TO EXIT$PC,CF,SPCT,
RND%*60000 400
3108 WAIT 100,1:GOTO 3100
3120 PRINT"COLM,DOWN,
RIGHT,SW,SW,CF,SP,SW,CF,
SP,SP:GOTO SCROLL 'NEXT TO
EXIT$SW=0"
3130 SW AT,4,1:INPUT$=R
3200 HL,%-1 TO EXIT$*CF
IF SW=1 THEN RETURN
3140 IF SW OR SW=0-1 THEN
SW=0
3142 SW DISPLAY FILED BY
SCROLLING
3150 PRINT"COLM"
3200 FOR P=0 TO 90-1
:PRINT"DOWN,SP,SW
3200 SW=1:SW=0 TO P0
:PRINT SW,SW'
: "SW,SW,P)
3200 SW SW IF SW=1:SW=0
3240 NEXT"PRINT"-----
-----
-----
-----
-----
3250 WAIT 100,1:INPUT
:WAIT 100,SW:POKE 100,0
:WAIT 100,1:GOTO 3100
3400 SW AT,7,3:INPUT$=R
3200 HL,%SW(IF SW) OR
SW=0-1 THEN SW=0
3410 SW=1:CF,SW=0,SPCA,
WRITE,SP,CF:1:SW=0:CF,
CF,SPCT,WRITE,SP,CF:1:SW
0:SW=0:CF,CF,SPCT,WRITE,
SP,CF:0:SW=0:CF,CF,
SPCA,WRITE
3420 SW SW TO DISPLAY RECORD
SW WITHOUT SCROLLING SW
ON SCREEN LAYOUT
3430 FOR T=0 TO 1:STOP 0
:PRINT"CHRG,CF,SW=0,
SPCA,SW:GOTO 'STRAID"
:CFPCT"
3430 GOTO 4400
3440 SW SW IF SW=1:SW=0 SW=
1:SW=0 SW=1:SW=0 THEN T:NEXT
:RETURN
3450 IF SW=1, THEN SW=0
3470 SW=0-1:IF SW=0 THEN SW
=0-1
3470 NEXT
3480 IF SW=1, THEN SW=0
3490 SW=0-1:IF SW=0 THEN SW
=0)
3495 NEXT
3500 SW
3510 SW SEARCH SUBROUTINE
3520 SW DIRECT COMPARISON
3530 IF 1:SW=0 SW=0:SW=0,
SW=0 THEN SW=0-1:SW=0-1
3540 SW
3550 SW
3560 SW
3570 SW
3580 SW
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4890 SW
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4970 SW
4980 SW
4990 SW
5000 SW

```

For both edit related searches it should be noted that the first occurrence of the string is used and also that the whole of the file will be searched for the necessary data even if one alteration is made.

The final EDIT option is Block Delete. This allows you to delete large chunks of records quickly, just enter the numbers of the first and last records to be deleted and the program will do the rest.

Now back to the main menu, Next is the view option file. This is very simple, you can either view one record (this uses the format layout) or you can select a record to view from and scroll the whole file. If you wish to view all the records, holding down a key will cause them to scroll down the screen. If you release the key the records will pause. Pressing 'Y' will exit back to the main.

Each on the main menu is the search option. To make it as fast and easy as possible information is retrieved about the field and search type to save string e.g. to search field three comparing directly and searching for LONDDON you would enter:

LONDDON

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 as narrowing down the records 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 BDRBATH (need to scan all of the address for the string BATH)

Y
JSDVGLS

and then enter 'Y' to view.


```

630 GYS AT,A,24:PRINT"GREEN,
SPC, NUMBER OF CONTACTS
BE = (ISPC12,4000)"
:POKE 2022,50
640 CO=1:PO=2024+PE
:POKE PE+1,40:POKE 2427+
PE,1:POKE 400,120
650 FOR I=0 TO 1 STEP 0
:SET I=I+1 IF 84""THEN NEXT
660 IF 84+OHRN(12) THEN 8412,
11+OHRN(12)+6000:700(I)=
:OHRN(6000+1194):RETURN
670 IF 84+OHRN(12)+AND(12) I
:HEX CO=CO+1:POKE PE=60,40
:POKE PE=60+1,12+OHRN(710)
680 IF PDR(SPE=CO+11+1) OR
CO=CO OR PE=CO+PE0 THEN
NEXT
690 POKE PE=60,44:CO=CO+1
:POKE PE=60,40
:POKE 2427+PE+CO,1
710 GYS AT,25,24:PRINT"ORANGE
CO=OHRN(12,4000)" :NEXT
720 GYS(1)(28+""GYS AT,A,24
:PRINT"YELLOW,0"
:HEX"PE=OHRN(12)" :NEXT
:SPC12,4000"
730 POKE 22,16:POKE 150,24
:POKE 22,16+PE AT,15,24
:SPC(15+PE+24):6000:740
740 IF 10""THEN 720
750 GY=ASC(194):IF 8134 440
:8134 THEN 24+OHRN(42+120)
:4+18+PE(12,120(12)+1
140 BR(1,1)+OHRN AT,A,24
:PRINT"RED,AVOID ABOVE
CIRCUIT TO INPUT PE &
PROVIDEPE,WHTE,84,80,87,
80,84,84,4000"
770 POKE 2023,140
:POKE 24270,190:RETURN
780 POKE 1,12:RETURN
790 :
800 HEX SET UP PINS FOR I/O
INPUT
810 84+BR(A,1)+POKE 22,0
:POKE 22,14:POKE 220,2
:PE=40
820 84+BR(84)-50:6000:830,
880,900,PE,140:RETURN
830 84+1
840 GYS AT,B,20:PRINT"BLUE
OVER 1.5077" :GYS AT,20,20
:6000:740:BR(1,1)+10
:POKE 22,0
850 GYS AT,B,20:PRINT"RED
POKE 1.5077" :PE(11),AVR0N,
CE1""GYS AT,20,20
:6000:740:BR(1,1)+10
860 IF 84,84+10,11194:84+10,
11+THEN 840

```

```

870 BR(A,1)+""OHRN
880 84+21:GYS AT,B,20
:PRINT"RED,GOOD THWY"
:GYS AT,10,20:6000:940
:BR(1,1)+10
890 BR(A,1)+""OHRN
900 84+23:GYS AT,B,20
:PRINT"RED,GOOD THWY"
:GYS AT,21,20:6000:740
:BR(1,1)+10
910 BR(A,1)+""OHRN
920 84+25:GYS AT,B,20
:PRINT"RED,GOOD THWY"
:GYS AT,23,20:6000:740
:BR(1,1)+10
930 BR(A,1)+""OHRN
940 84+27:GYS AT,B,20
:PRINT"RED,GOOD THWY"
:GYS AT,25,20:6000:740
:BR(1,1)+10
950 BR(A,1)+""OHRN
960 84+29:GYS AT,B,20
:PRINT"RED,GOOD THWY"
:GYS AT,27,20:6000:740
:BR(1,1)+10
970 IF P=0 THEN 84+OHRN(12),
PE0:CE1""NEXT
980 IF P(12) THEN 24+OHRN
(42):NEXT
990 RETURN
1000 :
1010 HEX TRANSFER FORMAT TO
MAIN PROG
1020 PRINT"OLEARY"
:GYS AT,3,3:PRINT"OHP
:8000 "0" TO 80-800
1030 GYS AT,3,3:PRINT"OWITE,
:8000 10000,STAMP ON
:SPC,80000(100)"
1040 SET 84+GYS AT,20,4
:PRINT 84+100000"
1050 IF 84+""THEN PRINT"
:10000,10000,84+800000000,
:8000,80,80,87,80,84,84,
:84+8000" :SPC12:840"
:PRINT 197,1:SPC 2,1,1,
:84+8000""OHRN 1070
1060 IF 84+""THEN 840
1070 IF 84+""THEN 840
1080 PRINT"THE O" :10000,100
:84+8000....
1090 840(15,8,10,"10"
:OHRN 2,8,1,"80"
:OHRN"2,8"
1095 PRINT"O,8"
1095 PRINT"O,8"FOR 840 TO 4
:FOR 840 TO 70
:IF 840,84""THEN 8410,
:840"
1095 PRINT"82,84,84":NEXT

```

```

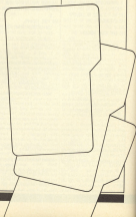
:NEXT
1095 IF 84+""THEN 8400:80
:1100:8400:0
1110 IF 84+""THEN POKE 190,0
:8400:1100
1120 PRINT"OLEARY,80000"
:LOAD"OHRN(100)" :PE,84,8000"0"
:84+8000",8" :POKE 190,2
:POKE 401,10
1130 POKE 401,10:PRINT"
:10000:8400+8400" :OHRN
1140 PRINT"OLEARY"
:GYS AT,3,3:PRINT"OHRN
:TO MAIN PROGRAM & PROG
:SPC,AVR0N,84,80,87,80,84,
:84,80000"
1150 SET 84+IF 84+OHRN(12)
:HEX 1000
1160 POKE 190,10:POKE 401,11
:OHRN
1170 :
1180 HEX 8400:8000
1190 POKE 24270,40
:FOR 840 TO 150:NEXT
:POKE 24270,0:RETURN
1200 :
1210 HEX 8400:8400:8400:8400
1220 FOR I=0 TO 1 STEP 0
:POKE 190,10:OHRN(12)
:RETURN

```

```

100000""OHRN 840"
:OHRN(10)
1230 HEX 840 4:84000000
1240 IF 84+""OHRN(12)
:840 1100:8400:8400
1250 IF 84+""OHRN(12)
:840 1100:8400:8400
1260 IF 84+""OHRN(12)
:840 1100:8400:8400
1270 IF 84+""OHRN(12)
:840 1100:8400:8400
1280 HEX CONTROL:8400:8400
1290 IF 10000 THEN POKE 190,
:10+1:POKE 190,1-200
:POKE 190,1:HEX(12):RETURN
1300 IF P THEN P=0
:POKE 190,1
1310 :
1320 HEX FLASH:8400
1330 POKE 190,1:POKE 190,1:HEX(12)
:RETURN
1340 FOR I=0 TO 40:SET 84
:IF 84+""THEN 1350:RETURN
1350 NEXT:POKE I=21,0
1360 FOR I=0 TO 40:SET 84
:IF 84+""THEN POKE I=21,1
:RETURN
1370 NEXT:POKE I=21,1
:GOTO 1340

```



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**Ranecaster delves once more
into the secrets of
adventuring.**

AS WE WATCH MANY SOFTWARE houses striving to improve the graphics which now flourish in most adventures, it is interesting to talk to the actual players of these modern-day marvels.

While nearly everyone agrees that witty clues, colorful 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 graphics have some relevance to the game play, then the graphics - either descriptive text and/or good puzzles - is what really matters.

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

Interesting as it is, who are we all trying to fool? Probably the only people to gain from all this are the promoters of programs - you have to admit it sounds better if you are advertising an all-knowing, all-allowing program. Then there is the software user to adventures, it certainly provides something to look at when trying desperately to think about what to do next!

Let us know what you think. And give us some examples of what you like best in the order of preference. While 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. Only you money to pay them but it is no ordinary school. It is an though time was stopped 50 years ago. The students 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 month is OCT and not 1986. Your self-determined quest is to find out *The Secret of St. Brides*.

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

There are two appanages to the game - the basic one of tracking down what is



Come Home Mike Hammer

The latest detective adventure to hit the C64 is from US Gold's All American Adventure series. It's entitled *Misquidator*. 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 colorful 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 'MODE'. This will display text only but a null RETURN flips the display into all graphics until the next null RETURN.

You play the part of a private-eye on the trail of a MA 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 this an 8.75 minutes (not real time) after you start-up 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 few letters of most commands must be given for them to be activated. This is very important since the response to anything it does not recognize is "SHRIBY (A)N'Y TH'N TH'N B'CHT B'GW". Fortunately this does not apply to direction commands (N,SE,W) and things like inventory (I) and look (L).

The general style is reminiscent of *Misadventure* (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.



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 little 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 if 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 hanker!

Diabolical

I always knew that I had a strong tendency towards the more active type of adventure games — *Halls of Death*, *The Valley*, *Excalibur Ultima III* and more recently the reconstituted Temple of Apshai Trilogy — but I never thought that I would prefer a program that existed so many times, that I had to count.

Just browsing through the shelves of a software computer store got me home here, I came across *Telegard* produced by Eclipse Software for The Avalon Hill Game Company. I thought I remembered seeing this advertised in some *American* magazine 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 reasonable successful, some have been pure garbage. *Telegard*, I find horrible horrible, but it is true to the main idea of a D & D type of scenario.

Telegard is a graphics adventure in which the main aim is to gain experience and find treasure while 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 cavernous inn. So far so good. All around you is a maze of passages. These you must explore to find treasure, gems, gold, silver, ever-on-hand. You start out with sword, shield and a mouse, all of a pretty mediocre kind, because if you search diligently you can find better quality items, indicated by such as "A+7 SWORD".

All of this is very much par for the D&D course, even the opening description of your characteristics is very sensible. You see a series of random numbers allocated for you: the score'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 passed 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 view the result by concentrating on one or two characteristics so you are not likely to see an "all 16'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. Here the advice isn't 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.

Just "hit points" may be regarded by a normal night's sleep as an ever-limit-

edly, it is not often possible to re-allocate to suit one's time to recuperate!

Although you start limited as you, this is by no means the only way to be found — there are lots of them. Thank the gods for small mercies! On arriving at an inn, any gold you have with you is hoarded safely and your experience level will with the amount of gold with which you arrived.

All valuable treasure — gems, silver etc. — is converted to the gold standard for this calculation. Besides doing it better which way you decide to visit, they are all linked by "Computer-Link", a fantasy world version of Barclays Bank!



As your experience increases, certain values trigger a change in your hit points; this means that you can take more punishment and can venture further into *Telegard* in search of more dangerous monsters and greater loot.

Amongst the maze of rooms and corridors which you explore will be found numerous stairways that reach down into the depths of *Telegard* — travel that way at your peril! It is quite dangerous enough to visit the level three adventurer to travel far from the initial position, let alone look for further enable down below!

Not only will your level be incremented by your increase in experience but also your ability to cast spells will increase. Initially you only have the skill to cast level one spells, and only one of these between cast, to end and recuperate at one of the thoughtfully provided altars.

Magical spells are divided into six levels of relative power. Each spell level has its own spells. Characters of experience level one or two, have only the

six spells at level one at their disposal. As the actor gains levels of experience the use of higher level (and therefore more powerful) spells becomes possible.

Each three levels of experience gained, permits the use of the next higher level of spells. Each set of roughly two types — "constant" spells and "duration" spells. The former are action offensive spells such as "magic missile", lightning ball or "fireball". The latter allow you to cure wounds, search for traps or gain through walls etc.

All commands are given via the keyboard as single key inputs and, except in the mouse's training exercise (entered by calling your character *Demis*), action takes place in "real time", so you have to have your wits about you. There is a full plenty of time to take the appropriate action — but it does not seem like it when you first start!

Commands are divided into two types — "action" and "movement". There are nine of the first type and they are very easy to memorize. "W" for help will tell you what they are! The "movement" commands are "Fight", "Evade", "Cast" (a spell) and to pick up something you will be prompted to press RETURN. Movement is controlled by the four keys W,U,F,A (W,U,W,U) and D.

There are 30 different types of monsters roaming around *Telegard*. Most of them are obviously opposed to your continuing existence! A very small proportion meet you with the greeting that they "like your body". That can be taken two ways to start with, initially I thought they were going to eat me but, they actually help you, perhaps caring you of all wounds or maybe giving you a powerful weapon.

The monsters have a simple system to you and your experience, so they have a different level, the level and then rank (Small, Large — Dragon highest) determines how many experience points you gain in defeating them. It also determines how difficult they are to defeat! Although you may be only on the first level, a surprising number of powerful creatures appear right from the start.

When I first came up against a level 16 Giant, I thought there must have been a glitch in the program but then I found the instruction booklet lists at level 20. As below a game of this type, some of the monsters have quite nasty habits — several drain your energy and knock you down a level of experience. Dragon fire is not much less either!

There are a number of "features" such as stairways, pits, altars etc., which remain at the same location — if you can find them again. Stairways seem to trap up quite often. The water from these contains colour as does its properties when drunk. Some colours are beneficial, and, some, harmful, some are not!

There are potions to heal and also those to increase your strength. Various

PROFESSIONAL PACKAGING

Iain Murray provides a program to smarten up your cassette library.

This program allows the user to produce neat label cards for cassette tape boxes for music tapes or computer data using a Commodore 1520 Printer/Plotter. It uses many of the features of the 1520 including the four character size, four colours, and vertical text for the spine of the label.

The program requests input of the tape number, a title for the tape and for each side, and the option to fit up to fill items on the label of each side of the tape. If any input is made incorrectly, this pressing

RETURN or its own at the next input will cause a jump back to the previous prompt. The plotter will then produce the required label 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 BEM extensions, but these BEM extensions need not be typed in.



TAPE 07	CLASSICAL PIECES	CLASSICAL PIECES
1 - BETHHOVEN	2 - BACH	CLASSICAL PIECES

CLASSICAL PIECES

1 - BETHHOVEN

2 - BACH

PROGRAM	INPUT INDEX
10 REM *** TAPE LABEL MAKER ***	60 TAB="**"INPUT TM
20 REM *** BY IAIN MURRAY	70=LEN(VAL,TRIM)
(C) 1986 IIM	80 IF TRIM THEN PRINT "TWO
30 REM *** FOR YOUR COMMODORE	90 PRINT "COMMODORE TAPE
C 64	NAME = "
40 GAB="C64C65"	100 TAB="**"INPUT TM
40 DIM IN(1,1)	110 IF LEN(TRIM) THEN PRINT
50 PRINT "CLEAR,WRITE,DOWN,	120 IF TRIM THEN TO
ASAP,13,DOWN,SPACE"	130 PRINT "DOWN(13) LEN"
60 PRINT "LABEL,SPACE,SPACE"	140 IF TRIM THEN TO
70 PRINT "DOWN(13) TAPE	150 PRINT "DOWN(13) THEN
NUMBER = "	END



Stuart Cooke puts Ariolasoft's Homepak to work.

IF, LIKE ME, YOU USE A COMPUTER FOR a list 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 list 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. TrainMate, a program that

looks extremely similar to the 3+1 software that is found on a Plus/4, offers just this facility. With TrainMate 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 40 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 activated. 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.

Homepak - 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 lot of papers 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 'shows 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 covered for, though headers and footers are dealt with in a strange way. Not only do you have to tell Homestead 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.

Homestead - 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 file. 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, Homestead 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's August 23rd
Joe's Birthday's June 1st
Fred's Address's 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 for getting 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.



Homestead I consider to be one of the most important things about this program. Modems are becoming cheaper all of the time and more and more people are becoming interested in communicating via computers. Before I go any further it is worth stating that this program is a terminal-emulation program which can be used to access bulletin boards and systems such as Telicom Gold. It is not a Windows type system and cannot be used with systems such as Pascal or CompuLink.

With Homestead and an RS232 modem it is possible to talk to your friends who have this software and modem, swap programs with each other and talk to each other via your computer keyboard. Many of the bulletin boards now have Commodore sections on them so you can ask questions to other people who use the system etc. In fact the day of the electronic office is here. One person can write an article using Homestead, send it to someone else via Homestead and they can then print it out using Homestead.

For the more technical beds out there the following data formats are catered for, ASCII, CBM (Commodore characters), Video and the very popular Hexadem.

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 Homestead 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 'junk' may be missing that its more expensive, individual programs, competitors have.

All in one

The other package mentioned is Telematic. 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. Telematic gets around this in a very clever way. It allows you to leave open loading the software, exactly what you want in memory. Below is the menu presented when you load the software:

- (1) Desktop (3 pages)
- (2) Plus Graph (1 page)
- (3) Write File (2 pages)
- (4) Home Office (1 page)
- (5) Utilities

Dealing with each option in turn. Desktop comprises of 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.

Name 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 tasks 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 way 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 80 lines of text can be entered into the wordprocessor. This doesn't sound too many but when you realize that a line is 80 characters a quick calculation will show that around 1800 words can be entered before you run out of room. This is more than enough for the standard letter that you wish to write. 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 the 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 the program. Don't forget that you do have the Help function in the expanded version which does solves this problem.

It is remarkably easy to transfer data from both the spreadsheet and database into the wordprocessor. In fact the only

way is to print the data from the program to print the information in the database at the top of every piece of paper, close back!

As with Harepak 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 screen act as a window over the larger 80 columns of the text.

The database or file manager is more of what I would call a real database. 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 costing expenses. Don't forget you can even get the wordprocessor to print out a letter taking information from the spreadsheet making printing letters 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 little examples, for instance the section on the spread sheet shows 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 the program that a lot of C64 owners have been waiting for. OK, so it has its limitations but there are ways to get around those. The fact that the programs you are going to need can be loaded into memory just the same and that data can be stored on one disk is surely, laid in the programs in the memory and that's it. Everything is at your finger tips. Now I've started using the programs I wouldn't be without them.



As I have previously mentioned the software is very similar to that found in the Commodore Plus/4 computer. The layout of the programs and the instructions for use are very similar, to the same. For this reason the software will probably get the same stick that the Plus/4 did when it arrived on the market, only 80 lines in the wordprocessor and other such comments abound when that basic

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

PSI 3 TRADING CO.
15 Gold 11475 09-4

10 9 7 9



HEARD 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 3 Trading Co. from US 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 leaving their hats out in despair and lamenting my orders. Orders were making me cringe willy-nilly and I no longer knew whether I was coming or going.

Four 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 displaying the candidates is displayed - they may be humans, aliens or robots 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 hero and a poor communicator but isn't hit an spell when the ship is under heavy attack.

Having agonized over your recruitment, it is on to the

mission itself. The screen displays your communication console with your current view displayed top left and the appropriate crew member top right. The bottom half of the screen gives various status reports while 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 - working out which order take precedence. Is it 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? Strangely, every department thinks that they should have priority. Anything get worse, in the animated portions of the crew show their feelings - totally laid back or glowering works. To give some idea of what you have to control, here is a quick look at the five departments and their various tasks.

The scanning department is in charge of the radar and will try to 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, lasers, cannons and the like. By analysing various statistics, you can zero in on efficient crew crew it 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 not be long before your ship suffers damage and it is necessary to request the services of the repair section. Items can be repaired (at a higher power cost), replace or discarded. There are several details at your disposal and again, 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 is very simple via either joystick or keyboard - it is just the decisions that are difficult. There is so much going on, that it will take some considerable time to get 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.

DOWN THUNDER

Amiga C-16, Plus/4

8 9 10 9



DOWN TAKING ON THE PART of that childhood hero Tom

Thunder, have entered the tomb of the Pharaoh Mambo in order

to find the treasure that was buried with him.

Incidentally 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, sometimes Amiga has managed to get a 128 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. Whatever 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 enemies. There are guards moving their spears up and down which Tom must jump over - just like the arcade game *Haunted Ark* - 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 there why not buy a copy and give Tom a hand!

S.C.

PHANTOMS OF THE ASTEROID

Mastertronic 1199 C&D

5 7 8 9



HELLBENT FIGHTING: A great haul of rock in the six round (the more rounds made, the more levels completed).

by avoid looking big-eyed monsters whose irrational qualities allow them to pass through rock and appear when you are least expecting it.

Now, a lone astronaut, armed only with a pathetic laser gun which luckily has an inexhaustible power supply. Gladly make jumps in your orbit as you hunt your way through the maze of caves with the aid of your trusty jet pack.

Suddenly, you hit a lone lava field and death comes quickly as your whole being is pulverised and you disappear in a puff of sulphurous bubbles.

Then comes the tedious bit, here you are a normal hero

again, you possess only one life and must wait for the Game Over screen to consult several dishevelled bars of "meat" before you can head another performance space to certain death.

The green force field isn't too bad since they disappear every five seconds and you can rip through. Apparently there is a way 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 11.99 and die as many times as you like.

NIC

MUGGY'S REVENGE

McBroom House C&D

1 1 5 2



AS THE NIGHT CLOSED IN, my hands fumbled with the black as a Mickey line down, telephone and heeled the

Muggy life in the dense blue glow of the monitor. Colours faded and I was transported back to the bright, dry days of F&O. As Muggy blinked under the unceremonious daylight outside the classroom, the feet were clanging down on liquor.

Through half-closed eyes the line streamed of vapour as my spirit slipped away into his mind.

Just as you get the boys together and made a deal with the Canadian locals across the Pacific. All the gas pumps had been driven underground like worms in a drought and new parkings were the harvest. All we needed were the horses, the politicians, the clams and the dough.

Now your brings resolutions, mine is to look the outfit for the clams and show a profit. You head the Wood Brothers to round the high points in ball games. They were came up with a slick ruse of "Chalk" McHugh getting his card marked down the Post Hall. It'll show in each New Year as a warning to any other creeps till they get hooked with the marriage. Life is still as dull as the dime on left spots. Even the short-outs are rick of emptiness. Everything is the progress behind a rainbow, a pig in a poke.

100

BONGO

Atari C-64, Plus/1

4 7 8 9



THIS VARIATION OF A PLANT- our hero trying to rescue a lion and lobbies game leads daniel in distress. Before the

daniel can be rescued Bongo must collect 10 sparkling gems (shining stars) to run around the screen.

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

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

Oh, so there's nothing original so let's forget the game has some interesting aspects. For a

start all of the characters are extremely large and well defined, the robot facilities of the C-64 and Plus/1 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 debugger. Once you get fed up of running around the screen provided you have the option of dumping your score.

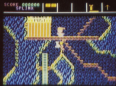
Well done, Atari! A program that all games-playing C-64 and Plus/1 owners should not be without.

SC



DR WHO AND THE MINES OF TERROR

Microcassette CD4



OLD-FASHIONED COPY-right 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' creative decided that it was against the national interest to team with Microcassette. No doubt rivalry lies in at the heart of this situation.

The result is reflected in the appearance of, dare I say it, Dribble-like creatures called Cavewalkers who guard the TRU machine which the Doctor must double before the latter of the time-space continuum is born to death.

The TRU (Time 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 both of the most precious crystals which are only found in sufficient quantity on the planet Rigit. For obvious reasons this is where the TRU has been built and it is now controlled by the Doctor's arch-enemy, the Master.

The game publicly claims that the game starts with the familiar Dr Who theme. Well, if this is true then I'm a topknot. Maybe there were some copyright problems but judging by the scoring of the opening suite it appears that no haven't misread much. I'd strongly advise that 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 mining as observed by all except the Doctor. It is a secret weapon in every sense of the word and if lost it will be impossible for the good Doctor to complete his mission to destroy the TRU 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 amnesia or not is not explained but the only way to persuade it to go up a ladder is to leave the Doctor to carry it. It is, nevertheless, a very useful beast which can be used to recover any item which is one side 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 hazardous mine-podagmatic creature, a Muck up, will be encountered. Normally this will first be in the form of Muckup eggs which hatch spontaneously as soon as a suitable heat source comes near. Given Muckup is unstable.

The map is also partially guarded by another Muckup and this is a useful key to the solution of the first of many problems which must be faced.

The documentation with the game is superb, an area in which Microcassette usually excels. Apart from the usual loading and playing instruc-

tions the pack also includes a useful solution to the Muckup problem, a detailed breakdown of the main elements of the game, a map of part of the mining complex and a printout of the major objects encountered in the game. The final card in the pack is vital because it gives the code used to recover the necessary upgrade containing the TRU plans. By far the game's challenge is an encounter with a computer. 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 so 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 on the last Cyrenian Sleep Chamber (CSC) that he passed. All of the objects which have been found and marked away in this topographic map will be retained but he will always have to relocate Splinx. The CSC have a second, important purpose, its standing next to one of these the game can be saved until another day.

Surprisingly, the game is quite pleasant the usual hype of the Doctor is particularly impressive. The challenges are difficult but logical and, apart from the nagging music, I wholeheartedly recommend this game.

I.G.

COMMANDO

The C-16, Plus4 CD5



COMMANDO ON THE C16 full of scrolling screens and an extremely popular, it has excellent sound effects. It

would be very easy to expect that a conversion of the game by the same company would be of the same high quality. Well it isn't. The only similarity between this and the C16 version is the fact that you control a Commando who is under heavy enemy fire.

In the version of the game the screens are static. Before you can get on to the next level you have to clear the screen of enemy personnel.

The first level places you commando under heavy enemy fire from enemy troops. I said heavy and I mean it, if you so much as pause for a second you will probably lose a life. There is a

simple trick to this screen that enables you to get through it quickly. Dodge all of the enemy bullets and get behind the rocks in which the men hide.

In the second screen you commando back himself in front of a bridge guarded by the enemy. This is about as much as I can tell you, as soon as this screen opens, missiles and bullets are winging their way towards you, you don't stand a chance.

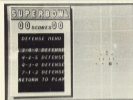
In my mind the only commands that should be in this game is one with a death wish.

S.C.



SUPERBOWL

Osman
CDA



THIRTY SIX, TWENTY FOLK. Thirty six. Hup! Hup! Ten, after considerable delay, Osman's Superbowl has finally arrived amidst considerable sarcasm, and waving of pompoms. Most of the delays were due to various gameplay problems (scores of over 100 points were being recorded) but these have now been sorted out.

Fans of American Football will know that despite initial appearances, there is actually a great deal of skill involved in the game, organising tactics and running to predetermined patterns. Osman has managed to pack a lot of detail into this game although some patriotic prejudice is displayed with a reference to real football in the instructions! For people who know nothing at all about this thrilling game, there is an audio tape included in the package which gives you a quick run down on the rules, terms and basic tactics. This works very well and is a lot better than the normal 12 page booklet that you usually get.

The screen is divided into two main sections. On the right is an overhead view of the playing area. This depicts the starting positions of the move that you want to try and execute and then follows the move through once the ball has been snapped. You control one previously designated player although it is possible to change this during the course of the play if you are fast enough. Heven runs on each side running in 32 different directions. Like quite a bit of getting used to!

The left hand side of the screen gives two functions. As a purely decorative part of the game, an action replay of the previous play appears on the game screen. This shows the players running, throwing, tackling and catching the ball and is nicely animated although it tends to get a bit repetitive after awhile (you can stop the display with a quick press of the fire button).

The sticky gummy part of the game - deciding on your tactics is determined through a series of menus. Starting with the offense, an initial menu gives you the chance to try a longer short pass, a rushing play or a special play (field goal attempt, punt and goal line rush). These choices lead into sub-menus giving you a choice of starting formations with such exotic names as shotgun and split end. Selecting "view next frame" from the menu allows you to watch the players moving to their designated positions - a very useful option that gives you some understanding of the theory behind the manoeuvres. You can also change which player you want to receive the ball once the move has started.

When you are happy with your choices, the "play game" option allows your opponent (or the computer) to decide on their defensive strategy. As soon as that is ready, the move is ready to be executed. The center snaps the ball back to the quarterback while the other players start to move around according to your instructions. A quick press of

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 runs then moves 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 release their lines, keeping the fire button pressed brings up a power scale showing the percentage of the maximum kick currently chosen. It is sweeping 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 organize. 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 16-0, 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.

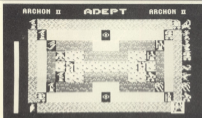
G.B.H.



ARCHON II: ADEPT

AtariSoft
£12.95, joystick required, C64

10 10 10 10



ARCHON WAS ONE OF THE most original strategy games ever written, justifiably winning several awards. Now Electronic Arts has released a sequel on the AtariSoft 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 classical signs representing the classical elements of Earth, Water, Air and Fire. In addition, there are two neutral squares which represent the void and the horse-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 lands. These four points in turn form 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 time they can either move or cast a spell providing that you have sufficient energy to cast 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, render an opponent's piece impotent as enemy, release one of your own 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, elements and elementals. Both sides have the same demons at their disposal - juggernauts, warlocks, gorgons and chimera while their elementals are different. Order can call on the services of a giant, halkon, thunderbird and salamander, representing earth, water, air and fire while Chaos has a behemoth, slime, fire and firebird available to him.

All these characters have different strengths and weaknesses when it comes to combat. Slime for example, just have to slip and the opposition starts to die. Salamanders hurl fireballs, gorgons patrol the while warlocks 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 annihilates opposition out of the way.

Combat occurs when two

pieces want to occupy the same square. The same applies to the background where you must make instant decisions as you fire to probe the opposition's weaknesses and utilize 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 item 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. breakers 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

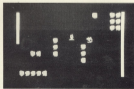
on which side you're on. The battle ground has a number of barriers which must be dodged round or used strategically. The different elements have differing effects on enemies and items. For example, fire wounds an item but leaves models unaffected while earth destroys models and slows items.

Control of the game is entirely via a joystick. Spells are selected from a menu while movement is achieved by moving a square shaped cursor. Having found the combat screen, a straight-forward aiming a missile involves pressing the fire button and moving the joystick in the desired direction. Adepts can move their models, while 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 crushed in your first few games. I would strongly recommend that you watch the demonstration game a few times so that you can get some idea of the strategical 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. While 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.B.H.



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THE FIRST OUTSIDE OPERATING SYSTEM FOR THE CBM 64 *



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ADVANCED ELECTRONICS INTERFACE - compatible with all the well-known electronic printers and Commodore printer programs. Prints all the Commodore graphics and control codes (important for example).

SCREEN DUMP FACILITIES - of 16-bit Hi-res and multicolor screen! Prints full page with 12 shades of gray for multicolor pictures, even from games and programs like Double, Battle and Frogging etc. Searches automatically for the memory address of the picture. Special version available for the CBM 801 and 803 printers.

THE EXTRA BASH FOR BASIC PROGRAMS AVAILABLE! You now command: Memory read, Memory write. They hold 100 bytes with machine language speed anywhere in the 64K Mem of the CBM 64. Can be used with strings and variables.

BASIC 4.0 COMMANDS - like Draw, Draw, Repeat, Rotate, etc.

BASIC TOOLKIT - with Auto, Return (incl. Gate and Gate), Find, Help, Off, etc.

* works with CT28 in the 64 mode.



Original multicolor full page screen during print out

PROGRAMMED FUNCTION KEYS - Run, Load, Save, Catalog, Disk commands, List (executes all list-operations).

KEYBOARD EXTRA'S - Allow you to delete part of a line, stop and continue loading, move cursor to lower left-hand corner. Files and Symbols in Mem. Typ command operates your printer as a typewriter.

COMFORTABLE EXTENDED ML MONITOR - with telescopic lens, scrolling up and down, backspacing, etc. - does not waste in memory.

RESET SWITCH - resets to monitor, resets, and all, 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.

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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 reviewing one of the reports 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 problems before now. Where 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 give. 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 printed or working program, 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

SOFTWARE FOR

SALE

programs on tape or disk for them. Obviously this takes 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 14.00. We will not be making disks available since they would have to allow more expensive and more difficult to post. This shouldn't cause you any

problems though as most of the programs will be protected and it will be a simple matter to save the programs to disk yourself.

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.

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SPRITE IDEAS

When you are designing a game one of the biggest jobs is designing the sprites. If you are good at art then fine, if not your trust monitor 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 Oge 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, Middles.



```

4: POKE(128),0:POKE(129),0:PRINT"TITLE" :REM SETS UP SCREEN COLOURS AND CLEARS OUR
REM
10: POKE(4096+87),81204:POKE(1298+1),0:REST:REM POKE DATA INTO 12188 ONWARDS.
20:REM ONCE DATA HAS BEEN READ IN ONCE TYPE "RUN 1280" TO RUN THE PROGRAM AGAIN
300:REM FRAME ONE... SPRITE ONE
305:DATA 0,18,0,0,195,0,93,213,0,251,89,0,249,117,0,289,248,18,288,248,23,288
310:DATA 218,22,259,89,88,127,89,88,253,89,87,275,89,91,289,89,19,289,113,0,288
315:DATA 0,127,89,0,128,89,0,93,214,0,11,90,0,1,189,0,0,18,0
430:REM FRAME ONE... SPRITE TWO
435:DATA 0,0,0,113,192,0,93,213,0,118,117,0,88,275,181,87,275,181,87,275,192
440:DATA 218,242,89,88,128,87,248,117,89,283,89,93,259,275,87,259,275,89,259
445:DATA 119,89,127,89,88,127,89,88,93,84,88,88,0,183,84,0,179,84,0,180,0,0,0
500:REM FRAME TWO... SPRITE ONE
505:DATA 0,18,0,0,195,0,93,213,0,251,89,0,249,117,0,289,248,18,288,248,23,288

```


Listings will be much easier to enter with our new system.

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

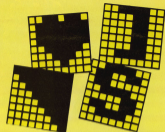
In future all control and graphics commands will be replaced by a mnemonic within square brackets. This mnemonic is not typed out as printed in the magazine but rather the corresponding key or keys on the keyboard are pressed. For example [RIGHT] means press the cursor right key, you do not type in [RIGHT].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

[SA] shift and A
[S] shift and -

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

[CA] Commodore and A
[C] Commodore and -
[C] Commodore and 1



LISTINGS

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.

[RIGHT] press cursor right 10 times
[C*10] press Commodore and * 10 times
[PC10] Press the space bar 10 times

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

Any number of mnemonics can be enclosed in brackets for example

[SHIFTSPACE] means type 10 shift A's 10 spaces and another 10 shift A's.

Mnemonic	Symbol	what to press
[RIGHT]		left/right
[LEFT]		shift left/right
[UP]		shift & up/down
[DOWN]		up/down
[F1]		F1
[F2]		shift & F1
[F3]		F3
[F4]		shift & F3

Mnemonic	Symbol	what to press
[F5]		F5
[F6]		shift & F5
[F7]		F7
[F8]		shift & F7
[CLEAR]		shift & CLR /WDAB
[HOME]		CLR/WDAB
[INVERSE]		CTRL & V
[INVERT]		CTRL & B

Mnemonic	Symbol	what to press
[BLACK]		CTRL & 1
[WHITE]		CTRL & 2
[RED]		CTRL & 3
[CYAN]		CTRL & 4
[PURPLE]		CTRL & 5
[GREEN]		CTRL & 6
[BLUE]		CTRL & 7
[YELLOW]		CTRL & 8



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COMMODORE READER'S



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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 | <input type="checkbox"/> | <input type="checkbox"/> |
| Useful | <input type="checkbox"/> | <input type="checkbox"/> |
| Not very useful | <input type="checkbox"/> | <input type="checkbox"/> |
| Not at all useful | <input type="checkbox"/> | <input type="checkbox"/> |

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
 1575
 1577

14. Do you own any of the following peripherials?

- Commodore printer
 Epson-compatible printer
 Other

15. Do you own any of the following peripherals?

- Keyboard
 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:

	All the time	More than half the time	Sometimes	Never
Original programming	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Typing in games listings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Typing in utility listings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Playing games	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Educational uses	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Business uses	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

13. Who else uses your computer?
- Nobody
 - Spouse
 - Parent
 - Children
 - Friends
 - Other

14. How much do you estimate you have spent in total in the last 12 months on your computing activities?
- 0-100
 - 101-100
 - 101-200
 - 201-300
 - 300-1000
 - 1000-1500
 - 1500-2000
 - Over 2000

15. How much do you expect to spend on hardware over the next year?
- 0-100
 - 101-100
 - 101-200
 - 201-1500
 - Over 1500

16. How much do you normally spend in a 12-month period on the following types of software?

17. Do software reviews influence your buying?
- Yes
 - No

	Games	Business Software	Educational Software	Utilities
0-100				
101-1000				
1001-1200				
1201-1500				
1501-2000				

18. Do software Charts influence your buying?
- Yes
 - No

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

20. Were you previously a regular reader of 'Your 64'?
- Yes
 - No

21. Were you previously a regular reader of Your Commodore before we incorporated 'Your 64'?
- Yes
 - No

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

23. Since we incorporated 'Your 64', do you think that Your Commodore is:
- Better
 - Same
 - Worse
- PLEASE STATE WHY
-

24. What do you think about the balance of articles in Your Commodore?
- | | More | About | Less |
|---|--------------------------|--------------------------|--------------------------|
| | right | right | right |
| New <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Programming articles <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Software reviews <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Hardware reviews <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Book reviews <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Games to type in <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Utilities to type in <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Business page <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Advertorial columns <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Letters <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Competitions <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
- What else would you like to see in four Commodore?
-

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

26. If you answered yes to Question 25, do you attempt to purchase the magazine on the day?
- Yes
 - No

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

28. If you do not obtain your copy by subscription, is it due to one of the following?
- Subscription too expensive
 - Good availability through local newsagent
 - Not every issue is required
 - Have subscribed previously but lapsed

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

30. Are you a member of a computer club?
- Yes
 - No
- If yes, please give details
-
-

PERSONAL DETAILS

31. Please tick the box which represents the annual total of your 'net' income (i.e. after tax, National Insurance, pension contributions, etc):
- From 17500-
 - From 10000 to 17500
 - From 12500 to 15000
 - From 15000 to 17500
 - From 17500 to 20000
- Name

Address

.....

.....

32. Which listings do you type in?
- | | All | Some | None |
|------------------------------------|--------------------------|--------------------------|--------------------------|
| Games <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Utilities <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

33. Which other computer magazines do you regularly buy?
- Commodore Horizons
 - Commodore User
 - Commodore Computing International
 - Zepp 64
 - Compu
 - Your Computer
 - Popular Computing Weekly
 - Personal Computer World
 - Other

- Marital status

Sex

Age

Occupation

Number of children

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join your party. Up to seven others can join - one from each of the other professions - wizards, paladin, bard, thief and shepherd being the others. Some will only join you when you give yourself wondrous to a certain degree. Experience points are awarded for killing an enemy. Your level limits 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 herbals and assorted protections to kill and jinx - a jolly little trick that causes your opponents to attack themselves instead of you. Interestingly magical lighters and shepherds has some magical ability although how much depends on your job and experience level.

There is a lot of lighting to be done if you are to attain your quest. Combat takes place on a variety of tactical depths 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 seven Hawkwind songs 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 learned 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 right hand of Dangerous Desert. After that, it doesn't leave apart from the fact that there will be some final combat in a place known only as the Nixes.

Other things to look out for are secret passages (which abound in caves and dungeons) and the guild where you will need to purchase magical items and possibly 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 your party while the bottom box is used for command entry and as a general information box. Everything in the game is controlled by single keyboard 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 it goes ahead of any of its rivals. To date, I have played it for well over 40 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.

Touchline

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Commodore 64

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7. Games	17. The Sea	27. The Storm
8. Graphics	18. The Sea	28. The Storm
9. Music	19. The Sea	29. The Storm
10. Sound	20. The Sea	30. The Storm

T P DR W

Allen Webb explores the complexities of medium-res graphics.

Everyone raves 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 CGA, in common with most other micros, has a resident set of standard characters. Arrange them in a matrix which represents 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 80 points up. While 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 Atwood's excellent *Psychoballs* was this sort of resolution.

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

The commands have the following syntax:

1 Dot:
555 X1Y1,X2,Y2,MODE,
COLOUR
X1,Y1 are the co-ordinates of the dot.
MODE decides how the dot is drawn:

1 — draws the dot
2 — flips the dot (ie, 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 Line
555 X1Y1,X2,Y2,MODE,
COLOUR
X1,Y1,X2,Y2 are the co-ordinates at the ends of the lines.

3 Area manipulation
555 X1Y1,X2,Y2,MODE,
COLOUR,MODE,CHARACTER
XC,YC specify the position of the top left hand corner of the area.
W is the width of the area.
H 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 (ie, 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 omitted when MODE=0. The character value is the POKE value that would set the character value of one fills the area with the letter A.
This command acts as a fill by 25 resolutions and, as before, set of range values are ignored.

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

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I've included a simple demonstration which shows some ways of using these commands. The first uses shades of gray 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 as for the dot command.

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

```
PROGRAM LOW RES LOADER
5000 FOR L=0 TO 24:CO#0
  :FOR B=0 TO 15:READ B
  :C=C#B+64:GOTO 5170:GOTO
  :B:GOTO 5170
5170 READ A:IF A=0:GOTO 5080:IF
  167:GOTO 5170:IF L=0:GOTO
  5080:GOTO 5170:GOTO
5200 NEXT L:END
5240 DATA 76,1,200,76,99,204,
  76,99,204,32,32,202,141,
  128,1,52,5099
5280 DATA 12,201,140,124,5,
  32,12,201,141,124,1,201,1,
  240,4,149,1650
5320 DATA 1,26,227,156,3,141,
  124,5,32,32,202,141,127,1,
  72,152,1445
5360 DATA 72,126,72,148,4,
  141,121,1,140,122,3,122,
  222,172,124,3,5099
5400 DATA 122,201,120,26,146,
  1,76,247,202,172,126,1,
  202,80,144,3,2046
5440 DATA 11,247,202,147,47,
  26,227,201,122,201,78,126,
  3,46,122,3,2041
5480 DATA 76,201,46,121,1,4,
  201,4,121,4,201,142,221,4,
  221,26,1699
5520 DATA 222,4,221,26,222,
  24,141,221,122,221,122,
  222,142,221,142,126,2047
5560 DATA 1,122,222,174,122,
  1,148,1,141,122,1,224,4,
  140,4,14,1420
```

```
2320 DATA 122,5,201,144,246,
  172,122,5,177,221,122,4,
  221,222,202,246,2540
2340 DATA 0,222,224,14,144,
  246,76,247,202,172,124,5,
  220,1,246,26,2146
2360 DATA 124,5,246,6,126,12,
  122,1,24,126,144,21,126,
  77,122,1,1446
2380 DATA 24,176,144,12,172,
  122,1,72,222,141,122,5,
  126,12,122,1,1246
2400 DATA 176,144,222,202,
  172,122,3,142,221,26,144,
  216,227,126,2,142,2476
2420 DATA 126,2,142,221,122,
  222,14,142,222,127,126,2,
  122,224,172,127,222
2440 DATA 1,201,14,246,2,142,
  222,124,104,144,104,46,122,
  126,122,47,1694
2460 DATA 124,126,222,226,
  148,127,46,222,222,222,
  224,142,12,222,174,32,2207
2480 DATA 126,172,32,247,242,
  142,26,76,72,122,172,226,
  71,142,1,141,1671
2500 DATA 126,3,172,126,1,
  222,172,140,1,202,26,144,
  4,76,247,202,1990
2520 DATA 172,141,5,201,26,
  144,1,76,247,202,172,144,
  2,26,227,174,1999
2540 DATA 2,141,142,3,172,
```

142,1,56,237,140,3,146, 149,3,149,1,1500	3,175,153,3,149,154,3,76, 253,3,173,1757	52,12,165,144,140,3,32,12, 253,141,158,1578	173,140,3,246,158,173,147, 3,246,233,204F
2260 DATA 141,145,3,141,144, 3,173,146,3,16,16,166,203, 140,145,3,1628	2260 DATA 251,2,146,237,150,3, 141,157,3,175,179,3,141, 275,3,173,1672	2460 DATA 3,201,3,208,15,208, 3,246,7,167,1,76,233,158, 3,141,167	2320 DATA 173,147,3,167,141, 3,141,147,3,15,89,205,140, 8,173,158,1660
2270 DATA 73,225,24,100,1,1, 141,147,3,175,143,3,16,16, 146,255,141,1628	2300 DATA 141,3,141,134,3, 173,158,1,204,3,204,3,173, 154,3,17,1528	2480 DATA 158,1,32,12,205, 141,137,3,175,139,3,205, 146,12,146,11,1507	2380 DATA 3,208,16,177,251, 73,138,145,231,173,137,3, 201,16,240,17,2040
2280 DATA 144,3,73,225,24, 103,1,140,145,3,173,148,3, 84,257,147,1663	2320 DATA 225,146,134,3,32, 86,203,175,167,3,16,36,39, 209,154,3,1486	2490 DATA 73,175,146,3,140, 139,3,136,141,146,3,175, 141,3,205,140,1723	2390 DATA 3,208,16,177,251, 73,138,145,231,173,137,3, 201,16,240,17,2040
2290 DATA 3,141,149,3,1,16,33, 147,225,141,134,3,149,4, 141,153,3,1527	2340 DATA 140,137,3,173,139, 3,24,209,131,3,141,139,3, 173,141,3,1520	2500 DATA 3,144,11,73,175, 142,3,141,140,3,204,141, 142,3,76,24,1523	2400 DATA 3,145,233,204,204, 148,3,198,211,158,14,3, 173,141,3,205,2380
2300 DATA 175,147,3,140,155, 3,175,148,3,141,255,3,175, 144,3,40,1668	2360 DATA 24,139,255,3,141, 140,3,76,80,204,56,237, 253,3,141,157,1660	2510 DATA 201,32,12,205,141, 139,3,32,12,205,141,140,3, 12,12,205,1510	2410 DATA 147,3,148,191,46, 3,201,16,240,204
2310 DATA 3,149,3,141,156,3, 76,253,205,147,3,140,156, 3,149,225,1652	2380 DATA 3,173,139,3,24,139, 146,3,141,139,3,173,141,3, 24,109,1523	2520 DATA 141,146,3,32,12, 205,141,147,3,32,12,205, 141,137,3,15,1590	2420 DATA 24,145,231,100,46, 133,231,148,231,100,4,133, 231,156,208,208,2040
2320 DATA 141,151,3,173,146, 3,140,152,3,173,147,3,141, 153,1,175,1700	2400 DATA 143,3,141,141,3, 204,159,3,46,3,76,149,203, 104,170,104,1700	2530 DATA 12,205,141,138,3, 249,4,32,12,205,141,158,3, 24,24,175,1513	2430 DATA 24,145,231,100,4, 3,133,231,148,231,100,4, 72,109,136,3,1716
2330 DATA 143,3,48,3,147,1, 140,151,3,173,152,3,141, 154,3,54,1346	2420 DATA 168,154,76,32,12, 203,141,139,3,32,12,205, 141,141,3,32,1462	2540 DATA 239,3,109,140,3, 201,46,144,1,76,24,175, 141,3,109,147,1463	2440 DATA 133,232,104,24,102, 216,133,234,145,201,133, 203,74,205,31,205,2450
2340 DATA 237,251,3,141,135, 251,3,173,1757	2460 DATA 140,137,3,173,139, 3,24,209,131,3,141,139,3, 173,141,3,1520	2550 DATA 3,104,3,144,3,74, 140,3,104,147,1463	

```

PROGRAM : 128 800 800
1 F0R8 S2881,11
2 D=12:G=13
10 S4=5:7:12
20 PR#87 D88=1407
31 F0R 240 T0 48
20 F99 S8=3,1,0,3,24,3,12
22 F99 S8=1,4,49,3,28,3,12
25 NEXT
26 F0R 240 T0 80
27 F99 S8=1,0,3,49,2,12
NEXT
28 F0R 240 T0 79
29 F99 S8=3,0,0,1,49,3,12
NEXT
30 F99 S8=1,41,0,41,49,0,12
31 F1=13+49 S8=49
F99 3+0 T0 37
40 F99 S8=1,0,71,1,72,1,12
50 F99 S8=1,0+1,71,1+1,72,1,12
60 F0=71+1:72=71:1:83=0:1:2
NEXT
70 F0R 240 T0 11
80 F99 S8=3,0,0,1,49,0,0
90 F99 S8=3,12,0,37,1,12
120 F99 S8=1,1,0,11,0,12
125 F99 S8=1,3,79,1,49,3,12
NEXT
130 F0R 240 T0 47
140 F99 S8=1,1,0,3,49,0,0
150 F99 S8=1,1,10,1,28,1,12
160 F99 S8=1,1,0,3,7,1,12
180 F99 S8=1,0,1,1,49,3,12
170 NEXT
175 F0R 2=1 T0 1000:NEXT
F0R8 S2881,49:PR#87
CLACK:CLACK*
180 PR#87:CLACK*
190 F0R 4=0 T0 240:PR#1
200 S=49+G:8:8:PR#1
F99=25:8:8:8:8:PR#1
210 F99 S8=1,28,24,0,71,1,12
NEXT
220 NEXT
230 F0R 2=0 T0 1000:NEXT
240 F0R 2=1 T0 20
S=49+11:12=0:49+11:8:0
40+49:11:12:49:11:8:0:11:25
250 F99 S8=1,10,75,41,41,16,0,0
NEXT
260 F0R 140 T0 37
270 F99 S8=1,0,79,1,14,0
NEXT:G70 240
    
```



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. Whilst 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 started a routine to put a row of stars along the top of the screen. Here is one solution:

```
10 ASSEMBLE 100,1
100 LDA #40000
110 LDA LDA #9
120 LDA #8: MATH
130 LDA LDA #0
140 LDA LDA #41
150 LDA LDA #8: MATH
160 LDA #0
170 LDA COPY #40
180 LDA BNE LOOP
190 LDA RTS
200 LDA ]
```

This uses the plus character routine in ROM to print asterisks to the screen at the current cursor position. Lines 110 and 120 print HOME (CHR(10)). I used this method since there is no need to worry about updating the colour matrix. Those of you with old ROMs, will no doubt be aware that when you set the cursor colour, the colour matrix is not updated. This means that if you move data direct to the screen memory, you will not necessarily get the colour you want. New ROMs do have had this fixed.

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

```
10 ASSEMBLE 100,1
200 LDA #40000
```

```
110 LDA LDA #0
120 LDA LDA #9: TIA
130 LDA STA (BANK, Y
140 LDA LDA #1
150 LDA STA $A0000, Y
160 LDA #NY
170 LDA BNE LOOP
180 LDA RTS
190 LDA ]
```

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 (index), indirect indexing is unnecessary. There are 256 characters with POKE values ranging from zero to 255, and this fact is line 120 by using the Y register to update the character to be POKE'd. 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 10240, I
30 POKE 50796, I
40 NEXT I
```

Line 170 acts in a slightly different way to the looping we've used previously, but it's covered that shortly.

There is one more addressing mode which you should be aware of. This is an infrequently used mode called the Indirect Indirect Addressing mode. 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),X

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

```
LDA (BANK,X)
STA ($AAX,X)
```

An 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 (BANK,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 \$AC,\$AD.

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 lengthily. 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 flag field 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 255, 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 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:

- BCI — branch if carry flag is set
- BCC — branch if carry flag is clear

- BGI — branch if zero flag is set
- BGE — branch if zero flag is clear

- BNL — 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 — this compares the accumulator to data or the contents of a location.

CPX — compares the X register to data.

CPY — X analogue to CPX.

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

To detect various results, you use:

```
Register = data — use BCS, BEQ, CMP #4
BCS LOOP if CARRY flag
LOOP if ACCUMULATOR holds four or more.
```

```
Register = data — use BCC, CFI #0
BCC LOOP branches if LOOP if Y register holds less than 10.
```

```
Register = data — use BEQ, e.g. CFI #4
BEQ LOOP branches if X register holds 4.
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 `INC`, `DEC`, `INC`, `DEC`, `INC` change the register and zero flag 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 T10J
110 BNEA #AC000
120 BNEA LDR #0
130 BNEA LDR #0
140 BNEA LDR #0
150 BNEA BNE LDR #0
160 BNEA DLY
170 BNEA BNE LDR #0
180 BNEA 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 define 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 I=0 TO 10: FOR J=0 TO 10: NEXT J, I
```

An alternative method is to call the routine at \$00B5. This routine generates a one millisecond delay.

Let's use this delay routine to generate a simple twinkle pattern. Consider the routine:

```
100 ASSEMBLE T10J
110 BNEA #AC000
120 BNEA LDR #8
130 BNEA STA #99
140 BNEA LDR #4
150 BNEA STA #99
160 BNEA LDR #AC000
170 BNEA INC #000
180 BNEA DR DELAY
190 BNEA DR #001
200 BNEA BCC #000
210 BNEA SWP LOOP
220 BNEA JIN#004: RTS
230 BNEA DELAY: LDR #99
240 BNEA LDR #0
250 BNEA LDR #0
260 BNEA BNE LDR #0
270 BNEA DLY
280 BNEA BNE LDR #0
290 BNEA RTS
300 BNEA ]
```

You'll immediately recognise lines 230 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 130 set up the delay parameters. The core of the routine is lines 140 to 270. It is an infinite loop which changes the colour of the border, delays a bit and then loops back. The sub-routine call in line 170 sets the `RUN-STOP` key. If this key is pressed, then the Z flag is set. Line 280 checks this and stops if the flag is set. By messing about with the delay values and see the effect. If you use a bit of care and possibly the odd `NOP` to get a more stationary coloured border in the border.

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

```
300 ASSEMBLE T10J
310 BNEA #AC000
320 BNEA LDR #0
330 BNEA STA #99
340 BNEA LDR #0
350 BNEA STA #99
360 BNEA LDR #0
370 BNEA LDR #0
380 BNEA LDR #0
390 BNEA STA #0400.7
400 BNEA LDR #1
410 BNEA STA #0400.5
420 BNEA TPA
430 BNEA DR DELAY
440 BNEA TAY
450 BNEA LDR #12
460 BNEA STA #0400.7
470 BNEA TPA
480 BNEA DR DELAY
490 BNEA TAY
500 BNEA LDR #TABLE, Y
510 BNEA BEQ #0400.6
520 BNEA STA #0400.5
530 BNEA TPA
540 BNEA DR DELAY
550 BNEA TAY
560 BNEA BNE LDR #0
570 BNEA BNE #1
580 BNEA TABLE: DR #15,15,17,16,13,15,17,10,15,15,16,15,0
590 BNEA DELAY: LDR #99
600 BNEA LDR #0
610 BNEA LDR #0
620 BNEA BNE LDR #0
630 BNEA DLY
640 BNEA BNE LDR #0
650 BNEA RTS
660 BNEA ]
```

Again the delay routine uses two locations to hold the parameters. This routine

simulates a device rather like the "Independent" 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 140 scans 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 BOM machines. The next three lines form a delay. The TPA and TAY either side of the call to the delay loop save the contents of the X 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 300 take a letter from the table and put it on the screen. Line 380 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 realise that I'm spending a lot of time explaining how the routine works. As we progress, I will make briefer comments since you should soon be able to see things out for yourself.

Oh, 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 credit but effective routine.

Secondly, I want a routine which will move 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 a 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?

Last month we'll explore eight and 16 unsigned arithmetic.

Teacher's Pet

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 identified:

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 good 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 latter 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 personal 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 clerical methods.

While rummaging through the shops, however, I did see an interesting item: a new product, this is a triple pack of Hill MacGibbon software for a much 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

ballooning and then goes on to look at the Hindenburg disaster and how a hot air balloon works. The ability to read and use a map is very important when flying a balloon and this topic is also covered. The software provides a balloon simulator with controls showing year, altitude, fuel (it's a hot air balloon), rate of climb and atmospheric temperature. Using the information given on the instruments, you must guide the balloon over varying terrain. In this way, *Ballooning* covers aspects such as physics, map-reading, mathematics and geography.

Car Journey

This would appear to be a minor one since the software involves the operation of a light baggage business. In it you must run the firm and keep it financially viable. This is done by judiciously arranging contracts to move goods from point to point and selecting the optimum routes. You get bonuses or penalties depending on whether to keep to the time limits. Naturally, you must attempt to choose contracts which end up at the starting points of other routes etc. It doesn't pay to run an empty truck! Different size vehicles are available to suit different size commitments.

The accompanying booklet deals with aspects of the car, how it works and its history. It also covers the history of roads and transport and the motorway system. A nice touch is an extract from *Road to Road* still describing Ford's discovery of the joys of motoring. The pack covers reading, mathematics, geography and mechanics.

Special Agent

This package puts you in the shoes of a budding James Bond searching Europe for the dangerous enemy agent who's gaily 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 routes and planes from timetables.

As usual, the booklet covers subjects connected with the central theme. You are introduced to the elements of

cryptographs, the capital cities of Europe and a little information on real life spies is given. It covers geography, reading, logical 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 learn quite fast the laws of words. What is more difficult to learn and contributes most to the difficulties of English is punctuation. Punctuation Pete is a program invented 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 at the cursor. I highly recommend it.

The last two programs are for the younger child. First there is *Pincher Biddle*. 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 printed to give the required effect. Microboard made it easy 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 race. These jumps must be distributed between the rabbits. There are leaders in which the rabbits can hole, if the fox isn't there! The game ends when all rabbits are home or have been eaten.

This game requires tough and clever for child to use a little logic, logical thought and some counting skills.

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

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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, most as 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 FORing 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 P1241 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 1K. Altogether this method actually uses just under 4K of memory. On the disk or tape, it takes up well over 1K of storage space — that is, 10 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?

DATA, TIME AND MEMORY

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

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 FORs the data into memory.
2. Now 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:

```
5 "file name",C800,C208,00
```

This will save the block of memory from C0000 (the start address) to C001F (the end address) on a disk drive with the device number of 0 or 05 (the 01 for tape) with a file name "SPRITES". (You choose the filename although you do not actually need one for files saved on tape).

4. You may need to save more than one block of data, for instance, a block of character data at C1200 and a block of machine code data at 49132. All you need to do for this is to repeat instructions 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 load the computer 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*4+8=2640=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 filename).

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 FORs 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",A,1 or SAVE "filename",A,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 blocks of memory. 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 5:441 : 10:4:1THINLOAD  
"filename",A,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 to tell that the block of memory goes back to wherever it came.

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

```
20 IF 5:1THINLOAD"" AND  
filename",A,1 etc.  
30, in the case of tape, the first  
line can become:  
10 1:4:1 : 10 : 1THINLOAD  
"":A,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, 5=0.
2. At line 1, 5 becomes 1 and the first load takes place.
3. After the load, the program starts again at line 10 but the variable 5 is still 1. Therefore 5 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.

FONT

FACTORY

Evelyn Mills looks at a new product from Impex.

THE FONT FACTORY (FF) IS APPLE 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 7025/MP3 801 although directions are given for using a printer interface emulating the MP3801 or 801. It is claimed that FF will work with most word processors with open sequential files and I have used Easytype 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.

Notably there is no manual supplied with FF; instead the programs give 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 84. 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 MSA1 enter "f" at the beginning followed by (return). Should you wish to use a different font in the middle of your document, insert a new "f" 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 goes back to work. When you have defined the number of fonts in your document, a single (return) will put 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 letters in the fonts selected, very simple indeed and very effective.

There are eight in-built fonts including Mono, Bold, Roman, Gothic and, most important of all, the Decorative. 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 specially 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 16 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; three again instructions are readily handled, when complemented with the manual. This function independently of a word processor, character widths are Normal, Money or Double width and the output has two options; one selects print according to the printing character in your slogan while the other selects total line printing (note - the word set in normal width prints a banner a moral two feet long!) FF 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, appreciably priced and certainly "user friendly".

the cassette buffer, address 628-819, where it can be easily used.

The final routine in this month's Scratchpad is a very handy cassette tape catalogue system from N V Newsen from Oxford. The object of the program is to allow you access to without programs or subroutines stored on a master cassette.

The program as it stands will store 10 versions of approx 5K

in length on a C60 cassette but this could quite easily be changed to suit individual requirements. If you use the C-64/Plus4 fast tape routine from our Feb '86 issue about 18 programs of 25K can be saved. The data can be altered to suit the names of your programs. Don't forget to put the program number at the start of each line as it is this that you will have to press to access that file.

PROGRAM LIST

```
10 REM "DOWN LIST"*****OVER PROGRAM 1994
20 REM (F1) = PAUSE : (F2) = DOWN.
30 POKE 251,248 : REM SPEED OF LIST
40 FOR C=0 TO 22:READ N1,C2,C3,C4,N2:GOTO 60
NEXT C
45 IF C=1234 THEN PRINT"DATA ERROR"END
50 POKE 174,56:POKE 175,2
60 GOTO 75,145,171,201,4,244,250,261,3
70 DATA 198,8,145,201,142,145,142
80 DATA 16,252,104,76,26,147
```

PROGRAM TAPEREADER

```
10 PRINT"DOWN"POKE 50254,0:POKE 5226,1
20 GOTO 170
30 PRINT"DOWN,RIGHT"RIGHT TAPES AND PRESS A KEY."
```

```
40 GET A:IF A=**THEN 40
50 PRINT"DOWN"
60 GOTO 1225
70 PRINT"DOWN"
80 GOTO 170
90 POKE 64,14:PRINT"DOWN,RIGHT"PROGRAM NAME:"
100 POKE 64,2:FOR I=0 TO 940
110 PRINT"DOWN"POKE 141,I:GOTO 120
120 PRINT
130 I=I+POKE 1020,I254+POKE 1020
140 I=I+POKE 1020,I254+POKE 1020
150 POKE 64,14:PRINT"DOWN,RIGHT"START ADDRESS:"
160 POKE 64,2:PRINT I
170 POKE 64,14:PRINT"DOWN,RIGHT"END ADDRESS:"
180 POKE 64,2:PRINT I
190 POKE 64,14:PRINT"DOWN,RIGHT"LENGTH:"
200 POKE 64,2:PRINT I-GO:POKE 64,14:PRINT"BYTES."
210 PRINT"DOWN,RIGHT"FILE:"POKE 64,2
220 IF POKE 1020=0 THEN PRINT"RIGHT"BACK"
230 IF POKE 1020=0 THEN PRINT"RIGHT"PACKING CODE"
240 POKE 64,14:PRINT"DOWN,RIGHT"PRESS ANY KEY"
250 GET A:IF A=**THEN 250
260 GOTO 10
270 PRINT"RIGHT"COOTPE HEADER READER"
280 PRINT"DOWN,RIGHT"TOP"
290 PRINT"DOWN,RIGHT"LIST,PRINT 1997"
300 RETURN
```

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TRILIGIC



FROGGY

Daryl Flowers shows

you how to kill the

frog!

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 LRV15 on to the status panel. CNV15 indicates whether the frog is dead or alive and if dead (CNV15 = 5), then we exit from the routine.

The next four instructions print the values in F000 and F000*1 and the following seven use the X register as an index to point to the five digits of INTF005 and M0005 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 BB10 and the BY. Their speed is increased by a small amount every time another 100 points is scored. The new run times store the current digit in the 100 column of the screen into INTF010. The code which carries out the increase in speed appears later in the routine.

Lines 10310 to 10100 decrease the two byte delay M0T04 and M0T04*1 to check whether another move has passed. If not then we jump to F025, which simply returns from the routine.

The next eight lines use the X register as an index to increase the ANTR05 value if the digit being increased reaches nine-plus-one in value, i.e. We check that digit is set to zero, and that next highest digit is increased. M0 TSP0 contains the value which is placed back into

1000 TAMP0

1000 NOVL,NOVE,NOV1,NOV2,NOV3,NOV4

1000

100 PLNR0

1000

1

1000 DEX

1000

1

1000

104 M0T04

1000

014 M0T04*1

1000

1

1000

00C F000+1

1000

104 F000+1

1000

00F F*1*1

1000

00C 000

1000

104 F*1*

1000

014 F000+1

1000

00C F000

1000

104 F000

1000

00F F*1*1

1000

00C 000

1000

104 01

1000

014 000

1000

1

1000

1

1000

1

1000

1

1000

1

1000

100 04

1000

00C 0000,1

1000

104 0000,1

1000

00F F*1*1

1000

00C 000

1000

104 F*1*

1000

014 0000,1

1000

00C

1000

00F 0000

1000

00C

1000

1

1000

1

1000

104 0000+0

1000

00C 0000

1000

00C 000

1000

00F 000

1000

00C 0000

1000

00C 0000

1000

00C 0000

1000

104 0000+0

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104 0000

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00C 000

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104 0000

1000

00C 000

1000

00F 0000

1000

00C 000

1000

00F 0000



10770	DND		11260	LDA #17
10770	POD	STX	11270	STA FOOD
10770		I	11280	STA FOOD+1
10720		I	11290	LDA #0
10730		I	11300	STA DD
10740		I	11310	LDA #RT
10750		I	11320	STA FL,FLD
10760	SGAO		11330	STA BSGLD
10770		I	11340	LDA #1
10780	LDA #D		11350	STA FL,FLD
10790	AND #ANDD		11360	STA BSGLD
10800	STX		11370	LDA #1
10810		I	11380	STA FL,FLD
10820	SGANDD	LDA #D17	11390	STA BSGLD
10830		STX #D17H	11400	LDA #1
10840		AND	11410	STA FL,FLD
10850		STX #D17H	11420	STA BSGLD
10860		LDA #D16C	11430	LDA #1
10870	LDA JMPPT1H		11440	STA FL,FLD
10880	AND #D16C		11450	STA BSGLD
10890	LDA #D16H,7		11460	LDA #1
10900	BACK	SEC	11470	
10910		BSC #40	11480	
10920		STA #D0C2	11490	
10930		JMP #D0C	11500	
10940	D16C		11510	
10950		LDA #D16H,7	11520	
10960	JMP BACK		11530	
10970	#D16C		11540	WHILE
10980	LDA #D16C		11550	
10990	STA #D0H1		11560	LDA #D
11000	STA #D0C2		11570	JMP #D0H1
11010		I	11580	SEC
11020	LDA #0		11590	BSC #4
11030	STA #D0H2		11600	BSC LOOP2H
11040	STA #D0C1		11610	STX
11050		I	11620	
11060		I	11630	WHILE
11070		I	11640	
11080	SEC		11650	LOOP2H
11090	LDA #D16H,2D5		11660	
11100	STA #D16H		11670	BSC #4
11110	LDA #D16H,2D5H		11680	BSC LOOP2H
11120	STA #D16H		11690	STX
11130	BSC #1D0C		11700	I
11140	JMP #D17H		11710	ENDIF
11150	LDA #1		11720	LDA #DRT
11160	STA #D17H		11730	LDA #DRT
11170	JMP #D17H		11740	DEF
11180	LDA #0		11750	BSC LOOP2D
11190	STA #D17H		11760	SEC
11200	JMP #D17H		11770	BSC LOOP2D
11210	LDA #D17D		11780	SEC
11220	STX #D17H		11790	BSC LOOP2D
11230	LDA #D17H		11800	STX
11240	AND #D17H		11810	I
11250	STA #D17H		11820	JMP #D17H
11260	LDA #D17H		11830	STX
11270	STA #D17H		11840	I
			11850	FINISH
			11860	END

NOTHING, so by changing this value (line 1260) you can adjust the distance that must be travelled before the value of METERS is increased.

The same principle used for increasing the meters is used here to decrease #D16C1 and increase #C1D1H.

What's left up to us is DND. If the value of NETH104 is different to the current value of #D0C2+1, then it is time to decrease the delay which caused the speed of the RED and FL, BADDPO and FULPD. 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 GED has been set by the collision routine, which one will add next issue.

Lines 10020 up 10050 set up the sprite definitions to paint the correct sprits for a dead frog. #D0C1 to #D0H simply set up the correct X and Y coordinates of the frog (the would look pretty silly, floating in mid air). Next the colours are set up in lines 10020 to 10040.

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

To stop this from happening, we point the interrupt vector at #D17H and #D17H to the end of the routine, thus executing no code.

The rest of this section is simple to follow, and does this: Decrease lives, print the status panel, pause, set up #D17H, call #D17H, set #D17H and by position, reset #C1D1H position.

The last pieces of code from line 11920 onwards, are simply delay loops used by the previous routine.

Panel issue - continued

LANGUAGE

This month David Janda begins a look at C — a very versatile programming language.

LAB-C

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 "favourite 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 committees, 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 64 — and the code that it produces is compact and fast. Another benefit of C is that it is portable. We have all heard claims 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" world 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 BBC 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:  
1) #include <stdio.h>  
2) main () /* This is a demo */  
3) {  
4) int main;  
5) main = 1;  
6) printf ("I am a simple");  
7) printf ("compares %i");  
8) printf ("My favourite number is %d  
because it is first. \n", main);  
9)
```

(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 `main` has been declared of the type integer. In line five `main` has been assigned with the value one and line six to eight print the output.

Line nine indicates the end of the function.

The `/*` instructs the micro where and in what form the value held in `main` 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 64 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, the emphasis is on introducing the user to the language. Development packages on the other hand (such as OC3 and Ophelus 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" complex 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 48 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 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 pointers 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:

Type	Size
char	1
short	2
int	2
long	2
unsigned	2
float	6
double	6
pointer	2

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 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 14, such as some sound and graphics functions.

Documentation

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

Punch holes enable the manual to be filed 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 type; 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 Walter, Prentice & Martin (Barns, £19.95, ISBN 0-673-12890-5) is supplied with the C Power package. Quite simply it is the best language tutorial book I have ever read! This hefty tome (528 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/or compiler should be copied on to one disk. Another disk should be used to copy the 816 side of the system disk; this contains the Sylib.1 and Sylib.1 function libraries.

The compiler itself is copy protected (not very well though) so no 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 mini-command interpreter. It supports command line arguments and I/O redirection 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 is option 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 executable files 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 C84 dependent functions, long integers and double precision floating point.

Having said that, its price is outweighed by the cost, and I would recommend the C Power package to the novice as well as the professional.

TABLE 1 - COMMANDS SUPPORTED BY THE SHELL

l	list work disk directory
ls	list system disk directory
mv	move file from work disk
mv	rename file on work disk
pr	list contents of a file on work disk
disk	send command string to work disk
load	load, but not run, command from work or system disk
work	show or set drive and drive numbers
sys	as above but for system disk
ed	load and run editor
cod	load and run syntax checker
cc	compile C source
link	run linker

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

**William Fong adds a
little more power to
your MPS**

BETTER MATRIX

Simply type it in as you would any other program and SAVE 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 leader by typing N/A. Then type M5 #150 to initialize better matrix. A 50 line memo 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, and RUN the program. Not very nice is it?

Now press function key 5, which will give a cyan leader, and RUN the program again. This time the letters will have descenders.

Better matrix should therefore give a better appearance to many of your programs. 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 \$C800-4995D so it will definitely not work with programs that use this area of memory.

THE COMMERCIAL 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 some of the lower cost letters have descenders. This means that a letter 'f' would simply sit on the same line as a letter 'i'. This makes it very difficult to read large amounts of text.

If you want to enter the wonderful 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.

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

By employing this on the MPS 801 we can obtain an acceptable print resolution of 14 dots by 12 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 3 which shows the normal printout of the MPS 801 compared to that of the newer matrix.

However, printing in this manner does have a disadvantage. As the printer has to go over each line of text more than once it takes a lot longer to print out any text, this is not only common to the MPS 801 but all NLQ printers suffer to the same way. On the MPS 801 the speed is reduced from 30 characters per second to 30 characters per second.

Getting It In

Better matrix is quite cheap and the program is all in machine code but is packaged into in the form of a Basic loader.

PROGRAM: BETTER MATRIX

```

3000 FOR L=0 TO 90:G0=0
4700 G=0 TO 25:G0=0
10=C=C+A*P*E 4*F*O=C+L+G+0,
A=0:G1=0
2010 G0=0:IF A=0:G1=0:G0=0:IF
A#0:G0=0:IF A#0:G1=0
3020 G0=1:G1=0:G0=0
3040 G0=1:G1=0:G1=1:G1=1
5,100,175,190,200,5,100,100,6,
150,21,100
3050 G0=1:G1=0:G1=0:G0=1:G1=
0,100,150,175,21,210,200,
200,210,200,200,270
3060 G0=1:G1=0:G1=0,100,240,
150,21,210,200,200,204,200,
200,240,1:G1=0:G0=0
3070 G0=1:G1=0:G1=0:G1=0:G1=0,
200,210,200,200,100,240,
1:G1=0:G1=0:G1=0:G1=0
3080 G0=1:G1=0:G1=0,100,210,
4,200,200,10,100,200,204,
4,200,10,100,2010
3090 G0=1:G1=0:G1=0:G1=1,100,
175,140,20,1,100,1,100,21,
200,10,40,2010
3100 G0=1:G1=0:G1=0:G1=0,10,
100,200,100,20,1,100,200,
100,10,100,100
3110 G0=1:G1=0:G1=0:G1=0:G1=0,
100,10,100,100,200,10,40,
100,10,100,100,20,1,200,0,
100,0,100
3120 G0=1:G1=0:G1=0:G1=0:G1=0,
200,204,100,10,100,100,10,
100,10,100,100,200
3130 G0=1:G1=0:G1=0:G1=0:G1=0,

```

```

200,1,70,0,100,204,0,200,
0,70,20,100
3140 G0=1:G1=0:G1=0:G1=0:G1=0,
50,175,200,10,100,0,10,00,
100,204,2040
3150 G0=1:G1=0:G1=0:G1=0:G1=0,
200,10,200,1,70,100,100,
200,10,200,1,70,100,100,
200,10,200,1000
3160 G0=1:G1=0:G1=0:G1=0:G1=0,
200,1,70,100,204,0,
200,1,70,100
3170 G0=1:G1=0:G1=0:G1=0:G1=0,
200,100,100,204,0,100,200,
1,70,204,100,204,0,200,0,
10,200,100,2040
3180 G0=1:G1=0:G1=0:G1=0:G1=0,
200,204,0,0,200,0,70,100,10,
100,200,21,100,10,200,200,
240,10,204,1000
3190 G0=1:G1=0:G1=0:G1=0:G1=0,
100,100,100,200,10,100,10,
100,100,10,100,100,2040
3200 G0=1:G1=0:G1=0:G1=0:G1=0,
200,204,0,100,100,10,204,
200,204,0,100,100,204,
200,204,100,100,2040
3210 G0=1:G1=0:G1=0:G1=0:G1=0,
200,204,0,100,100,10,204,
200,204,0,100,100,204,
200,204,100,100,2040
3220 G0=1:G1=0:G1=0:G1=0:G1=0,
100,200,70,10,100,100,7,100,
100,100,100,204,100,100,
100,100,100,204,2040
3230 G0=1:G1=0:G1=0:G1=0:G1=0,
100,200,70,10,100,100,7,100,
100,100,100,204,100,100,
100,100,100,204,2040
3240 G0=1:G1=0:G1=0:G1=0:G1=0,
100,100,100,100,100,100,100,10,
100,100,100,204,100,100,100,
100,100,100,2040
3250 G0=1:G1=0:G1=0:G1=0:G1=0,
100,100,100,100,100,100,100,10,
100,100,100,204,100,100,100,
100,100,100,2040
3260 G0=1:G1=0:G1=0:G1=0:G1=0,

```


COMMUNICATION

If you've never heard of
bulletin boards or you just
want to know how to get on
one — read on. David Janda
shows you how.

I HAVE BEEN ACCUSED OF DOMINATING Communication Corner with WYNN/CNET blurb. Well, as promised, here is a refreshing change. This month the subject is bulletin boards.

A bulletin board (BB) front page can be best compared to a community bulletin board. A BB is usually run by a host on a home micro with disk drive and 2400-wpm 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-interest info, you name it you can put it on a BB.

Compared to Microsoft or CompuNet (I know I would mention them sometimes!) BBs are not technically brilliant, but they are by no means crude. One of the best things about using different BB's board-making 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 VisiData (Prestel) user who does not have this type of package, Databit on page 208(17)000 at £1.50 should get you going. CompuNet users can purchase TTS which is at T14007 for \$4.95.

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 VisiData (Prestel-like) standards. This type of board presents information with colour and line-art graphics in a page format. Microsoft-Prestel subscriptions will not need to buy any additional software, but CompuNet subscribers will need the free VisiData priggly at 2030. Again, with the dumb terminal software, most comms software has a VisiData mode.

Which Modem?

Most of the BBs are run at 300 baud. This means that you'll need a modem such as the Voyager 7, Nightingale or Multi-modem from Atwoods Technology. All these modems will also allow you to access boards at 1200/75 Prestel and scrolling formats. CBA modems (users need not feel hand-dive 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 Go-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 addresses that you can play.

When using a BB, it's worth remembering that the service which you are using is two-way. That is, it's up to you, the user, to help supply the board with information. Have you got any software of 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 Visual type software to access the board. 1200/75 means that you need scrolling type software and a modem, such as the one from CBA, to access the service. Finally, BB means 300/300 baud access which needs scrolling software. CBA/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 Bequaq which I shall check out soon enough. I also understand that there is some public domain (free) BB software knocking about in Iceland which I shall also track down. As you can see before, running a Bulletin Board on a C-64 is perfectly feasible.

COMMUNICATION

CORNER

Name	Telephone	Basis
BABS 1	0284 276398	800
Balston (Ox)	01 728 8718	V/Data
Carroll (Ox)	0222 464 726	V/Data
C-Vine	0702 548371	V/Data
SBBS Swansea	0792 283993	800
Chavira at Home	01 668 8894	V/Data
Hackney 88	01 585 3312	V/Data
Hambling Thunder	0752 364879	800
Livingston 88	090 436236	800
London 88	01 495 6687	800/12-75
London Underground	08 863 0786	800/1286-75
Maid	01 941 5719	800
Maiden-88 (Liverpool)	091 428 8004	800/1286-75
Manuel	01 941 4285	V/Data
Manuel	0924 20441	V/Data
Manuel	0278 54494	800
TERR London	01 548 9480	800/1286-75/1288-1280

Below is a printout of part of a session on SBBS Aberdeen which is on 24 hrs a day, at 800 based on 0034.787918, eight hrs no parity. SBBS runs on a C128 with a 1.5M disk drive. The 24K of software was written by Nigel Gaskin, the 3type using the BBS Basic compiler, not 8ad etc!

The time is 04:31:15 One moment loading.
SPACE BAR/pause/escape, CTRL 3/pout
SBBS Main Menu (3)
B-News/Bulletin Board info
C-Goodbye/Log-off
H-help with this section
M-Messaging Area
U-User log
X-Exit for 3WSP

3-Goto Main Menu (2)

1-Print this menu again

CGH.M.L.L.Y.2

or 1 for menu 1

The time is 04:31:35 One moment loading.
SPACE BAR/pause/escape, CTRL 3/pout

SBBS Messaging menu

G-General message
H-Help with this section
P-Pen-pal messages
S-Sync message to/from

1-Goto Main Menu (1)
2-Goto Main Menu (2)
3-Print this menu again

CGH.F.S.Y.1,2

or 1 for menu 1

The time is 04:31:55 One moment loading.
SPACE BAR/pause/escape, CTRL 3/pout

SBBS General message
C-Check Mail
D-Delete a message from file
H-Help with this section
M-Messaging categories
Q-Quick read of messages
R-Read message(s)
S-Send message
1-Main Menu (1)
2-Main Menu (2)

C.D.H.M.Q.R.S.Y.1,2

or 1 for menu 1
One moment loading

File message 1 1 Last message 1 34

Message number: [From] [To] <CR> or hit
F.34-34

One moment loading.
Message 24 [general] section.

MESSAGE TO ALL
MESSAGE FROM : FERGUS MCDONALD
SUBJECT : ANOTHER CB&BBS!
DATE : THURSDAY 30/ 2/85
USER IS A :NON MEMBER.

Hi folks! I have set up a BBS in Dublin, Ireland, running on a Commodore 64 with 8052800 and 2 disk drives. I am a heavy CB&B fan. The BBS software (by me) is called SBBS. It is an interpreted - no manual! 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 this of the one SPQ 1001 CB&B disk drive with 1M88 get disk!! Anyway, the board (run by me) for the Irish Amateur Computer Club is called the IACCBBS, and ring Dublin 900M (24 Hours) on 8-lin, no par, 1 line, 800 baud

C.D.H.M.Q.R.S.Y.1,2

or 1 for menu 1
One moment loading

Last but not least

Well that's it for another month. I shall be reviewing at least two machines and some common packages. Finally, a special mention to Richard James (CHET BBS) who wanted his name to appear in this magazine in 1984 column. Neil said! Don't forget to stop the a line on Compend 10 D.J.A.N.D.A. or Postal 91099267.

CORNER

STATESIDE

NEWS

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 Logic from Starpoint Software, seem to reflect in their names the low point reached by Commodore's stock. By midwinter it had slid to its lowest level ever of six, down from an all time high of 56 on the NY Stock Exchange.

In this great company an 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 rumored that 80% of the sales were of the old reliable, the C128 was supposed that an artificial shortage in the C64 was created by holding back supplies of them in the east coast. Other rumors were that the C64 was "warehoused" in order to take its price and/or to reintroduce it in a new case with some fancy new touches. The above rumors, incidently, also through the courtesy of Felix Eberica who writes in what 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. Glavin, Editor, 428 Clinton Avenue W, Brooklyn, NY 11218 USA. Its cost in the US is \$12.00 a year. Cheap, cheap, cheap.

My contact with user groups was greatly expanded by attendance at the 1986 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 2310, Roseburg, Oregon 97430 USA, and the above mentioned NYC conglomerate. No less than nine smaller California groups were listed in the show catalogue.

What's a 800 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.

New to the programs which I mentioned earlier, Freeze Frame by CARDCO, Inc., 3815 Topoka, Wichita, KS 67218 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 voilà, the frame is frozen and sent to your printer. You then continue to run whatever you may have at 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 51 screens) and then retrieve it for display or for printing. The other is a cartridge named Snapshot III which comes from those fine people at C64 Software, Inc., P.O. Box 583, Crown Point, Indiana 46037 who developed the best of the 1541 Disk Drive Alignment Programs (buy the Version 2.8 at \$44.95 plus shipping).

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

Remember the exciting advertisement from Starpoint Software of Coonley, CA 98847? They announced a utility called STARDON which would do everything seven makes great utilities. Well, they were blocked from releasing it by a lawsuit stopped on them by S&L/Ec Electric Works, 2311 South Wisconsin Road, Mountain View, CA 98041. It says that it was too much like their can-

ridge 1541 FLASH (\$59.95 - on sale, plus \$15.00 US shipping charge) which was developed by the same computer expert.

Starpoint is delisting one of the bargains of the year. They are marketing a 256K RAM board for the Amiga functionally identical to the Commodore 2058 RAM board for 109.95 + \$6.00 shipping outside the USA.

Logic, which is also a Starpoint product at \$44.95, is a combination hardware and software package that does this little survey of new utilities, it "deprotects" by capturing and saving the protected programs as it runs in the 64's memory. This "snapshot" job helps the user become 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 do their for four months at \$4.95 monthly. Viewtron charges you only \$49.95 for a 300 baud "talk" 640 by Anchor Automation. They show in a first hand on Viewtron for free. Playnet gets a bit tricky in its combination offer of a magazine subscription to SHOT, a Playnet membership kit and a modem if you subscribe to Playnet for three months and pay a first time membership fee of \$19.95.

There has certainly come to Amiga, the dawn of a new era of falling and falling is flowing from the developers like a wind up magic ring. The Electronic Arts Golem 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. Flight Simulator from Sublogic, Napoleon at Waterloo by Kresch Software, Skyfox and a re-issue of the Software Golden Order, Le Ping, Eliza, Adventure and Life from EA are available now.

The C128 is like fortunate in the because of new programs designed especially for it. True, some very low old programs are being updated such as Visaprint and Superfont. And now that Commodore has issued a new version of CPM for the 128, which really works this time, all those wonderful old CPM business programs are there for the taking.

I may be including a mention of the PC 10 in upcoming columns if the announcement by PR (that's Public Relations) US english man for S-PRIUS Information Services is true. Commodore is going to try and hit the business world with a IBM 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 business 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 useless) Plus/4's.

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 1/300th 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 \$0014 and \$0015 are the low and high bytes of the indirect values for the location of the interrupt. These values can be readdressed in order to make the C-16 jump to your own machine code routine. This method was used in the play routine and the synthesizer 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     $0114
LDA     high byte
STA     $0115
CLI      interrupt on
RTS     return
```

Similarly to restore the original interrupt:

```
SEI
LDA     $00
STA     $0114
LDA     $01
STA     $0115
CLI
RTS
```

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 (MPPBC08) to return

PROGRAMMING

THE

C16

to the service routine. To jump back from the user routine to continue processing, ignoring the C-16's service routine, use the instruction (MPPBC08) (RC 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 synthesizer 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 600 KHz on our PAL system machines, it therefore takes an 0.8333 seconds to count all the way from 65535 to zero. Timer #1 has 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:
 \$0108 Timer #1 low byte
 \$0109 Timer #1 high byte
 \$0110 Timer #2 low byte
 \$0111 Timer #2 high byte
 \$0112 Timer #3 low byte
 \$0113 Timer #3 high byte

To set a timer simply load the timer's registers with the starting value; it will then count down to zero. As the timer will obviously have to be set in two parts, (one PDB) or STA for the low byte and one for the high byte) there should therefore be a delay of no greater than 115 µs between writing the low byte and the high byte, otherwise the timer will start to count down and therefore to be set incorrectly.

To eliminate this problem, therefore, the timer registers should be set in machine code using the following type of routine:

```
SEI      disable interrupts, (we don't want a keyboard
```

interrupt to occur between writing the low byte and the high byte)

```
LDA     low byte of start time
STA     low byte of timer
LDA     high byte of start time
STA     high byte of timer
CLI      turn the interrupts back on
RTS     return
```

The Timers and Interrupts

Timer #1 is a more sophisticated timer than timers #2 and #3. When this timer is written to, it sets the timer to that value as requested, but also sets the "timer #1 reload register" to that value. The timer then counts down to zero, at which point an interrupt is generated if bit three of the interrupt mask register is set. Bit three of the interrupt status register is then set. The timer is then reset to the reload value, and the counter carries on decrementing until it reaches zero when another interrupt is generated etc.

Timer #1 is potentially a very useful timer allowing periodic interrupts of specified delay length, for instance timers are used to generate accurate inter bit delays in a fast tape loading system which is under development.

Timers #2 and timer #3 are simpler timers. These timers go back to \$0000 after they have reached zero, instead of being reset to a reload value. They still have the ability to generate interrupts when they reach zero however, to have interrupt for timer #2 only, set/reload bit six of the interrupt mask register. When the interrupt takes place, bit six of the interrupt status register is set high.

The Interrupt Mask

The interrupts are turned on and off by writing/resetting bits on a register called the interrupt mask at \$F05A or decimal 63296. Bits one to

seven control the following:

```
Bit 1 timer interrupt
Bit 2 light pen
Bit 3 timer 1 interrupt
Bit 4 timer 2 interrupt
Bit 5 timer 3 interrupt
Bit 7 interrupt request
```

Setting a bit high on the mask byte will enable the appropriate interrupt. Bit 3 light pen! There is no connector for a light pen on the edge connector, but there may be on the joystick port.

The Interrupt Status Register

This byte (at \$F05B or 63297 decimal) records which interrupt has interrupted. It is important for the interrupt service routine 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). Similarly, 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 the three timer interrupts can still be used even when the timer 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 \$0164, for instance (figure 1) is used before loading/saving a block/header in the C-16. The routine at \$0178, shown in figure 2, is the opposite of the routine of \$0164 and is used after loading/saving a block/header.

However it is not always necessary to perform timing routines using the method

described above, thanks to a very useful ROM routine at \$2EA. If quite accurate time delays are all that are required, the routine at \$2EA can be used. Calling this routine will generate a delay of 1/50th second. This routine is used to generate delays in the typing/loading routine, e.g. the 1/5 second between printing SAVING or LOADING and turning the screen off on saving/loading to:

```
LDX #00
STX $2EA
DBX
BND #41
CO
...
```

Note that as the routine at \$2EA turns the interrupts off to get better timing, the CO command is used to re-enable them if you want them on again.

The Clock

The registers \$002 and \$003 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 \$C42 but can be re-directed to go to a user routine. Figure 3 shows the assembly test 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 redraws the pointer \$002 and \$003 (78 and 79) to a new service routine stored at \$046. The whole machine code program is 308 bytes long and resides between \$0608 and \$0726, 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 \$080 to \$081 (the bytes). The time and the alarm time can all be set with Basic commands. The routine is stored at \$0608 (\$216 decimal).

Description of Clock Program

Lines \$0128-\$012B initialise the routine's own variables.

Lines \$0880-\$088D turn off the clock by relocating the 'update clock' routine to its original value.
Lines \$0890-\$089D turn on clock; diverts 'update clock routine' to new service routine.
Lines \$0800-\$0870 set time. To set the time, type 995157,12 41:23. The latter three numbers are the time in hours, minutes and seconds. The system for scanning the line used in this subroutine will be explained in a later article on extending the Basic. Line \$0870 then turns the clock on.
Lines \$0870-\$0878 set the alarm. This works in the same way as the 'set time' routine. It is located at \$1800 (\$157 decimal), so 995180,12:41:23 sets the alarm and initialises it so that it sounds for 30 seconds when the alarm time is reached.
Lines \$1000-\$1090 = clock service routine.
Lines \$1000-\$1090 count each 1/50th second jumping to \$C42 if the next second has not been reached.
Lines \$1208-\$1240 update seconds.
Lines \$1408-\$1240 update minutes.
Lines \$1248-\$1260 update hours, switching back to 00:00:00 after it reaches 23:59:59.
Line \$1700 calls the routine which handles the alarm sound if it is on.
Line \$1718 calls the routine to print the time on the screen.
Lines \$1808-\$1860 check to see if the alarm time has been reached by comparing the time (\$01-\$03) and the alarm time (\$094-\$0E) byte by byte.
Lines \$1900-\$1990 the alarm has been reached. Line \$1938 calls the alarm sound subroutine which starts the alarm sound if it is required.
Lines \$1998-\$199D call a machine code routine whose address is stored in bytes \$02 and \$03. If \$03 is set.
Lines \$2000-\$2200 = Alarm routine. This handles the 30 second beeping alarm if it is on.

Lines \$2183-\$2200 are concerned with making the beeping.
Lines \$2580-\$2680 initialise alarm sound. If an alarm has been reached and the register \$44 is > 0 to signify that the alarm sound is enabled, an alarm sound is generated in voice 2.
Lines \$2618-\$2670 set the duration to 30 seconds.

Lines \$2580-\$2618 set the frequency.
Lines \$2628-\$2668 'on' voice 2.
Lines \$2668-\$2670 select 29 beeps.
Lines \$3000-\$3090 Print time. This prints the time in the top right hand corner of the screen if \$18 is > 0.
Lines \$3090-\$3096 set up the colour for the text. This is initially set to 9 (black) but can be set to other colours by POKEing address \$C7.
Lines \$3096-\$3100 print the characters of the time on the screen.

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(\$C42) should be used to re-call the routine.

In conclusion, to use the clock, list of all initialise by typing in 995158.
To set the time 995157, 12:10:36
To set the alarm 995180, 07:10:28
To turn off the clock: 995120

PROGRAM : CLOCK CODE	
1000 0A+2580:0A+2600+7E	915,145,212,204, 3029
0A+8080:0A+1940:0A+78.	2000 0A78 5A,308,16,124,212
0A+0A+0A+0A+0A+0A+0A	2005 20E,113,746,213,306,58,124,
0A+0A+0A+0A+0A+0A+0A	212,170,211,145, 1989
0A+0A+0A+0A+0A+0A+0A	2009 0A78 212,201,34,208,28
0A+0A+0A+0A+0A+0A+0A	124,212,210,210,201,53,204,
0A+0A+0A+0A+0A+0A+0A	16,174,218,208, 2714
0A+0A+0A+0A+0A+0A+0A	2010 0A78 16,124,213,210,28
0A+0A+0A+0A+0A+0A+0A	9,208,11,142,209,201,58,204,
0A+0A+0A+0A+0A+0A+0A	6,124,214,154, 2122
0A+0A+0A+0A+0A+0A+0A	2011 0A78 209,21,207,6,12,1
0A+0A+0A+0A+0A+0A+0A	7,7,142,8,181,206,212,214,28
0A+0A+0A+0A+0A+0A+0A	6,12,192, 1920
0A+0A+0A+0A+0A+0A+0A	2012 0A78 208,247,21,214,4
0A+0A+0A+0A+0A+0A+0A	102,252,242,5,108,124,8,14,6
0A+0A+0A+0A+0A+0A+0A	6,204,102, 2234
0A+0A+0A+0A+0A+0A+0A	2013 0A78 228,242,25,196,28
0A+0A+0A+0A+0A+0A+0A	9,148,229,6,1,249,2,149,22,
0A+0A+0A+0A+0A+0A+0A	212,220,171, 2222
0A+0A+0A+0A+0A+0A+0A	2014 0A78 17,220,41,129,6,2
0A+0A+0A+0A+0A+0A+0A	26,146,17,220,6,149,228,220
0A+0A+0A+0A+0A+0A+0A	6,240,6, 2024
0A+0A+0A+0A+0A+0A+0A	2015 0A78 149,4,140,222,4,1
0A+0A+0A+0A+0A+0A+0A	4,221,4,147,2,140,14,222,14
0A+0A+0A+0A+0A+0A+0A	7,248,141, 2108
0A+0A+0A+0A+0A+0A+0A	2016 0A78 15,222,171,17,222
0A+0A+0A+0A+0A+0A+0A	40,244,8,40,141,17,222,149,
0A+0A+0A+0A+0A+0A+0A	28,121,229, 1920
0A+0A+0A+0A+0A+0A+0A	2017 0A78 6,145,222,206,4
0A+0A+0A+0A+0A+0A+0A	246,26,142,8,145,211,127,21,
0A+0A+0A+0A+0A+0A+0A	6,202,208, 2179
0A+0A+0A+0A+0A+0A+0A	2018 0A78 228,142,4,181,204
0A+0A+0A+0A+0A+0A+0A	107,11,12,202,208,148,6,6,
0A+0A+0A+0A+0A+0A+0A	6,6,6, 1762,-1
PROGRAM : CLOCK TEST	
10 007090	
20 0A+0A+0A+0A+0A+0A+0A	
110 0A+0A+0A+0A+0A+0A+0A	
0A+0A+0A+0A+0A+0A+0A	
112 0A+0A+0A+0A+0A+0A+0A	
0A+0A+0A+0A+0A+0A+0A	
113 0A+0A+0A+0A+0A+0A+0A	
114 0A+0A+0A+0A+0A+0A+0A	
115 0A+0A+0A+0A+0A+0A+0A	
120 0A+0A+0A+0A+0A+0A+0A	
130 0A+0A+0A+0A+0A+0A+0A	
140 0A+0A+0A+0A+0A+0A+0A	
200 0A+0A+0A+0A+0A+0A+0A	


```

000
210 IFB=**DABC(44)-DTX(2)
00
220 C=LEFT(44,2)+D(44)
44,LEN(44)-2+LEN(44)C(2)C(4)
+D(2)C(2)+C(4)D(2)C(4)+D(2)
0
400 A=LEFT(44,2)+
410 B=D(44)
420 IFD=THEM(44)BYT(44)
14 "RETURN
430 F(2),D(4)-D(1)+D(1)+D(4)+
1: F(2)**THEM(44)+D(2)D(2)
410
500 D(1)+D(4)+D(4)**THEM(2)
510
520 LEFT(44,1)+F(2)**T
HEM(44)+D(2)D(2)
530 F(2)**THEM(44)+D(2)
540 F(2)D(4),D(1)+F(2)D(4)+
F(2)**THEM(44)+D(2)D(2)
550 F(2)D(4),D(1)+F(2)D(4)+
F(2)**THEM(44),D(1)+F(2)D(4)
560 F(2)D(4),D(1)+F(2)D(4)+
F(2)**THEM(44),D(1)+F(2)D(4)
570 F(2)D(4),D(1)+F(2)D(4)+
F(2)**THEM(44)+D(2)D(2)
580 D(2)D(2)
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740 F(2)D(2)D(2)D(2)D(2)
750 F(2)D(2)D(2)D(2)D(2)
760 F(2)D(2)D(2)D(2)D(2)
770 F(2)D(2)D(2)D(2)D(2)
780 F(2)D(2)D(2)D(2)D(2)
790 F(2)D(2)D(2)D(2)D(2)
800 F(2)D(2)D(2)D(2)D(2)
810 F(2)D(2)D(2)D(2)D(2)
820 F(2)D(2)D(2)D(2)D(2)
830 F(2)D(2)D(2)D(2)D(2)
840 F(2)D(2)D(2)D(2)D(2)
850 F(2)D(2)D(2)D(2)D(2)
860 F(2)D(2)D(2)D(2)D(2)
870 F(2)D(2)D(2)D(2)D(2)
880 F(2)D(2)D(2)D(2)D(2)
890 F(2)D(2)D(2)D(2)D(2)
900 F(2)D(2)D(2)D(2)D(2)
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920 F(2)D(2)D(2)D(2)D(2)
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970 F(2)D(2)D(2)D(2)D(2)
980 F(2)D(2)D(2)D(2)D(2)
990 F(2)D(2)D(2)D(2)D(2)

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Bill Brammer begins a series designed to help you get the most out of your disk drive.

PROGRAMMING THE 1541

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-in-one, all-cloning (often expensive) floppy Disk Controller as I/O 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, so performs such tasks as formatting, reading, and writing. Of course, the more complex the DFS or DOS required, the more space it takes up inside the computer (the BBC micro uses the plug-in DFS 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 reduction in memory usage restricts the

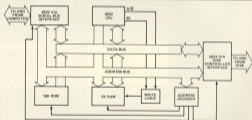


Figure 1:

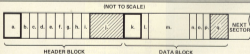


Figure 2:

versatility of supporting software, data storage is, on the whole, inefficient, 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 1541, an intelligent serial-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 (slowwww), not parallel (fast), and it had quite a few bugs (if sometimes thought it was a dual drive), but, after all, anything was better than tape. When the 1541 arrived on the home computer scene, it was deemed 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 6802 based computer much like the Vic or 64, with RAM, ROM and Interface chips. This means that at the end of your serial line 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 motor 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 6812 Versatile Interface Adapters handle serial bus communications and control the drive mechanism, as well as supplying timing and interrupt facilities for the processor. The Disk Operating System software is held inside 8K ROM chips, and 2K of RAM not only provides the necessary workspace for the 6802, but is also useful buffer storage. A hardware address decoder, complete the quota.

1541 Block Diagram

The 18K of D025 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 contains the Read-Write head and data storage. The 6802 Processor has to share

time between the FDC and the IPF, which also reduces the effective operating speed of the 1541. The FDC, IPF and Interface Chips will all be elaborated on individually in the series progress, together with a full RAM memory map.

Disk Format

In order for the D025 to find its way around the disk a format routine is used to divide the disk surface up into tracks and sectors. Tracks are formed into 11, track one being the first and outermost, and track 10 the innermost, with the directory on track 18. Each Track is further divided up into 17 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 10, 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 data 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:

Zone	Track No.	Sector Range	Sectors/Track	Clock Rate
1	1-7	0-20	21	307,000 bits/sec
2	18-24	0-16	16	305,714 bits/sec
3	25-30	0-17	18	306,667 bits/sec
4	31-35	0-16	17	290,000 bits/sec

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 bit

(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 Code Recording, GCR for short (Apple mirrors also use GCR). Prior to being written on to the disk, every data byte is converted into a form 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 D025 to convert each half into a five bit result.

For example, to convert the eight bit byte 1A3 (10100111) into GCR, the byte is first split into two four bit hi-order nibbles, 1810 and 0111. Using the conversion table these nibbles now become 10101 and 01111 respectively, and so our completed GCR byte is 101010111. Using Group Code 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 the data. The 6802 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 D025 actually converts four bytes at

the same time. This is the minimum amount of bytes that can be converted by an eight bit processor ($4 * 10\text{-bit bytes} = 40\text{ bits} = 5 * 8\text{-bit bytes}$). Thus, when writing data, four eight bit bytes are collated and then converted into four GCR 10-bit

GCR Table

Hex	Binary	GCR	Hex	Binary	GCR
00	0000	01010	08	1000	01001
01	0001	01011	09	1001	11001
02	0010	00101	0A	1010	11010
03	0011	00111	0B	1011	11011
04	0100	01110	0C	1100	01101
05	0101	01111	0D	1101	11101
06	0110	00110	0E	1110	11110
07	0111	00111	0F	1111	00101

bytes, and written as five eight bit bytes. This all sounds a bit confusing, but you'll pardon the pain; it'll show you an example:

4-bit bytes: 588, 5A4, 5B1, 5C7
in binary: 00081000, 00101000, 00000000, 00000001

4-bit nibbles: 8000, 0008, 0010, 0018, 0000, 0001, 0008, 0001
in 5-bit GCR: 01010, 01001, 10100, 01000, 01010, 01011, 01010, 01011

in 6-bit GCR: 0101010, 01101010, 10100001, 00001101, 01001011
in hex: 512, 578, 5A5, 5B2, 5A8,

Thus our original four eight bit bytes 800-5A4-001-001 are actually written onto the disk surface as 552-578-5A5-5B2-5A8. Reading GCR bytes off the disk is exactly the same process reversed.

5-GCR bytes: 552, 578, 5A5, 5B2, 5A8,
in 8-bit GCR: 81000010, 01100001, 00100101, 00101011, 01001011, 01001011

in 1-bit GCR: 01010, 01001, 11010, 10100, 01010, 01011, 01000, 01011
8-bit nibbles: 0001, 0000, 0010, 0010, 0000, 0001, 0000, 0001

in binary: 00010000, 10100100, 00000001, 00000001
4.5-bit bytes: 908, 9AA, 901, 9A1

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 synchronization field or Sync Mark, used to identify the beginning of the block and immediately following the block is a short gap which gives the DOS 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 517 bytes (48 consecutive one bit) 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 80h.

c) Header Block Checksum: This is the header field checksum byte created by XORing 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) ID0 and ID1: These are the formatting IDs specified in the instruction "FORMAT" where ID0 and ID1 are "00" (Note: ID0/ID1) is the correct order as written on the disk). These are the IDs that the DOS uses for initialization and during all read and write operations, not the "cosmetic" IDs found in sector 01.

g) 5-4 504 bytes: These are filler bytes used as padding when the DOS is converting the header bytes 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.

h) Header Gap: eight eight bit GCR 308 (81001010) bytes providing the DOS with breathing space between the header and data fields.

Data Block

i) Sync Mark: Warns the DOS a block is coming up.

j) Data Block ID: Informs the DOS that this is a Data Block. Its value is always 80h.

k) Data: 256 Bytes of user data.

l) Data Block Checksum: This is the data field checksum created by XORing all the 256 bytes of data together.

m) 4-3 504 bytes: Filler bytes used as padding during GCR conversion.

n) Inter-Sector Gap: This is also known as the Tail Gap, and its size varies between four and 12 eight bit GCR 155 bytes, supplying the DOS with space in between each sector to allow for fluctuations in drive speed. Its size is determined during the format sequence, which contains a routine which tries 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 Formatting" is occasionally unreliable. Conventional word fixed gap formatting on earlier drives had found that the last sector on the track sometimes over-wrote the first slightly. Fast Formatting 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:

Section	4-bit Hex	4-bit GCR
Sync Mark 1		5 bytes
Header Block ID	8 bytes	10 bytes
Header Gap		8 bytes
Sync Mark 2		5 bytes
Data Block	256 bytes	257 bytes
Data Gap		4-12 bytes
TOTAL		327-45 bytes/long

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Program Name:

Computer/memory disk:

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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 Massmart, have produced a few cheap, 'professional' programs at around the £75 mark. Now a new range of disk based budget software is set to hit the stores at a price of only £28. 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 flaw. 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 programs. 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 will extremely well in supermarkets with a price tag of around \$5. Who knows, we may soon be able to buy a Wordprocessor at the same time as our car tires.

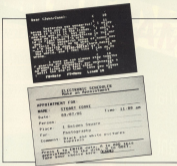
Load'N'Go! software falls into a number of different series. The series that is being marketed over here at the moment is the 'Business Management Series'. A lot of this range of software could be put to good use in either a small business or at home. Its main purpose is to make life easier for you.

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 £28 Master Word must be the cheapest wordprocessor available. It has many of the functions of its dearer competitors such as search and replace and the ability to set line spacing and margins. It also however lacks the more 'up market' fancy bits such as page numbering and headers and footers. Another

BUSINESS



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 regenerate 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 (Truck 11) 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 spread sheet 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.

Really '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 formulas in locations as you can on other spreadsheets. Since a spreadsheet is supposed to help you if you have a lot of formulas 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 treat.

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, who the appointment is with, where it is and any comments that you need.

Once you have entered in the data you can search for all meetings for a certain person after certain dates. You can be all

DMG BUDGET



meetings between dates. It is even possible to print details of all meetings at a certain place or with certain people.

How do you do it? I never manage without this one!

Money Matters

A couple of financial organizers are included in the series. These are "Pro Financial Organizer" and "Home Finance Organizer 1". Both disks offer checkbook and address list programs while the Financial Organizer 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 Galt!

The files 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 checkbook 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 address 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 '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 compare 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 do you know are you going to keep track of them all?

Well, "Disk Indices" will solve this problem for you. This program will store information on up to 100 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. It is 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 owner.

Verdict

Most of the programs available are around the same quality as a good magazine listing. They 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 Microsoft made when it launched its £1.99 apps.

Who knows, good business 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.

IN PRINT

**Eric Doyle has been trying
out a real hardware bargain.**

WHEN I READ THAT THE BICO LTR-I printer claimed letter quality printing and that the price was less than £200, my immediate reaction was, to say the least, one of disbelief. After unpacking the box I remained unimpressed, the printer head looked very Mickey Mouse-ish but when I tried printing 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 datestamp. You load the kind, rotate the wheel to get the correct date, then ink the rubber-faced letters on a pad and stamp away. In this novel letter 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 presses 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 Gutenberg!

The limitation of the printer lies in the fixed roller idea. The characters you get are the ones you're stuck with. No graphics screens dumps or characteristic Commodore symbols, just plain and simple alphanumeric 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 rollers loosen its grip on the paper and the head carries on printing to and fro across the same line. A wordproc with the facility to stipulate a page length would overcome this fault.

For most people the main application they could look for is the ability to print out listings of their latest project for a relatively 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 platen 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 platen rollers.

Control of the printer is limited to the basic character codes of the Commodore. For example, CHR\$(0) followed by CHR\$(1) will initiate a line feed and force the printer to the beginning of the next line. CHR\$(2) sets the printer to normal line spacing and CHR\$(3) will allow double spacing for extra clarity.

The number of characters available is limited to 126. This includes all the alpha-

betics of a daisywheel. Because the printer has to move up and down the paper frequently, this means that a speed of 18-C 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 queries 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



numeric characters and punctuation marks, in the main these correspond to Commodore's version of ASCII but some of the characters around CHR\$(90) vary. The most important difference is that the pound sign has an ASCII value of 115 instead of 92 but a little bit of thought should overcome this problem.

Despite the Heath Robinson appearance of the printer, the quality of the printout is excellent. After a while the letters may get a little faded or the serifs of their outlines become broken but this can be remedied by the simple application of more ink on the roller giving a result indistinguishable from the quality of a typewriter.

The speed of the printer is comparable

with a review machine which may have seen hard use at the hands of others and the resilience of the printer head seems to promise a fairly long life.

The cost of the printer should be seen in the light of the need for a graphics interface. I believe Bicos sell one for around £20, so if you're in the market for a cheap printer with high quality, small and you're willing to accept the 20th Century edge that Bicosprinters can't be chosen, then this is definitely a machine to consider. The only other printers at this price are thermal printers and with the cost of thermal paper these days it could be worth while considering a machine with low post-sales overheads, in which case this could be the one for you.

David Cartrell helps
you get your finances
in order with the help
of your C64.

BUDGET

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.

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 available.

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 CHECK' and combines all the others to give a grand balance.

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 1526 Printer Plotter or a standard printer. The printer used when this program was written was a Star 5G-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 CATEGORIES'. These are:

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

SAVE & 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 it could be useful. As you spend your money between the categories, the amount you entered will decrease. When it reaches zero it will disappear.

Options 1 and 2 work together with option 10. If you remove the message from the

screen, the amount will remain the same until you bring it back.

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

MOVIE TRANSFER: Enter the two categories involved, then

press 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 LISTING

```

1 PRINT CHR$(14) : POKE 50000,1 : POKE 50001,11
2 PRINT"COLM,C1,AVSN,SPC1,AVSRT,YELLOW,OR,IV,AV,SV,
   DE,ST3-AERWSON,C1,SPC10"
3 GOOD 1000
4 PRINT"DOWN,YELLOW,SPC,AWRITTEN BYPCO,SDIAY12,SPC,
   DEAWTLE"
5 PRINT"DOWN,SPC1,AC10PHRSDAT (2) 1000"
6 PRINT"DOWN,BLACK1200 0.5 FILE? (1-COPY,0)1100"
7 AWRTTLE 00 (IF AWRTTLE 1
8 (IF AWRTTLE OPEN 1,3:GET 10
9 (IF AWRTTLE 1
10 PRINT"COLM,C1,AVSN,SPC1,AWRPP,YELLOW,BL
   W0 A FILEYSON,C1,SPC10"
11 PRINT"UP,RED,STWLC0"
12 PRINT"DOWN,WHITE0 ACCESS CODE (1-CO,AWRTT);AWR"
13 GET C0 (IF C0AWRTLE 10
14 (IF C0CHR$(12) THEN 14
15 W0AWRCH-C0:PRINT"1";:GOTO 13
16 W0AWRCH"1:GOTO 1"
17 OPEN 1,1,AV,AWRCH:AV1(1),AWRCH,SV,DE(1),SW
18 W0 AW(1),SW,AW(1),SW,AW(1),SW(1),SW
19 PRINT"DOWN,WHITE"AVN (AV 10) AW:PRINT"SPCPC1"AWRT
20 INPUT,A
21 FOR B=1 TO 4:INPUTA,AW(1):INPUTA,AW(1),
   (FOR B=1 TO 10:10-1:INPUTA,AW(1),B)

```

```

22 INPUT,SC:G00:INPUT1,40:G00:INPUT,04:G00:
INPUT,04:G0:G0:G0:G0:
23 CLOSE I:OPEN I,5:GOTO 35
24 PRINT:CLEAR,C1,ROSK,SPCA,YELLOW,RYOFF,04,04,04,04,
04,04:G00:RYOFF,RYOFF,SPC15:
25 G000:R000
26 PRINT:DOWN,BLACK,5:THE MAXIMUM NUMBER OF CATEGORIES
YOU CAN
27 PRINT:UP:PAGE IS TWENTY.
28 PRINT:DOWN,CYAN,NO. OF CATEGORIES: INPUT #
  29 IF #=1 OR #10 THEN PRINT:UP,SPC12,0:4:5:GOTO 30
  30 IF #=2:G0:G0:G0:G0,00:21,04,04:G0:G0:G0,04:G0:G0,
  04:21,04:12,04
  31 #=1:G0:G0:G0:G0:G0:G0:G0:G0:G0:G0:G0:G0:G0:G0:G0:G0:
  32 #=1:G0:G0:G0:G0:G0:G0:G0:G0:G0:G0:G0:G0:G0:G0:G0:
  33 PRINT:DOWN,CYAN:FOR #=2 TO #-1:PRINT:CATEGORY "#
  1-COMM,OFF:INPUT #+1:
  34 PRINT:UP,SPCA,SPC,CYAN:NEXT
  35 PRINT:CLEAR,C1,ROSK,SPCA,RYOFF,YELLOW,04,04,04,04,
  04,04,04,04,04,ROSK,C1,SPC15:
  36 PRINT:ROSK,UP,CYAN:WRITE*
  37 G0:PRINT:R00:R00:R00:R00:R00:R00:R00:R00:R00:
  38 0=:G000:112
  39 PRINT:TAB:111:"G0:DOWN:4=:5" + OTHER OPTIONS.
  40 PRINT:WHITE,RYOFF,04,04,04,04,04,04,04,RYOFF:":
  41 0=:G000:126:04:04:G0:G0:G0:G0
  42 #=:G000:144:04:04:G0:G0:G0:G0:G0:G0:G0:G0:G0:G0:G0:
  43 IF 0=:1: THEN 114
  44 PRINT:CLEAR,DOWN,6:WHICH PAGE 1 - 3 DO YOU?
  45 G000:206:PRINT:DOWN,6:CURRENT PAGE 1-34
  46 G0:G0:G0:IF 0=:0:0:G0:G0:G0:G0:G0:G0:G0:G0:G0:G0:G0:G0:
  47 G000:159
  48 04:04:12:04:G0:G0:G0:11:40: THEN 40:G0:G0:11:0
  49 PRINT:CLEAR,DOWN:10:DISPLAY ON 1-
  50 PRINT:DOWN:0 = SCREEN:PRINT* + GSPC,0:PRINT*
  +PRINT* + 10:GSPC,0:PRINT*+G0:CLTER*
  51 G0:PRINT:UP:PRINT:DOWN
  52 IF 0=:0: THEN G0:G0:OPEN I,4,1:PRINT1,DOWN:114:
  GOTO 27
  53 IF 0=:1: THEN GOTO 27
  54 IF 0=:2: THEN 21
  55 CLOSE I:OPEN I,6
  56 OPEN I,6,6:PRINT:R0:OPEN I,4,1
  57 G000:207
  58 IF 0=:0: THEN PRINT:
  59 PRINT:R0:PRINT, "BLACK,04,5:SPEC:R0:1:G0:0:0:0:0:0:0:0:0:
  (G0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:
  60 PRINT: " -----"
  61 IF 0=:0: THEN PRINT1, DOWN:1:3:CLOSE I
  62 GOTO 04
  63 FOR #=0 TO #00:G0:G0:G0:P-1:G0:G0:1,P1
  64 G0:1,P-1:G0:G0:P1:G0:G0:P1-1:G0:G0:1,P1
  65 G0:1,P-1:G0:G0:P1
  66 G0:G0,P-1:G0:G0:1,P1:NEXT
  67 RETURN
  68 FOR #=2 TO 40
  69 IF 0=:0: THEN 74
  70 G000:221:PRINT1, " TAB:1,0:PRINT:R0:R0:
  PRINT:20:1,0:
  71 PRINT:R0:PRINT:R0,0:1,0:PRINT:R0,PRINT:
  PRINT:PRINT:PRINT:PRINT:0:1,0:PRINT:R0:
  72 PRINT:R0:PRINT:R0:1,0:
  73 CLOSE I:G0:G0:G0:G0:G0:G0:G0:G0:G0:G0:G0:G0:G0:G0:
  G0:G0:G0:G0
  74 PRINT:R0:R0:R0:R0:
  75 L:0:G0:1,0:G000:204
  76 IF 0=:0: THEN GOTO 200
  77 G000:205
  78 IF 0=:0: THEN PRINT:R0, "12,0:PRINT:1,DOWN:1:1:
  GOTO 20
  79 PRINT: " TAB:1,0:
  80 IF 0=:0: THEN OPEN I,1
  81 IF 0=:0: THEN PRINT: "0:1,1,0:PRINT:1,DOWN:G0:G0:G0:G0:
  82 PRINT:R0:PRINT:
  83 IF 0=:0: THEN PRINT: "0:1,0,0:PRINT:1,DOWN:G0:G0:G0:
  84 PRINT:R0:PRINT:
  85 IF 0=:0: THEN PRINT: "0:1,1,0:PRINT:1,0:1,0:
  GOTO 87
  86 PRINT:R0:G0:PRINT:PRINT:0:1,0:PRINT:R0:
  87 IF 0=:0: THEN PRINT: "0:1,0,0:PRINT:1,DOWN:G0:G0:G0:
  88 PRINT:R0:PRINT:
  89 NEXT
  90 IF 0=:0: THEN OPEN I,3
  91 IF 0=:0: THEN FOR #=1 TO #PRINT:R0:1:3:CLOSE I:CLOSE 3:
  CLOSE I:OPEN I,3
  92 PRINT:TAB:14:"YELLOW,RYOFF,04,04,04,04: "1,0:04,
  04:
  93 PRINT:ROSK,RYOFF,04,04,04,04,04,04,SPC:1:1:04:04,04,04,
  04,04,04,04,04,04,04,04,04,04,04,04,04:
  94 G0:04:04:04:G0:G0:G0:G0
  95 IF 0=:0: THEN 100
  96 IF 0=:0: THEN 04
  97 PRINT:ROSK,DOWN:SPC:0:0:
  98 INPUT:ROSK,DOWN:SPC:LEFT:1:04
  99 IF 0=:0: THEN 10
  100 IF 0=:0: THEN 10
  101 IF 0=:0:0:0:0 AND 04:0:0:1:0:0 AND 04:0:0:0:0:0:0:0:0:
  102 IF 04:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:
  103:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:
  104:IF 04:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:
  105:G0:G0:G0:G0:G0:G0:G0:G0:G0:G0:G0:G0:G0:G0:G0:G0:
  106 GOTO 10
  107 PRINT:CLEAR,C1,ROSK,SPCA,RYOFF,YELLOW,04
  108 G0:G0:G0:G0,C1,SPC15:
  109 G000:2099
  110 #=:0:RYOFF:INPUT:DOWN,DOWN,0:PRINT:FOR 0:0:0:0:0:0:0:
  111:G0:G0:1:4
  112 #=:0:G0:G0:1:04
  113 #=:0:G0:G0:1:04
  114 END
  115 PRINT:UP:CLTER:FOR #=0 TO #00:DOWN:0:0:0:0:
  PRINT:TAB:11:"R0:0:41" = "R0:1:0:

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113 NEXT RETURN
114 PRINT YIELD$,YIELD,C1,SPC14,DISP$,YIELD$,YIELD,C1,SPC14
    SPC 10,SP,SP,SP,SP,SP,SP,SP,C1,SPC14"
115 GOTO 7000
116 IF W=0 AND T#0 THEN W=0
117 IF W=0 THEN LY=1-000000 044:PRINT "UP, YELLOW, 0000,
    IMAGE LEFT = -17000"
118 PRINT TAB(60) "10000,00,SPC14 +SPC,DEBITDATE ACCOUNT."
    PRINT "TAB(9) 0 =SPC,LEAVE A FILL."
119 PRINT "TAB(9) 0 =SPC,RETURN TO MAIN MENU."
    PRINT "TAB(9) 0 =SPC,ENTER 000."
120 PRINT "TAB(9) 0 =SPC,DEALABLE WAGE MESSAGE."
121 PRINT "TAB(9) 7 =SPC,DEALABLE WAGE MESSAGE."
122 PRINT "TAB(9) 0 =SPC,DE-WARE CATEGORIES."
123 PRINT "TAB(9) H =SPC,DRINKY TRANSFER."
124 PRINT "TAB(9) I =SPC,SAGE A CATEGORY."
125 PRINT "TAB(9) J = REASON PROGRAM."
126 PRINT "TAB(9) K =SPC,SPDFORM CALCULATIONS."
127 PRINT "WRITE,DOWN,RYSON,C1,SP,SP,SP,SP,RYSPFF,SPC14"
128 B#"";GET W:IF B#""THEN 129
129 IF W=0:GOTO #441 OR W=1:GOTO #441: THEN 128
130 ON W:GOTO #41 4470 511,125,125,126,187,128,176,211,234,
    238,238
131 PRINT YIELD,C1,RYSON,SPC14,RYSPFF, YELLOW,DEBITDATE
    ACCOUNTRYSON,C1,SPC10"
132 GOTO 7000
133 IF W=0 AND T#0 THEN W=0
134 IF W=0 THEN LY=1-000000 044:PRINT "UP, YELLOW, 0000,
    IMAGE LEFT = -17000"
135 0=SP:PRINT "DOWN",00000 012:PRINT "WRITE,RYSON,C1,SP,
    SP,SP,SP,RYSPFF,SPC14"
136 GET W:IF B#""THEN 136
137 0=RC:180=44:IF B=0 OR 1/A THEN 134
138 GOTO 30"
139 IF W=0 AND T#0 THEN W=0
140 IF W=0 THEN LY=1-000000 044:PRINT "UP, YELLOW, 0000,
    IMAGE LEFT = -17000"
141 LY=041,RC:111=01+0000 044
142 PRINT "DOWN,CY,SP,DRINKY IN ACCOUNT =-17000"
    IF W=0 THEN RETURN
143 PRINT "DOWN, YELLOW =SPC,0400 TO ACCOUNT."
    PRINT "DOWN,C122 =SPC,DEBITDATE FROM ACCOUNT."
144 PRINT "DOWN,04012 =SPC,04012 TO MENU."
145 B#"";GET W:IF B#""THEN 145
146 IF W=0:11 (1 OF 0) 04012: THEN 145
147 IF B#"" THEN T#="YELLOW,RYSON,04,0000"
148 IF B#"" THEN T#="C1,RYSON,04,04,04,04,04,04,04,04,04"
149 IF B#"" THEN T#="C122,RYSON,04,04,04,04,04,04,04"
150 PRINT "DOWN",T#="" ;GOTO 145
151 PRINT YIELD,C1,RYSON,SPC14,RYSPFF, YELLOW,04040 4
    F:04,RYSON,C1,SPC14"
152 PRINT "UP, RC,CY,W,C1,04044"
153 CLERE 1
154 PRINT "DOWN,0000 YOU WANT TO HAVE AN ACCESS CODE?SP,
    00110"
155 GET W:IF B#""THEN 155
156 IF W=0 THEN 155
157 PRINT "RYSON,C1,ENTER ACCESS CODE 0=SPC,C1"

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140N="" ;GOTO 270-0000 160
159 PRINT "UP",1,1,1,04
159 PRINT "DOWN,DOWN"FOR 1=1 TO 20:PRINT "00000"NEXT
160 PRINT "UP,040 10 TO 40:PRINT "0" THEN W=0+12:111"
161 PRINT "W=0:PRINT "010:FOR 00=1 TO 00:00=0
162 IF 04=0,00="" THEN 04=0,00="" ;00=0+12:111"
163 IF 04=0,00="" THEN 04=0,00="" ;00=0+12:111"
164 PRINT "04=0,00="" ;04=0,00="" ;04=0,00="" ;04=0,00=""
    ;04=0,00=""
165 PRINT "04=0,00="" ;04=0,00="" ;04=0,00="" ;04=0,00="" ;04=0,00=""
166 IF LEFT(W)=1+1+000000 THEN 04=0+04,11:RETURN
167 04=0+04+12:04=0+04:RETURN
168 ON W:180 GOTO 187,192,192,194
169 PRINT "DOWN,CY,W,DOWN" ;INPUT W:1,RC:111
170 IF W=1,RC:111="" THEN 170
171 IF W=0 THEN W=0
172 INPUT "DOWN,DOWN,DEBITDATE 0=" ;W=11,RC:111
173 W=1,RC:111+04,04,RC:111+04,1,RC:111=04+16,
    RC:111
174 W=11,RC:111+04,04,RC:111+04,1,RC:111+04,1,RC:111
175 W=11,RC:111+04,04,RC:111+04,1,RC:111+04,1,
    RC:111=04+04,RC:111
176 1111,RC:111+04,04,04,1111,RC:111+04,04,04,1111
177 IF W=0 THEN T#="04,RC:111"
178 IF RC:111=49 THEN 0000 47
179 IF RC:111=49 THEN 11=0+0+1,0000 104+41
180 IF RC:111=49 THEN RC:111=04,11+1
181 IF RC:111=49 THEN RC:111=04,11+1
182 GOTO 184
183 PRINT "DOWN,CY,W,DOWN" ;INPUT W:1,RC:111
    INPUT "DOWN,DOWN,DEBITDATE 0=" ;W=11,RC:111
184 11=0+04,RC:111=11:0000 04,04,04,04,
    RC:111+04,04,04,04 THEN 187
185 PRINT "04,DOWN,RYSON,C1,SP,SP,RYSON,RYSON,SP,SP,
    SP,SP,SP,SP,SP,SP,SP,SP" ;SP,RYSON,RYSON"
    FOR 1=1 TO 1000:04"
186 W=1,RC:111+04,04,04,RC:111="1111" ;GOTO 114
187 04,RC:111=04,04,RC:111=04,1,RC:111=04+16,
    RC:111
188 W=11,RC:111+04,04,04,RC:111=04,1,RC:111+04,1,RC:111
189 W=11,RC:111+04,04,04,RC:111=04,1,RC:111+04,1,
    RC:111=04+16,RC:111
190 11=0,RC:111=04,11+04+11,RC:111=04,11+04,11+04
191 IF RC:111=49 THEN 0000 47
192 IF RC:111=49 THEN 11=0+0+1,0000 104+41
193 IF RC:111=49 THEN RC:111=04,11+1
194 IF RC:111=49 THEN RC:111=04,11+1
195 GOTO 114
196 PRINT "DOWN,C1,RYSON,SPC12, YELLOW,RYSPFF,0404-0404
    CATEGORIESRYSON,C1,SPC12"
197 GOTO 7000
198 0=0:0000 112:PRINT "WRITE,DOWN,RYSON,C1,SP,SP,SP,
    RYSPFF,SPC14"
199 B#"";GET W:IF B#""THEN 199
200 1=04:04=1-04:04:11 OR 1/A THEN 199
201 0000=04,04,11="" ;04,11,11=04,11,11=04,11,11=04,
    11=""
202 B#"";11=""

```

```

281 PRINT@COLM,C1,PYCN,SP12,YELLOW,RYOFF,SP3DNAME
CATEGORY@ANON,C1,SPC11"
282 GOTO 1888
283 FRONT@DANK,YELLOW,SP@SPANT CATEGORY "RM" :="
(FRONT@ANON@AMKE)
284 FRONT@DANK,GREEN@STER NEW CATEGORY "RM" :="
(INPUT @AKC)@DTE 114
285 FRONT@COLM,C1,RYCN,SP@M1"
286 @AL@AN@C111@D@AM@C121@ RM@THEN PRINTM,
TH@CC1:GOTO 218
287 FR@FR@D@A@C12:FOR @@=0 TO @@FR@M@,TO@CN,SPC1"
NEXT
288 PRINTM,"YELLOW@AKM@G@D@ 7888@RETURN
FRONT@COLM,C1,RYCN,SPC1,RYOFF,YELLOW,M1
ONLY TRANSFER@RYCN,C1,SPC11"
289 GOTO 1888
290 @A@G@OR 112:FRONT@C1@TRANSFER FROM CATEGORY :="
(INPUT @
291 IF @C@ THEN 114
292 FR@RC@M@-@+@G@OR 248
293 @-@@C@M@-@+@@ SP@,RO@C@-11@ THEN 218
294 FRONT@COLM,@DOWN,YELLOW,RYCN,RYOFF,SA,SE,SP,SP,
SA,SE,SP,SP,C1,SP,SA,SE,SP,C1,SA,SE,SE,SP,SE,M1"
295 FOR T@ TO 1288@N@T@G@D@ 114
296 FRONT@COLM,C1,RYCN,SPC1,RYOFF,YELLOW,SPC
ONLY TRANSFER@RYCN,C1,SPC11"
297 GOTO 1888
298 @A@G@OR 112:FRONT@C1@ CATEGORY :="@INPUT @C@
299 IF @C@ THEN 114
300 FR@RC@M@-@+@G@OR 242
301 FRONT@COLM,C1,RYCN,SPC1,RYOFF,YELLOW,M1
ONLY TRANSFER@RYCN,C1,SPC11"
302 GOTO 1888
303 @-@@C@M@-@+@@+@@C@M@-@+@
304 FRONT@COLM,C1,RYCN,SPC1,RYOFF,YELLOW,M1
ONLY TRANSFER@RYCN,C1,SPC11"
305 GOTO 1888
306 @-@@C@M@-@+@@+@@C@M@-@+@
307 FRONT@DANK,W@TE,@TRANSFER FROM :="
FRONT@RYCN@M@C1 "TRANSFER,SPC1@SPC,RYCN@M@C1
308 LN@AN@,RO@C@-11@G@D@ 214
309 FRONT@DANK,C1,SP@M@1 IN ACCOUNT :="1888
310 FRONT@DANK,C@M,S@M@NT :="INPUT @@C,RO@C@1
311 IF @@C,RO@C@1=@@A@M@ THEN 214
312 @A@M@COLM,RYCN,RYOFF,YELLOW,RYCN,@@C@C1,SA,SE,SE,
SP,SE,SE,SE,SA,SE,SP,C1,SA,SE,SE,SE"
313 FOR T@ TO 1288@N@T@G@D@ 114
314 FRONT@DANK,RYCN,RYOFF@L@ :="@AN@,RO@C@1
315 @@C,RO@C@1=@@M@M@,RO@C@1-1-@@C@,
RO@C@1
316 @@C@,RO@C@1=@@M@C@,RO@C@1-1-@@C@,RO@C@1
317 @@C@,RO@C@1=@@C@,RO@C@1
318 LN@C@,RO@C@1=@@M@C@+@M@M@"
319 @@C@,RO@C@1=@@M@C@,RO@C@1
320 @-@C@:IF @@C@-@M@ THEN @G@D@ @C
321 @-@C@:IF @@C@-@M@ THEN @G@D@ @C
322 IF @@C@-@M@ THEN @@C@-@M@C@1-1
323 IF @@C@-@M@ THEN @@C@+@M@C@1-1
324 GOTO 114
325 @A@M@ FRONT@COLM,C1,RYCN,SPC1,RYOFF,YELLOW,@A@M

```

```

@ @D@M@RYCN,C1,SPC11"
232 GOTO 1888
233 IF @M@ THEN FRONT@DANK,W@TE@M@M@1 "RYCN,
SA,SE,SA,SE,SA,SE,SP,C1,SA,SE,RYOFF"
(FOR T@ TO 1288@N@T@G@D@ 114)
234 FRONT@DANK,C@M@NT@ NEW CATEGORY "M@M@+@M@
@M@C@121,RYCN" @A@M
235 @A@M@M@M@,RYCN@RYOFF 114
236 @M@
237 IF @M@ @M@ @M@ THEN FRONT@COLM@'G@D@ 214
238 RETURN
239 IF @M@ @M@ @M@ THEN FRONT@COLM@'G@D@ 218
240 RETURN
241 @M@M@M@ (M@C@1)
242 IF @@C@-1-@M@C@1,@M@ THEN @M@M@+@M@'G@D@ 242
243 IF @M@M@M@M@M@M@M@M@M@M@,LN@M@M@-1,
110@ THEN 242
244 @M@M@M@M@"
245 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
246 IF @@C@-1-@M@C@1,@M@ THEN @M@M@+@M@'G@D@ 272
247 IF @M@M@M@M@M@M@M@M@M@M@,LN@M@M@-1,
110@ THEN 272
248 @M@M@M@M@"
249 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
250 IF @M@M@M@M@M@M@M@M@M@M@,LN@M@M@-1,
110@ THEN 272
251 @M@M@M@M@"
252 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
253 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
254 IF @M@M@M@M@M@M@M@M@M@M@,LN@M@M@-1,
110@ THEN 272
255 @M@M@M@M@"
256 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
257 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
258 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
259 IF @M@M@M@M@M@M@M@M@M@M@,LN@M@M@-1,
110@ THEN 272
260 @M@M@M@M@"
261 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
262 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
263 IF @M@M@M@M@M@M@M@M@M@M@,LN@M@M@-1,
110@ THEN 272
264 @M@M@M@M@"
265 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
266 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
267 IF @M@M@M@M@M@M@M@M@M@M@,LN@M@M@-1,
110@ THEN 272
268 @M@M@M@M@"
269 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
270 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
271 IF @M@M@M@M@M@M@M@M@M@M@,LN@M@M@-1,
110@ THEN 272
272 @M@M@M@M@"
273 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
274 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
275 IF @M@M@M@M@M@M@M@M@M@M@,LN@M@M@-1,
110@ THEN 272
276 @M@M@M@M@"
277 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
278 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
279 IF @M@M@M@M@M@M@M@M@M@M@,LN@M@M@-1,
110@ THEN 272
280 @M@M@M@M@"
281 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
282 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
283 IF @M@M@M@M@M@M@M@M@M@M@,LN@M@M@-1,
110@ THEN 272
284 @M@M@M@M@"
285 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
286 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
287 IF @M@M@M@M@M@M@M@M@M@M@,LN@M@M@-1,
110@ THEN 272
288 @M@M@M@M@"
289 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
290 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
291 IF @M@M@M@M@M@M@M@M@M@M@,LN@M@M@-1,
110@ THEN 272
292 @M@M@M@M@"
293 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
294 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
295 IF @M@M@M@M@M@M@M@M@M@M@,LN@M@M@-1,
110@ THEN 272
296 @M@M@M@M@"
297 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
298 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
299 IF @M@M@M@M@M@M@M@M@M@M@,LN@M@M@-1,
110@ THEN 272
300 @M@M@M@M@"
301 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
302 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
303 IF @M@M@M@M@M@M@M@M@M@M@,LN@M@M@-1,
110@ THEN 272
304 @M@M@M@M@"
305 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
306 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
307 IF @M@M@M@M@M@M@M@M@M@M@,LN@M@M@-1,
110@ THEN 272
308 @M@M@M@M@"
309 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
310 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
311 IF @M@M@M@M@M@M@M@M@M@M@,LN@M@M@-1,
110@ THEN 272
312 @M@M@M@M@"
313 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
314 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
315 IF @M@M@M@M@M@M@M@M@M@M@,LN@M@M@-1,
110@ THEN 272
316 @M@M@M@M@"
317 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
318 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
319 IF @M@M@M@M@M@M@M@M@M@M@,LN@M@M@-1,
110@ THEN 272
320 @M@M@M@M@"
321 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
322 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
323 IF @M@M@M@M@M@M@M@M@M@M@,LN@M@M@-1,
110@ THEN 272
324 @M@M@M@M@"
325 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
326 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
327 IF @M@M@M@M@M@M@M@M@M@M@,LN@M@M@-1,
110@ THEN 272
328 @M@M@M@M@"
329 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
330 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
331 IF @M@M@M@M@M@M@M@M@M@M@,LN@M@M@-1,
110@ THEN 272
332 @M@M@M@M@"
333 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
334 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
335 IF @M@M@M@M@M@M@M@M@M@M@,LN@M@M@-1,
110@ THEN 272
336 @M@M@M@M@"
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338 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
339 IF @M@M@M@M@M@M@M@M@M@M@,LN@M@M@-1,
110@ THEN 272
340 @M@M@M@M@"
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342 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
343 IF @M@M@M@M@M@M@M@M@M@M@,LN@M@M@-1,
110@ THEN 272
344 @M@M@M@M@"
345 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
346 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
347 IF @M@M@M@M@M@M@M@M@M@M@,LN@M@M@-1,
110@ THEN 272
348 @M@M@M@M@"
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351 IF @M@M@M@M@M@M@M@M@M@M@,LN@M@M@-1,
110@ THEN 272
352 @M@M@M@M@"
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354 @M@M@M@M@M@,C@M@M@M@M@M@M@M@
355 IF @M@M@M@M@M@M@M@M@M@M@,LN@M@M@-1,
110@ THEN 272

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