MICRO COMPUTER PRINTOUT

A PLAIN MAN'S GUIDE TO PERSONAL COMPUTING

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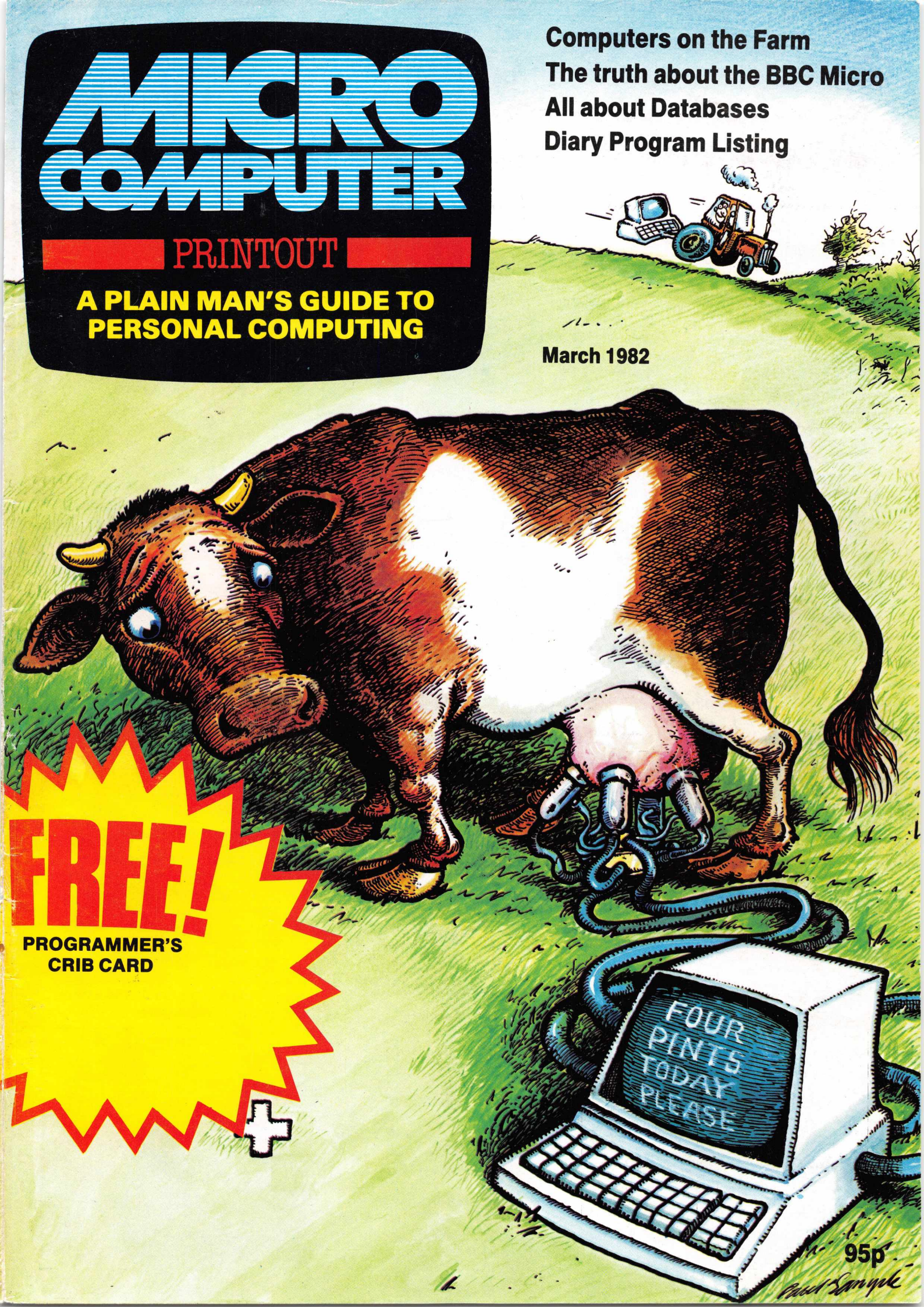
March 1982



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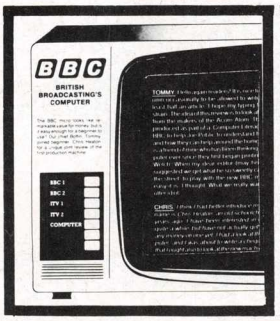

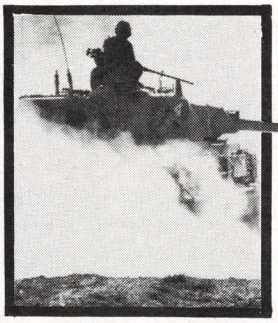

30 VERY SERIOUS GAMES
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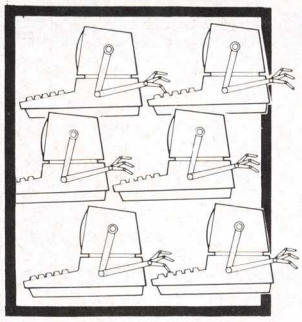
44 REVOLUTION ON THE FARM
How micros are turning muck into brass.



76 PROGRAMS THAT WRITE PROGRAMS
Fact and fiction.

FEATURES

20 READ/WRITE Angry of Mayfair vs. Disgusted of Dagenham.

24 HOTLINE The news that's fit to print and quite a lot that isn't.

32 TOMMY'S TIPS Your programming problems solved here.

36 CARING FOR YOUR COMPUTER What *not* to do with it.

40 MEMORANDA Complete Diary program listing.

42 ZX 81 PEEK & POKE The mystery revealed.

50 WHO NEEDS MATHS ANYWAY? Can you compute without it?

56 DO YOU NEED DATABASE? State-of-the-Art Report.

60 IT'S ALL DONE WITH STRINGS Sophisticated Programming even for beginners.

64 DISK DOCTOR Gives your PET Disks a medical.

69 COMPLEAT COMPUTER CRIB SHEET Our acclaimed beginners guide reprinted.

71 MIKE'S MUSES On rounding errors and other disasters.

84 INSIDE TRADER The gossip columnist who eats writs for breakfast.

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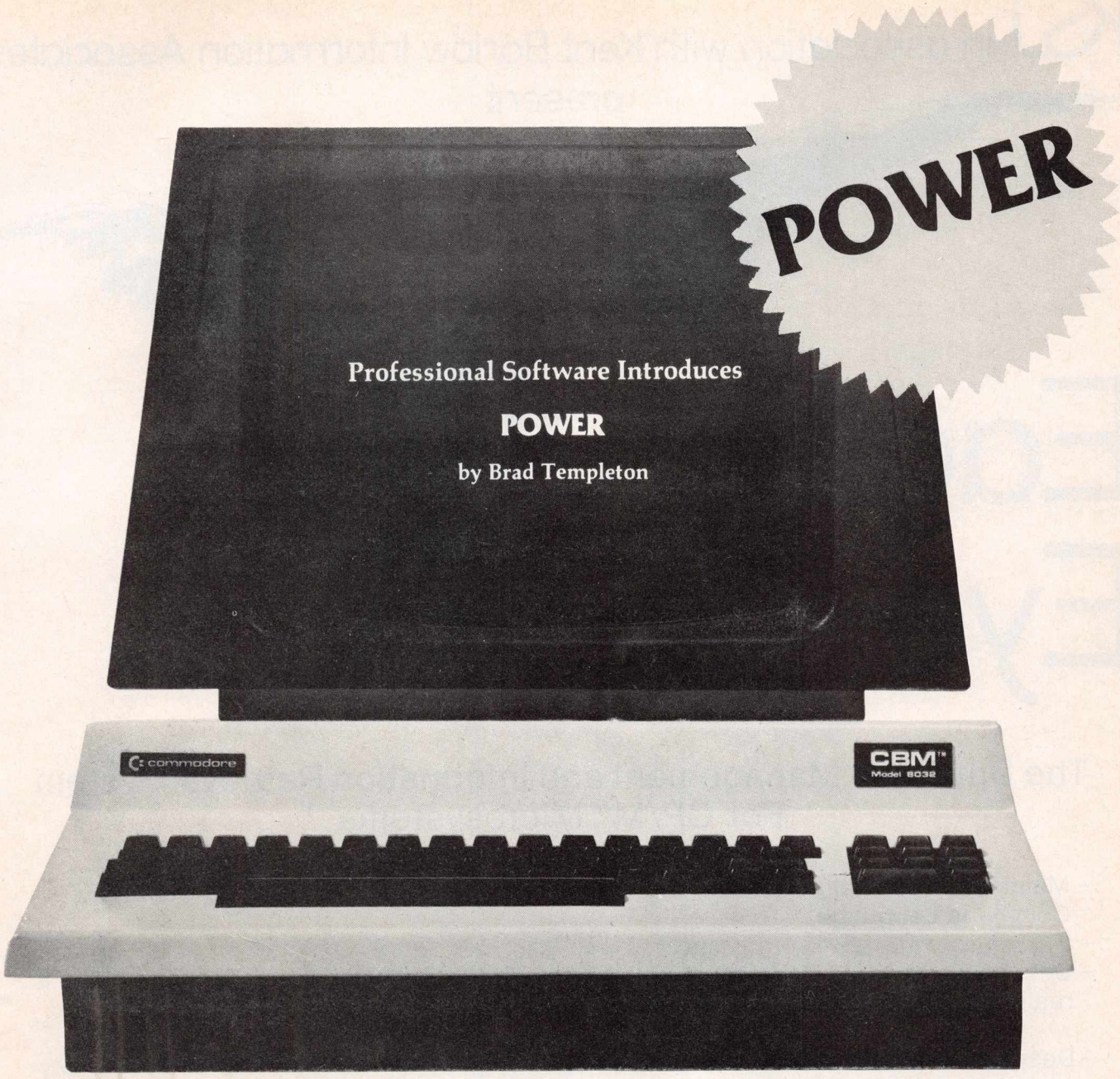

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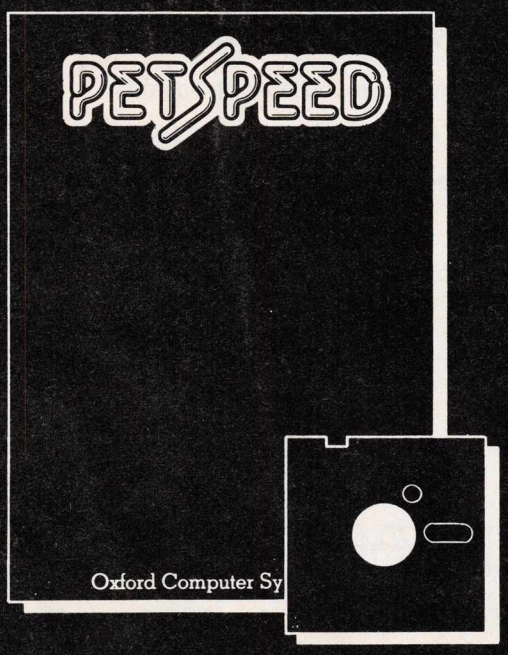

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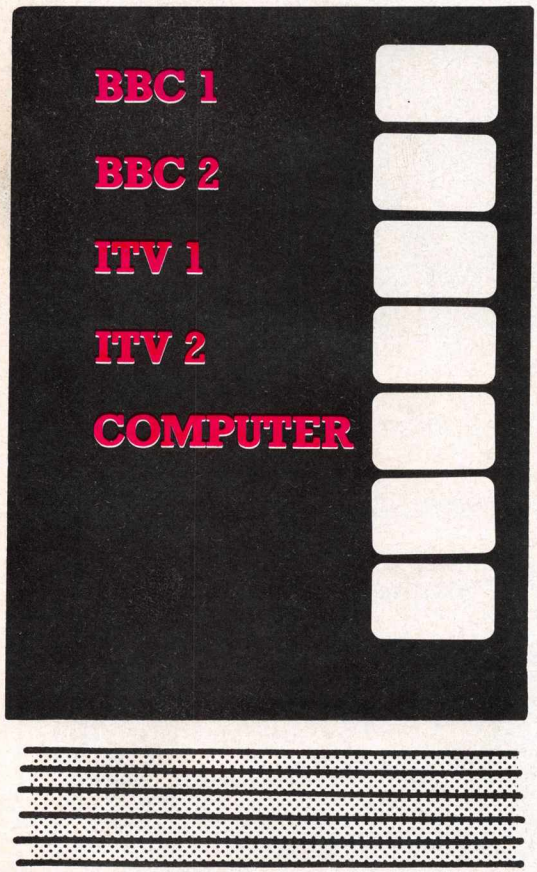


TOMMY: Hello again readers! It is nice to be let out of my column occasionally to be allowed to write a real article, or at least half an article. I hope my typing finger can stand the strain. The idea of this review is to look at the new BBC micro, from the makers of the Acorn Atom. This machine is being produced as part of a 'Computer Literacy Project' run by the BBC to help Joe Public to understand how computers work and how they can help around the home. My partner in crime is a friend of mine who has been thinking about buying a computer ever since they first began printing pictures of Raquel Welch. When my dear editor (may his camel never thirst) suggested we get what he so sweetly calls 'a typical man-in-the-street' to play with the new BBC micro to see just how easy it is, I thought 'What we really want is a complete and utter idiot'.

CHRIS: *I think I had better introduce myself to start with. My name is Chris Heaton, an old schoolchum of Tommy's from years ago. I have been interested in home computing for quite a while, but have not actually got around to laying out any money on one yet. I had a look at the Sinclair ZX81 computer, and I was about to write a cheque when Tommy said that I ought also to look at the new machine from Commodore, the VIC, so I spent a most enjoyable morning with Tommy at one of our local dealer's premises. I had just saved up the extra when this BBC micro came along. I must say, I don't like the way each of Tommy's suggestions is a bit more expensive than the last!*

Tommy was most insistent that I should play with the machine on my own, with the absolute minimum of assistance, so that we could decide how easy it would be for a dummy like wot I am to learn how to use it. So, feeling very nervous, I opened the box and unpacked it.

My first reaction was that it was much bigger than I expected. As I said, I have played with ZX81s etc., but this is larger than the VIC. It still felt very comfortable on my lap in front of the telly, so the size should not be a problem. It is still a good bit smaller than any of the computers in Tommy's junk-room. Also in the box were several cables, two booklets and a program cassette. I was about to plug the computer into the mains when Tommy stopped me, and said that the first rule I had to learn was that I ought to read the manual before I tried out the equipment. He also said that it would be a good idea if the computer, television and cassette recorder were reasonably close together. I left him re-arranging my living room, much to the disgust of my fat old tabby.

I started with a slim volume, helpfully entitled 'WELCOME', which seemed a good place to start. This started with a detailed description of how to connect the computer to the TV, with lots of photos, like those DIY car manuals, and then explained the meanings of the various keys on the keyboard. This was followed by a couple of short programs for me to key in, and pictures of the displays they would produce. These

did not make much sense, but I did recognise some words like DRAW and PLOT. Then followed another series of photographs explaining how to connect the cassette recorder, and a section describing each of sixteen programs on the free cassette. The booklet ended with a message from the BBC Computer Literacy Project Editor, a Mr. David Allen. Is he any relation I wonder?

While I had been engrossed in the "Welcome" booklet, Tommy had been dipping into the other booklet, which he said was a BASIC reference manual, and the beer in my fridge. I said that we ought to get started while he could still type, and he agreed.

It was left to me (again) to work out how to connect the computer to the TV. Despite my two left hands, it was extremely straightforward. All you have to do is connect one end of a cable to the computer, plug the other end into the aerial socket of the TV, and you are in business. You have to adjust the tuning on the TV, because the computer acts like another TV station, but most sets have plenty of spare buttons, one of which can be used for the computer without disturbing the existing settings.

The cat had hardly fallen asleep again before I was proudly showing Tommy the results of my first program copied from the "WELCOME" booklet. It was only four lines long, and drew a series of random shapes of different colours on the screen, but at least it worked!

TOMMY: As Chris has told you, the documentation supplied with the BBC micro is of a high standard. In fact, as our machine was a pre-release model for review, we did not have the full range of manuals, only the simple introduction which Chris described, and a BASIC language reference manual. This does devote several chapters at the start to elementary programming, but the bulk of the learning material was not available, and is intended to be used in conjunction with the television series.

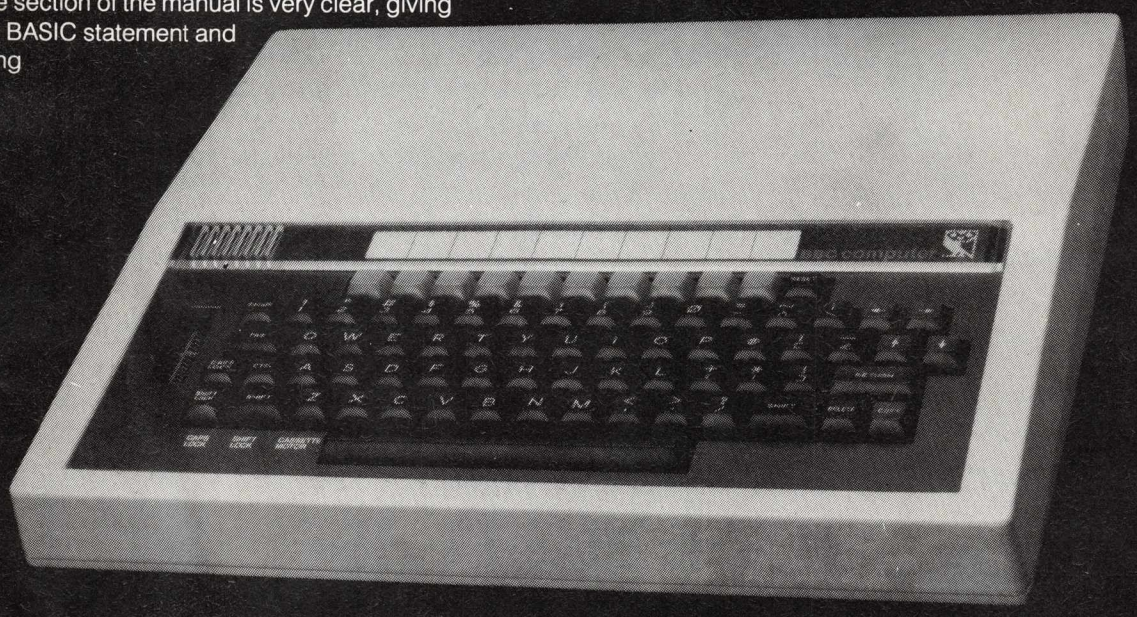
The reference section of the manual is very clear, giving one page to each BASIC statement and function, explaining the meaning of each and giving several examples. One feature which I have not seen before is that every page contains a list of 'related words' to be used as a cross-reference. For example the page for GOSUB also mentions RETURN and ON; FOR mentions TO, STEP and NEXT. This is especially useful for a beginner who is not quite sure if he has the right word; he can look up similar words and check their entries.

I do have one slight gripe, and that is that the cables could do with being a little bit longer; Chris' TV and hi-fi are not really far apart, but the cables were just not quite long enough.

CHRIS: *The time had come to connect the cassette, and here we ran into our first snag. Two cables are supplied: one ending in a 5-pin DIN plug, the other in bare wires. As my recorder uses phono plugs, we had a problem. The advice given by the "WELCOME" booklet was to go to a hi-fi dealer, who would put plugs on for us. Fortunately, Tommy is a dab hand with a soldering iron, and after dashing back to his house for his bits and pieces (and some more beer!) he managed to rig up a cable for me.*

The first program on the tape is recorded ten times over. The idea is to allow you to experiment with the volume and tone controls on your recorder to achieve the best results. In my case, the program loaded first time with the controls still set as for normal listening, so by the time the tenth program had loaded successfully and told me that my recorder was properly adjusted, I was beginning to get a bit tired with it!

The first real program was a 'typing test'. The computer displays a character on the screen, and you have to press that character as quickly as you can. The machine tells you if you are right, and tells you your reaction time. At the end of the test the computer tells you your score. Mine was not really very good, but by the end of it, I knew how to find most of the "special" keys which are not on my typewriter.



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BBC Microcomputer

TOMMY: I was very impressed with the way the machine picked up the programs from the recorder. I have used cassettes on PETs (old ROMs, 1978 vintage!), Apples, and also pre-production versions of the ZX80, ZX81 and VIC, all with greater or lesser failure rate, but I was most pleased with the way the BBC micro just worked first time without any fussing with volume and tone controls. For any users who have Chris' problem with getting cables to match your recorder, I would advise you to have a chat with the dealer who sold you the computer. If you do go to a hi-fi dealer, take the reference manual with you, because that gives the connections for the cable.

The other programs on the tape are a fair assortment of novelty items, a 'sketch pad' program for doodlers, a calculator, a poem-writing program, biorhythms and so on. We will leave Chris playing with his new toy while I point out some of the features of the BBC micro which I think make it rather special.

The machine itself measures 16" by 13½" by 2½", so, while it is larger than a Sinclair or VIC, it is still quite comfortable on the lap. Not as cuddly as the *Printout* secretaries, but we can always wait for Mk II!

It has a more or less IBM standard keyboard, with all the options such as ESCAPE, CONTROL and also four cursor controls (no shift this or escape the other like Apples and PETs), and 10 soft keys, whose meaning can be altered by a program. If you are developing a program called "PROG", you might have one key saying LOAD "PROG", another saying SAVE "PROG", a third saying RUN and another LIST. In this way the four most common commands are replaced by a single key each. The keyboard action is a very good one, with full size keys; no Mickey Mouse stuff on this machine.

It is well provided with interfaces, having three different video outlets, a cassette port, an RS423 port (a super-RS232, fully compatible but going up to huge speeds) and an analogue input, which betrays its Atom ancestry, but also useful for Apple style paddles and joysticks, as well as a light pen. Slightly more exotic are a disk drive, a standard parallel printer port, a PET style user port, connections for Econet, Acorn's own network system (see the article on networks in January's issue) etc. etc. Not all of these are implemented yet, and some will only be available on Model B, the more expensive version.

The video display is very good, even on a standard television, with none of the colour fringing which spoils some systems. The resolution is also very good, going up to 640 by 256 dots on the Model B, while even the cooking version can manage 320 by 256. The system can be put into 'Teletext' mode, where each character is formed as for the Teletext standard, ready for connection to one of the Teletext systems. The normal character set is also user-definable, so you can create your own alphabets.

The BASIC language is not from Microsoft, but that is by no means a problem. Unlike Sinclair BASIC, it follows all the common BASIC standards, but with several very handy extensions not found in Microsoft BASICs in this price range, such as AUTO, RENUMBER, TRACE and DELETE.

In fact, the BASIC contains many features I have only seen on much more expensive machines. For example, you can define functions, using DEF FN, which are more than one line long, and include FOR loops, GOTOs and so on. You can also have procedures, which are like a cross between a function and a subroutine. It has a full error trapping system (ON ERROR GOTO). It has a formatted PRINT statement similar to the PRINT USING statement found in some BASICs, so you can format all your values to 2 decimal places padded to 10 characters, say.

Another very useful feature is that the BASIC interpreter has a built-in assembler, so it is really very easy to write mixed BASIC and assembler programs. The BASIC also contains many features to drive the various ports, so there are no nasty PEEKs and POKEs to be done before you use the serial port for example. In fact, the BASIC contains a lot of my personal favourites from a range of BASICs on many microcomputers. Now back to Chris.

CHRIS: *After trying several of the programs on the WELCOME cassette, I was very keen to have a go myself. As Tommy explained, we did not have the full range of teaching manuals, but the first 5 chapters in the user guide seemed to be a condensed version of the instruction books aimed at someone with no previous experience of computers.*

I was soon able to show off my first program to an admiring wife, which asked her for the weight of a piece of beef, and told her how long it needed to cook. One problem did show up quite quickly, given my poor typing ability coupled with lack of programming ability. I remembered from my quick play with a VIC that I could change a program line by moving the cursor back and typing over the line. The BBC micro was a little more awkward. I think I will leave it to Tommy to explain.

TOMMY: The editing on the BBC micro is not as bad as Chris is trying to make out. It takes a little bit more learning than the intuitive method used on the Commodore machine, but even he got the hang of it in the end. You can use the cursor control keys as in the PET, but now you have two cursors, and "editing" cursor, which is a flashing line, and the normal "input" cursor. When the editing cursor reaches the line you want to edit, you can press a "COPY" key, which copies a character from the line being editing to a new line at the bottom of the screen. The 'cursor right' key moves the editing cursor along without copying characters, and so it acts as a delete key. You can insert characters at any point by just keying them in; this is the insert function.

This is certainly a novel system; the nearest thing to it is the editing on Microsoft's MBASIC, which runs under CP/M. I would say it is better than the Apple editor, but the Commodore screen editor still rules the roost as far as I am concerned.

CHRIS: *Top sum up then, I was quite pleasantly surprised by my first real experience with a microcomputer. Even without the proper teaching manuals, and before I have seen the TV series, it was not very long before I was writing a couple of simple programs. Moreover, I now realise the huge gap between myself and trained programmers. Some of the advertising for home computers implies that if you buy such and such a computer, you will be writing stupendous games and business programs within a week. I am now more determined than ever to buy one of these beasts, but more worried than ever by the problem of the equipment being outdated within a week.*

TOMMY: I too was very favourably impressed by the BBC micro. On the grounds of appearance, the variety of ports, the power of the BASIC, and last but not least the speed. I managed to price Chris off the machine for long enough to do some simple benchmarks, and it is near enough twice the speed of my PET. Coming with 16K of RAM it gets my vote for best value for money in the price range.

To those of you who share Chris' worry about being outdated, I would say forget it! The fact that another machine has just been brought out with better performance does not make you machine suddenly useless; it will still perform as well as ever. If you are that worried about having the most up-to-date piece of kit, then I would say you are more interested in the ego trip than the computer and should stick to the established status symbols such as noisy bikes and flash suits.

A Beginners Guide

"Don't plug Commodore" said the man from Commodore. "Write us an essay that people will find useful instead." It was an offer I couldn't refuse.

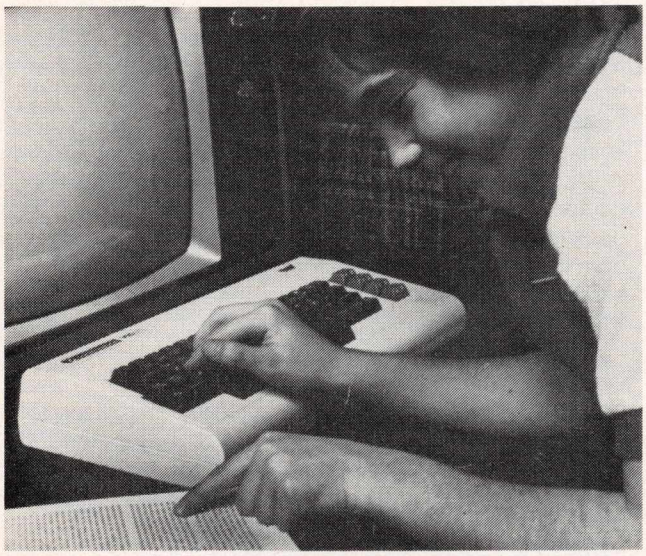
First things first then. Money. What do the darn things cost?

At Home

Anywhere between £70 and £7000. Maybe more. What you need spend is, of course, another matter. To a large extent you get what you pay for. But for a real computer that you can use at home the VIC-20 at £189 including VAT has to be a strong candidate. Why?

Colour graphics (assuming you have a colour TV) and a proper typewriter keyboard for a start. And sound. And plug-in program cartridges.

Budget another £45 for a cassette recorder to store your own programs; typing them in from scratch everytime is a real pain. It is likely you will want to add some additional memory to the 5K of Random Access Memory (equivalent to about 5000 characters of text) the VIC-20 arrives with. That's because only 3K is actually available for programming. Plugging in an extra 8K RAM cartridge will make a £45 hole in your pocket – but it will allow you to play Space Invaders!



Other popular and currently available home micros to consider are the ZX80 at £73, and the Atari 400 at £345.

In the classroom

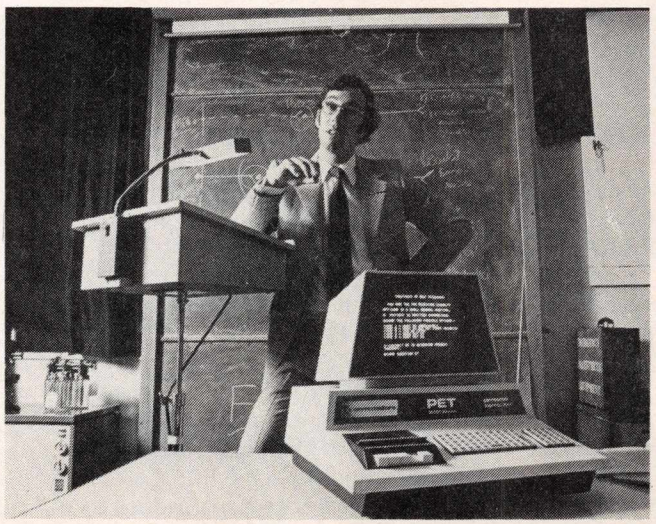
Schools have tended to opt for machines like the PET, the most popular choice, at £550 + VAT for 16K version, or the more expensive Research Machines RS380Z. For this you get a built-in black and white screen, for giving upper and lower case letters plus graphics. As with all Commodore machines, the BASIC language – very easy to learn – is built in.

The other major plus is the software. Lots of it available from independent suppliers. Commodore even give it away free if you are a school. Or you can swap with other teachers.

In business

Advising businessmen on the right micro is tricky; so much depends on the quality of the programs. In fact some experts recommend looking for the program first. Fortunately for Commodore I can put hand on heart and say that no system offers a wider range of off-the-shelf business programs than the PET.

There are a few businessmen that get by with 16K of RAM memory and a cassette drive – but not many. A more sensible configuration would be 32K of memory and a floppy disk unit. Quite a few companies offer this specification including Apple and some of the new Japanese machines.



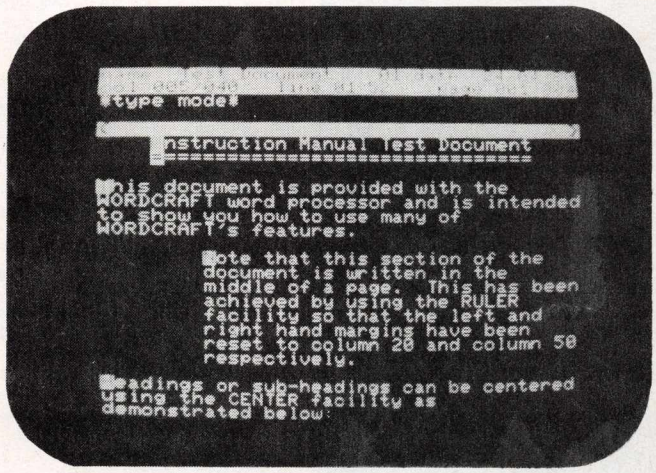
to Micro Computers

by C.R. Oppenheim

To give you an example of pricing, the 32K PET with 337K bytes (characters) floppy disks costs £1390 + VAT. The Apple price would be similar but with much lower capacity disks. Add £395 ex VAT for a dot matrix printer and you have a pretty effective business system for around £1800.

A good sales/purchase ledger package will cost around the £300 mark on the most popular microcomputers, perhaps twice this price on the others. Economies of scale you see.

Word Processing



Word Processing is probably the single most popular business application; it is so useful for sending personalised letters and maintaining lists.

After looking at more expensive systems I chose a SuperPET; its larger screen giving me lines of up to eighty characters long. Keyboard layout is QWERTY like a typewriter, so my secretary's happy too.

After the American *WordStar*, which runs on CP/M based machines, *Wordcraft* is probably the best known word processing program, and at £375 + VAT it has the merit of being cheaper. After careful consideration that is what I chose.

Whilst dot matrix printers, which as the name suggests create the letters out of dots, are fine for accounts, a typewriter quality printer is better for word processing. Commodore's new daisywheel at £850 + VAT looks like a bit of a bargain; if you are feeling rich you could pay £2000 for another make which would get through your letters even quicker.

Adding up the cost of a Word Processing system based on the 32K SuperPET with the powerful 1 megabyte disks (they store 1 million characters approximately, the length of a Dickens novel!), the price comes in around £3000 + VAT. That's including the software!

That's about all I have space for, for now. But if you have any queries, drop me a line c/o Commodore. Or alternatively fill in the coupon for further details and the name of your nearest dealer.

Send to: Commodore Information Services,
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C COMPILER (BD Software) £80/£15
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CBASIC Compiler Systems £75/£12
This is a non-interactive BASIC used by many business application programs. It supports full file control chaining formatted output and random disk file access, 14-digit arithmetic WHILE/-WEND and optional line numbering.

C COMPILER (Whitesmith's) £325/£20
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S-BASIC £155/£20
A structured BASIC compiler generating 8080 native code, combining structured programming and the speed of machine code while maintaining the convenience of BASIC.

BASIC-80 (Microsoft) £175/NA
This is Microsoft Extended BASIC interpreter, version 5. It is a powerful, ANSI compatible disk BASIC with many features not found in PET BASIC, such as WHILE/WEND, chaining, variable length file records, double precision floating point, PRINT USING facility, error trapping, hexadecimal numbers and more.

BASIC COMPILER (Microsoft) £195/NA
This compiler is language compatible with the Microsoft version 5 interpreter but generates 8080/Z80 machine code, so that program execution is typically 3 to 10 times faster.

COBOL-80 (Microsoft) £375/£20
An ANSI '74 COBOL compiler producing relocatable modules compatible with FORTRAN-80 or MACRO-80 output. COBOL-80 has a complete ISAM facility and interactive screen handling.

CIS-COBOL (Microfocus) £425/£30
An ANSI '74 standard COBOL compiler fully validated by U.S. Navy tests to ANSI level 1. The compiler also supports many features of level 2 including dynamic loading of COBOL modules and a full indexed Sequential (ISAM) file.

FORTRAN-80 (Microsoft) £230/£20
The popular science and engineering language, complying with the ANSI '66 standard (except for the COMPLEX data type), with enhancements such as mixed mode arithmetic.

PASCAL/MT+ £265/£20
A Pascal compiler meeting the ISO standard, with many enhancements including full string handling capability and random access files.

PASCAL/M £220/£15
This compiler produces p-code and is an extended implementation of standard Pascal, with long (32-bit) integers, a SEGMENT procedure type (for overlays) and an added string data type.

PASCAL/MT £160/£20
This is a subset of standard Pascal, which generates ROMable 8080 machine code and supports interrupt procedures, CP/M file input/output, and assembly language subroutines.

PASCAL/Z (Ithaca Intersystems) £205/15
A compiler producing ROMable, re-entrants Z80 micro-code highly optimised for speed, supporting variant records, strings, CP/M file input/output, and assembly language subroutines.

muLISP £110/£15
LISP is an interactive programming language widely used for artificial intelligence applications.

PL/I-80 (Digital Research) £265/NA
A general purpose application programming language giving mainframe capability for developing large-scale structured programs in a microcomputer environment

TINY C TWO £130/£30
A compiler written in TINY C. The source code is included on disk.

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WORDSTAR (MicroPro) £255/£35
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MAILMERGE(MicroPro) £80/£15
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MICROSPELL £130/NA
This is a spelling help program which scans through a document file stopping at each dubious word, offering corectly spelt alternatives and allowing you to correct the word with a keystroke

TELECOMMUNICATIONS

BSTAM £105/NA
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M/SORT FOR COBOL-80 £130/£12
A record sorting utility for COBOL-80 conforming fully to the ANSI '74 level 2 sort/merge standard (except for alphabet name collating sequence).

SYSTEM TOOLS

CROSS ASSEMBLER £95/£10
XASM 05, 09, 18,0 48, 65, F8, 65, COPS 400 and 51
Cross assemblers for the Motorola 6505, Motorola 6809, RCA 1802, Intel 8048, Motorola 6800, Fairchild F8, MOS Technology 6502, National Semiconductor 400 and Intel 8051 families.

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* Details supplied on how to use the joysticks in your own programs.

For the games presently available you will require a Controller Board price £19.50 and one Joystick price £9.60 (Please add 0.80p P&P).

Games available: (many more to follow, especially 2 player games)

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READ/WRITE

Mixing business & pleasure

I wonder if you can help me.

I am a self-employed, really a one man band, life assurance and financial investment consultant. I sought a lot of advice from various firms marketing microcomputers in the Midlands to find a set up which would fulfill my needs. After a lot of conflicting and very disturbing advice I purchased the following equipment:- Commodore 8032, 8050, 8027 printer, and software, VisiCalc and Wordcraft 80.

The equipment and software seem ideal – the Wordcraft for word processing and VisiCalc for my investment monitoring and calculations.

Would you please advise me on the two following problems?

1. Is there a software package which will store all my client's records, that will enable me to call on client's records within certain categories, for example, by age, or occupation, or family size, or type of policy? Also is it possible for these clients records to be stored in alphabetical order, rather than in random order, even though they may be inserted not in alphabetical order?
2. With the limited number of investment clients I have, at the moment, there is enough memory in the VisiCalc. I expect in the not too distant future, that I will reach the limit of the 10K for any one group of investors. Is there any practical way of using more of this very clever and useful tool, to overcome the limitation that 10K for one page imposes?

I hope the above is clear and that you can assist me in using my equipment more fully. By the way, on a lighter note, can you advise me of some games software suitable for the 8032?

F.W. Halliday,
Sutton Coldfield

Your story about conflicting and disturbing advice from rival micro suppliers rings very true, Mr Halliday, and we would always recommend to the first-time buyer that he obtains sales references from any supplier before making a commitment.

What you need for your clients' records is quite clearly a database – and for a full explanation of the state-of-the-art and allied jargon, see the feature this issue – and the Software Buyers Crib Sheet (November 1981).

There are many such packages suitable for the 8032/8050 including DMS, PETAID, OZZ and others. The former two will actually link into Wordcraft allowing you to make use of clients' records when preparing standard letters or reports. Alphabetic sorting is common to most databases – though you should check carefully.

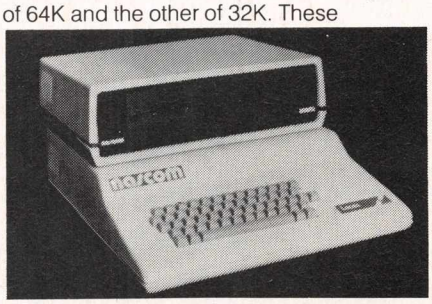
The request for more VisiCalc memory is a common one – and unfortunately the PET is not an easy machine to expand. Commodore have released a 64K add-on board for around £250 which would increase your memory to 96K. A new version of VisiCalc is available from ACT Microsoft – and several other major software suppliers will follow suit.

Whether to make available games for the 8000 series PET has been one of Commodore's most prolonged dilemmas – since they are worried about degrading the businesslike image. Audiogenic Ltd. of Reading, however, have now made available a good range of 8000 games – by means of an ingenious routine, which makes the 8032 look like a 40 column machine to the program.

Galactic declaration

Having recently seen your November issue of *MicroComputer Printout*, where you asked for Nascom users to come forth, we decided to do so.

Our small society uses two Nascom 1's (we noted that your illustration in the November issue showed a Nascom 2), one of 64K and the other of 32K. These



computers are used to run the Scottish Regions version of Galactic Society Four, a Science Fiction war games society.

Programs are run in both BASIC and Z80 machine code, and sometimes both simultaneously. Without these machines we could not run the wargame on anything approaching the scale we do. All the leg work of processing financial files is eliminated and the bulk storage of information is made easy.

At the moment, we have only two Nascoms at the central site, but are working on designing modems for a network of Nascom 1 machines throughout Scotland. Just to show that we are not biased towards Nascom machines, we also use Acorn micros for our Research department and hope to be adding the new BBC machine in a few months.

The original owners of Nascom suffered a great deal of abuse for their handling of the product, mostly because they did not appreciate just how many Nascoms they would sell in their first year. The new owners (Lucas Logic) are making slow but steady progress in opening up the market for new Nascom products, like their 64K memory board, retailing at £140 plus VAT. Which means you can get a 64K machine (with BASIC on tape) all for under £500 (plus VAT). That is why we use Nascom 1's and we would be happy to hear of anyone else interested in setting up a national network of Nascoms.

G.J. McPhee,
Galactic Society Four,
5a Hamilton Court,
Calside, Paisley, Scotland.

BBC Points of View

Read/Write January 1981 Brickbats and Bouquets.

I endorse the pro ZX81 anti ZX81 software sentiments expressed by J.R. Byng and I accept your timely reminder that one cannot really expect much software advice at the price. The point remains why does Sinclair sell the £3.95 cassettes under its own label and still disclaim any association with the writers?

Now that the BBC Computer Literacy Project is under way, I am looking forward to a *MicroComputer Printout* assessment of this programme.

A. Wolstencroft,
Knutsford, Cheshire

We take the point about branded software, Mr Wolstencroft, and as for the review of the BBC series, our resident genius, Tommy, will be viewing them with a critical eye, alongside newcomer, Chris Heaton.

U.F.O.

Did the illustration accompanying 'In Touch with Aliens?' *(February issue)* really show a man undergoing the electric chair as Inside

Trader stated? Or was it a sick joke? And what had the article got to do with computers anyway? Do you people know what you are doing?

Doug Bough,
Warminster, Wilts

No. YES. Not a lot. No.

Atari Rainbow

Congratulations to Terry Hope for a well-researched article on Colour Graphics in the January issue.

Regarding the statement suggesting that

only five colours can be displayed at any one time, however, your readers might like to try the following:-

```
10 GRAPHICS 11
20 FOR X=1 TO 190:COLOR X/12:PLOT
1,X:DRAWTO 79,X:NEXT X
30 GOTO 30
```

The above program will display 16 colours on the screen and is in fact similar to Graphics Mode 9 except that instead of one colour and sixteen luminescences this mode allows only one luminescence and sixteen colours.

A. Jones,
Ingersoll Electronics
London

READ/WRITE

The Editor welcomes your letters, but if you require a personal reply please enclose an S.A.E.

Brass knobs for Atari

As an Atari 400 owner I was most interested in your article on colour graphics in the January issue. My thirst for information on Atari has led me through your pages in previous issues to no avail. I shall be sure in future, however, to keep in close touch with *MicroComputer Printout.*

What about some more information on those extra graphics modes. I ran your "Brass" program and was most impressed.

I. Skinner,
Mile End, Stockport

Since publishing 'Colour Graphics', my poor predecessor, Terry Hope, has had to go into hiding to avoid the barrage of letters and phone calls from Atari owners demanding to know more about the previously undisclosed graphics modes.

Terry has promised, however, to divulge all in a second article if bribed with sufficient Scotch. Donations please to:- Editorial Lubrication Fund, c/o Microcomputer Printout.

? Computational Error

Concerning "Instant Software: Business Programming Made Easy" by Mike Gross-Niklaus, Jan 1982 issue of *MicroComputer Printout.*

On page 68 Mr Gross-Niklaus states that to convert square feet to square yards one multiplies by 9. Surely not – unless there are now three yards to one foot.

Anybody following Mr Gross-Niklaus' instructions would end up buying 81 times as much carpet as they needed because, as I am sure he knows, to convert square feet to square yards one must *divide* by 9.

M.W. Peters,
Liverpool L8

System crash

'Great Computing Disasters' *(February issue)* omitted almost all of the really great

debacles of the past five years. To wit, the CompuThink disk, Apple III, The Byte Shop crash, Kit Spencer, PCW's 'Last One' review, the New Brain, ACT's piracy case, Computer Age magazine and the VIC power supply (with 'melt down' facility).

Nick White,
Slough, Berks

You missed out the Gregory Yob manual.

Love at first byte

In response to "Not for Publication" (Read/Write Jan '82) – which I must point out, you *did* inadvertently publish:

As company secretary of Close Encounters Singles Group, a *personal* introductions agency, abhoring this use of computers, I would like to ask Mr. A Glotz why he feels the need to use his Sinclair ZX81 at all. His principles are as excellent as are (presumably) his male members – but to attract the ladies he must use the personal touch.

May I also suggest that "Computeraunch Intros" could have just the teensiest M.C.P. ring to it?

Close Encounters is the largest Personal Introduction and Social Group in the United Kingdom. I would like to offer my experienced advice to Mr. Glotz, or to anyone else who may be interested, if, in return, he could offer suggestions on the alternative uses of my own underworked, and rather bored Sinclair ZX81.

Julia Hamilton-Keeling
Close Encounters,
Blundellsands, Liverpool

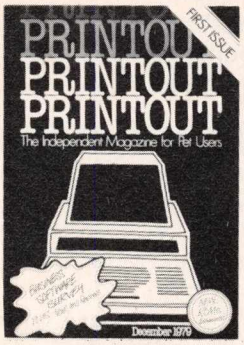
We are passing Ms. Hamilton-Keelings home telephone number to the gentleman who placed the following small ad in our classified column: 'Sincere tall editor, mid-twenties, own Porsche, seeks intro to blonde, well-built female person for friendship etc. Box 69'

Magnetic disaster

In view of your article on Great Computer Disasters, you may be interested in the following story:

Recently an American working in Britain tried to use for the first time his cash dispenser card, when he needed money outside of bank opening hours. He knew he had followed the instructions correctly and he knew he had money in his account, but the machine kept rejecting his card. His bank manager could see no reason why this should happen and gave him a new card. The same thing happened with the second card. By the third card this gentleman was becoming both annoyed and mystified. Then he saw that in his wallet where he kept the card a paperclip was clinging to another card which electronically operated the doors to his office. There was also another card in his wallet which was magnetic. These cards had reversed the polarity of the bank cards, so making it impossible to use them. The bank has now had to issue a warning to people to make sure they keep their cash dispenser cards away from anything magnetic.

Mrs S. Taylor,
Hove, Sussex



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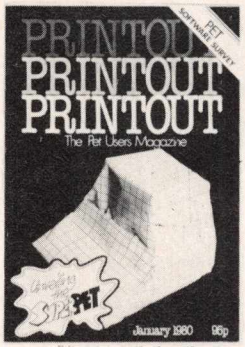

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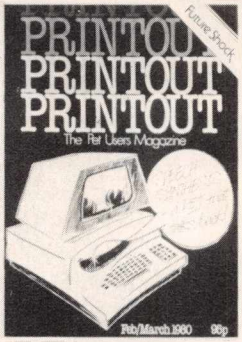

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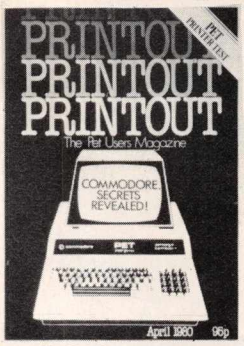

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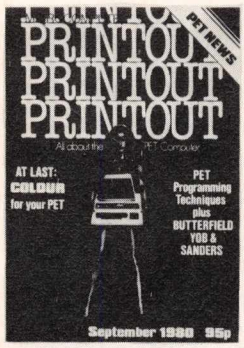

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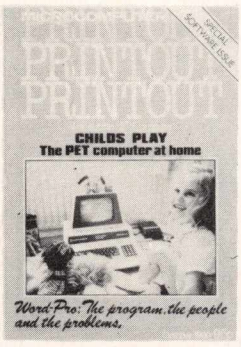

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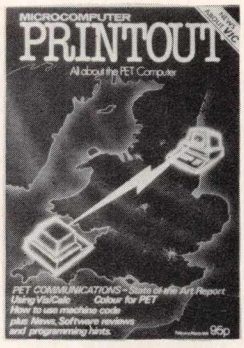

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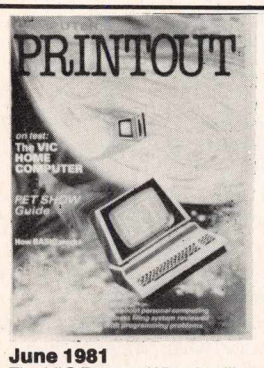

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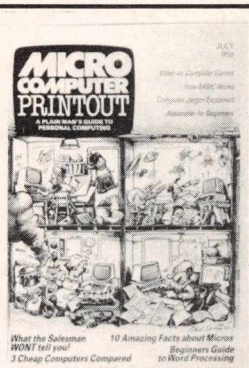

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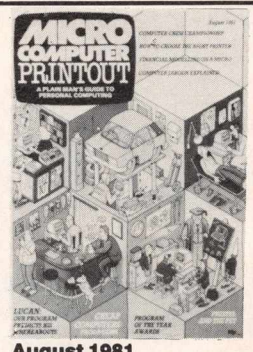

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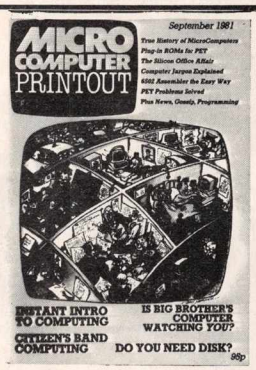

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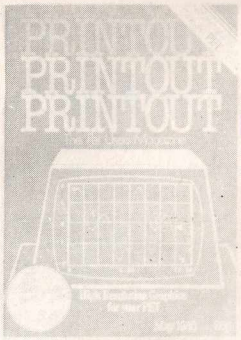

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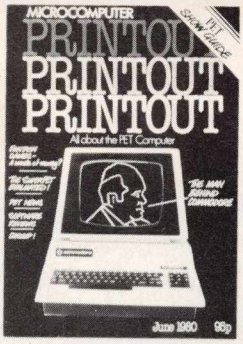

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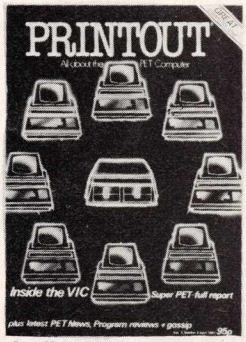

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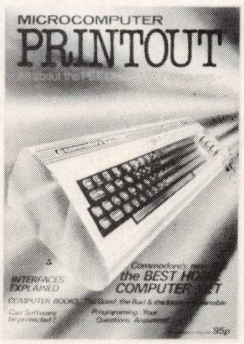

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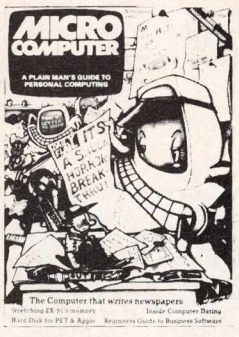

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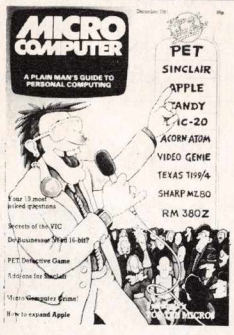

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NEWS

HOTLINE

One born every minute

You would think that by now the Press would have twigged that with Commodore, nothing is *quite* as it seems.

Take recent reports in the *Wall Street Journal*, bible of the American financial community, and our own *Guardian*. According to these, Commodore have invented a computer which can emulate any other computer.

The truth is as usual somewhat different – and a lot more interesting.

Commodore *have* developed a new line of computers, as predicted in this column. The first of these is the anticipated 40 column SuperVIC with a PET-compatible 40 columns x 25 line screen display, and 16K of RAM. However, with the VIC-20 doing well, it is unlikely to be seen here before the Autumn at the earliest. No surprises there.

Commdore's Chairman, Irving Gould, also announced an inexpensive game computer intended to compete with Sinclair. Dubbed the Ultimax it boasts a flat membrane keyboard, and plug-in cartridges which convert it from games machine into music synthesiser. Plug a BASIC cartridge in and it becomes a computer. These cartridges are said to be VIC compatible. The American retail price quoted by Mr. Gould is $149.95, with deliveries to start "in the Spring".

Personally, I wouldn't count on seeing any Ultimaxes on sale here before Autumn at the earliest.

Uncle Irving also announced something called the Commodore 64. And this is where it gets interesting. According to the press release put out by Commodore following his statement, this is "a full colour 40 column micro with 64K of built-in memory retailing

at $595 – making it the world's lowest-priced microcomputer with a built-in memory of 64K."

With Commodore, it is sometimes necessary to read between the lines. Compare then Commodore UK's press release with that put out by the American parent, and several interesting things emerge. First, the British lot have taken care to put everything Mr Gould said in inverted commas – almost as if they disassociate themselves from their chairman's remarks. Secondly, they don't add any additional information – like prices or release dates.

So what are we to make of all this? Here's my analysis.

The Commodore 64 is a replacement for the 40-column PET. But don't expect any funeral announcement – just a cessation of supplies – probably late Autumn, when they have had a chance to sort out the problems of converting the 64 to our PAL TV system.

Secondly, the 64 is just the first of a new range, and will rapidly be joined by Commodore's real entries for the great business computer race: a CBM128 and a CBM256 with 128K and 256K of RAM respectively. Photographs in my possession show an 80 column version with integral disk drives .....

An 8088 softcard is under development, but not yet operational. When ready, it will enable the new machines to run programs written for the IBM and Sirius computers, and indeed any software running under the CP/M 86 or MSDOS operating system.

Useful though that will be, it is not the same as compatibility with "any other" computer. But then, with Commodore 'wait and see' is often the wisest policy.

Rigor Mortis

I rather hesitate to mention newsletters again. No sooner was the ink dry on my last two recommendations than both went into terminal interrupt mode.

There being no shortage of punters ready to lose their entire wardrobes in publishing, allow me to introduce Michael Flusky and *Software Brief-In.* Issue Number One of this eight pager deals with such topies as the current legal status of software copyright. There are also reviews of three word processing packages and a roundup of software news. Subscriptions cost £3.50 for 10 issues, from 7 Banstead Road, Purley, Surrey.

Michael Commendal, ex-editor of an American micro magazine has also invested his life savings in a newsletter. This one is called *Programmer,* has 12 pages and costs $13 for 6 issues from P.O. Box 3210, Manchester, N.H. 03105, USA. It seems to be aimed at those who make their living from program royalties, an occupation that must enjoy about the same degree of financial security as newsletter publishing.

Cheapest Daisywheel

Daisywheel printers – they are the ones that produce typewriter quality printing – have always been expensive. A press release announcing a Triumph Adler daisywheel for £695, arrived on my desk with a scribbled note from the Editor asking "Is this true?"

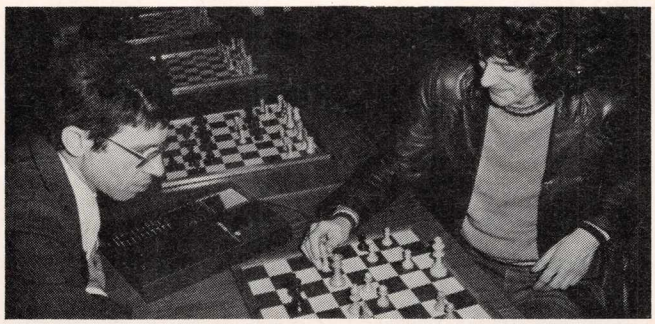
Yes, say the distributors, Butel-Comco of Garrick Industrial Estate, Hendon, London. Which must make it the cheapest on the market. Unless, of course, you know different.....

Chess playing Monkeys

The computer's reputation as the dumpkopf of the chess world took rather a dent last month when a new British designed machine made monkeys out of a number of the worlds top players.

Monkey Number One is the leading Soviet chess problem expert, L. Zagornjko, who won first prize in an important competition by composing a famous problem to which none of the judges could offer a solution other than Zagornjko's own. The rules require that a winning problem admits of only one solution.

To the embarrassment of all concerned the *Chess Champion*



Mark V has now come up with two more solutions to the Zagornjko problem during the course of man-vs-machine contest with Monkey Number Two, International Master, Dr. John Nunn. That's him on the right with a red face.

SciSys who market the Chess Champion (£279 inc. VAT) aren't saying who programmed it, but I rather suspect that David Levy (pictured left) knows something about it. He is the International Master who, in 1969, took – and won – a bet that no computer could beat him in the next ten years.

SciSys haven't been overly forthcoming about the machine itself either. The Chess Champion V's success – it *is* the current champion in the 'commercially available' class – may however also owe something to the 48K bytes it has to run in. An unusual feature is its ability to retain moves made in the game being played after it has been disconnected from the mains.

I need hardly add that it made a monkey out of me in no time flat.

by Julian Allason

Beware of the 'Fuzz'

Peter Laurie is man with a problem. He, Prof. Frank Knowles, and Anthony Macilwaine have come up with a revolutionary software product. But being Editor of a journal that styles itself 'Britain's leading microcomputer magazine' (all right: it's Practical Computing – although we don't concede the description) he can't very well be seen pushing his own products. I practically had to beg him to send me details.

The product in question is *Superfile*, and as I said it is revolutionary. Why? Fuzzy matching principally.

Perhaps I had better start at the beginning. *Superfile* is a database management system for micros. Nothing new in that? You'd be wrong, because the one thing the database management experts of my acquaintance agree upon is that none of the current crop of micro databases are worthy of the name.

Superfile is a very different cup of tea. It is extremely simple, very fast, and quite big: a hard disk system running under CP/M 2.2 can handle 15,000 documents, each containing 100 words or figures. You don't, of course, need a hard disk if your requirements are more modest.

It is also pretty efficient, there being no restriction on the size or type of information fields. If a surname is just three letters short, *Superfile* will accept it without wasting space.

The structure of the records seems to be completely flexible, so if you want to add new useful information even if the need to was unforeseen when the database was set up, you can.

Best of all, there's fuzzy matching. That means that if a Dr. Osborne rings up and you want to find his record, the fuzzy matching mode allows a search for Osborn, Osbourne, even Ozborn. It will bring back the details of anyone who *sounds* like the name you asked for.

Superfile costs £175 from Laurie at Southdata Ltd., 10 Barley Mow Passage, London W.4. They also do a CP/M Spelling Corrector program for £95, which unlike others on the market, spells in *English* rather than American.

Trouble at t'Beeb

It is true. There really is no business like show business, and with the BBC Computer Literacy Project now well under way, it is interesting to watch the speed with which the organism grows. The number of associated companies and individuals involved increases daily.

Ian McNaught-Davis and Chris Serle presenting THE COMPUTER PROGRAMME

There's BBC Enterprises who market the BBC machine, BBC Publications who sell the book, the National Extension College who run the 30-hour BASIC course, and, of course, Acorn, who designed the computer. Not to mention Telesoftware project managers and local support networks too numerous to mention.

So impressive is the machine (see our feature, this issue) and the organisational machinery surrounding it that it's all too easy to get caught up in the tide of euphoria that has already engulfed the above named participants.

What's rather more interesting is how this situation arose. It seems to have started two years ago with the suggestion that the BBC might actively assist in the aim of increasing public computer literacy. Plans were drawn up for a series of programmes that would teach BASIC computer programming.

The problem of course was which BASIC? The BBC's conclusion was that the best policy was to opt for one that was (1) fairly standard and (2) powerful enough to cope with high-level colour and sound commands. And since there wasn't a British machine around that fitted the bill, the Beeb decided to specify a design of their own.

There then followed several months of design work, tendering and heated arguments with rival manufacturers. After a false start, the final choice was for a system based on a machine which Acorn Microcomputers had "nearly ready" for market. It is that, with only minor modifications, which is now being sold as the BBC Model A and B computers.

And very sophisticated machines they are, too – as you will read in Tommy's evaluation later in this issue.

In the intervening two years the concept of the T.V. programmes changed dramatically as the first showings revealed.

The aim of the series is no longer to teach BASIC. Indeed, if it is BASIC you are after, you will need the '30 hour BASIC' book and correspondence course offered by the National Extension College. Instead the TV series sets out to provide a general introduction to the world of computers.

True, potential applications of computers are illustrated with the aid of a BBC machine – but with the BASIC tutorial now axed – one can't help wondering if the computer is really justified as a BBC product. It is certainly true that they have created an excellent machine, but by all accounts, Acorn would have brought it to market on their own.

So with the pot of gold now firmly in the hands of BBC Enterprises rather than T.V. Centre, the rumblings have started.

The BBC, so beloved by the British populace for its integrity and independence, is governed by a charter, which covers amongst other things, the marketing of associated products: The Book of the Film, The Record of the Theme Music, and so on. That charter expressly prohibits the making of programmes that promote peripheral products.

From what I hear, this particular affray may rumble on for some time to come.

It can send you blind

Computer games are bad for you. What's more they are undermining our heritage, according to the Council for the Preservation of Rural England who object to the Space Invasion of rustic pubs.

The Association of Technical and Managerial Staffs reckon that being very close to a computer screen constitutes a health risk. And the Noise Abatement Society's views on the subject have no place in a family magazine.

To make matters worse Thorn/EMI, that pillar of the electronic establishment have gone and converted the few remaining traditional pastimes – Cribbage, Dominoes, Snooker, Billiards, and, yes, Darts – into programs for the Atari computers, with VIC versions to follow.

At £20 each (that's cassette not cartridge) they aren't cheap, but the quality of sound, graphics and game interaction is superb.

Atari 400 – now enhanced by more high-quality games

Tommy, who boasts his own billiards table, is a trifle sceptical of the rules as implemented in their snooker game. But then no one in their right mind would take on Tommy, who in defeat has been known to clear a crowded bar with his cue.

The jigsaw program's quite good too. And safer.

HOTLINE

Who shot TI?

The TI 99/4A with typewriter keyboard and improved design.

So far, in the great microcomputer race, the Texas Instruments TI99/4A Home Computer has been firmly placed in the Also Ran category. Yet in our recent comparative survey of microcomputers (*Which Home Computer?* February 1982) – which, incidentally, has already caused more than a few raised eyebrows – the TI scored consistently high in all categories. So why hasn't it been a roaring success?

First, a history lesson. The TI 99/4 was introduced into this country around 18 months ago as a microcomputer designed specifically for the home. It was supported even from the earliest days by a range of high-quality plug-in program cartridges. And for once, the manufacturers didn't pretend that their machine was equally suitable for business.

But there was a snag. According to one school of thought the Texas giant ran into technical difficulties. The alternative version is that it decided that the European market simply didn't justify the development costs of producing a customised machine.

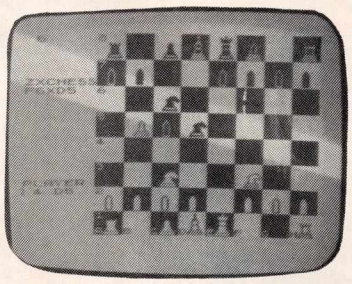
Either way, incompatible T.V. standards were the root of the problem. While American T.V. sets work on a colour system called NTSC (often described as Never The Same Colour), most European systems are PAL (naturally the French are different). The result was that a low-cost microcomputer had to be sold with a not-so-low-cost American standard monitor. Total bill £1,000. Total sales? Texas prefer to draw a veil over the subject.

In September of last year, TI's computers informed them that they were in an ongoing marginal overseas sales situation, and a PAL version was finally released, only to be rendered obsolete almost immediately by the improved 99/4A.

The improvements included a proper typewriter keyboard, upper and lower case text on screen – and sound that came out of the T.V. speaker. The 99/4A now costs £299.95 and plugs directly into your own T.V. A wide variety of peripherals are available, including a 200 word speech synthesiser (very good speech quality). Solid-state software ranges from Household Money Management to Electrical Engineering, with many a game in between.

According to Nick Hills of TI, the company is still battling against public opinion. "Our initial growth was stunted by the need for the US monitor," he says, "and the TI machine is still remembered for that."

But with the 99/4A currently being test marketed by Boots, Rumbelows, Argos, Comet and Kays, that situation looks set to change.



ZX CHESS. *I know. I didn't believe it either. But here are the pictures to prove it. The pieces are normally represented by letters, K for King, R for Rook and so on. But if you add the Quicksilva graphics board you can have pretty graphics too.*

Author Richard Turner tells me that ***ZX Chess II*** *has a rating of 110 on level 3 at his local club. It costs £15 from Artic Computing, 396 Reckitt Avenue, Hull, North Humberside.*

ZX Joy

The most vehement criticism I hear is invariable directed at the Sinclair ZX81's keyboard, a flat touch-sensitive sheet of mylar on which the keys are printed. Which is curious since few of the complainants are more than two-fingered typists.

Mind you, a lot of ZX81 owners are playing games these days and it *is* frustrating (not to mention dangerous) to be scrabbling around for the 'Fire' button when the alien ship moves into view.

Now Sinclair owners need suffer intergalatic zap no longer. MicroGen have come up with a joystick that connects between the ZX81 and the 16K expansion RAM pack. To use it, a short PEEK routine is added to BASIC programs.

£30 buys you the controller board plus one joystick. A second one can be added upon payment of £9.95. At present the board lacks any casing, but MicroGen plan to offer one in due course.

They will also be marketing Space Invader and Breakout games which use the joystick.

Details from 24 Agar Crescent, Bracknell, Berks. Tel. 0344 27317.

How big is big? *ITT must qualify whichever way you define the term. So the trade held its breath last month when the electronics giant whipped the veils away from its new mystery micro.*

Having previously marketted a badge engineered Apple II as the ITT 2020, until a little misunderstanding with Apple put paid to the arrangement, ITT were expected to reveal something rather special.

Instead the eager hacks found themselves confronting what one distinguished reviewer described as "the identikit 1981 machine". He was referring to the well tried combination of Z80A central processor, 64K bytes of RAM, 80 characters x 24 lines screen format and twin 280K disk drives, running under the CP/M operating system. Word processing and database packages are also thrown in for the £2,500 it will retail at when it goes on sale next month.

"A year ago I would have been over the moon" one dealer commented, "but today it all looks a bit old hat."

But I wonder. ITT is after all a company with a certain amount of financial muscle, and these days it is marketing and money that count at least as much as state-of-the-art technology.

Further enquiry suggests that the trade would be making a mistake to write the ITT 3030 off too soon. It is clearly a workmanlike machine and the design is modular. That means the Z-80A could be swapped for the bit Intel 8086 CPU and associated firmware. Other optional upgrades promised include 512 x 512 dot high resolution graphics, double density disk drives offering 1120K bytes of online storage, and an interface card for one or two 5¼" Seagate/Honeywell hard disk drives, providing either 5 or 10 megabytes capacity.

To my mind a bigger question mark hangs over ITT's distribution. Dealers who signed up for the ITT 2020 (the Apple look-alike) have deserted in drives to Apple. ITT are dismissive. "We are not interested in people who sell computers to enthusiasts; the new 3030 is a business system and will be sold by business dealers" say the Consumer Products Division.

Prospective business dealers may find, however, that ITT are actually in competition with them. The Business Systems Group having earmarked "big users" as its territory.

Which brings me back to the question with which I started: How big is big?

by Julian Allason

Into Orbit

The prepackaged software industry seems to be suffering a growing credibility problem.

Last month over a hundred press releases landed on my bed (traditional working place of the hard working hack), each of them announcing the launch of a radically new, vastly superior business software package.

What they also have in common is a slavish adherence to the time-worn principles and procedures of data processing, i.e. mini computers and upwards.

Worse – they all suffer from what Americans term the Not Invented Here syndrome. Rather than make use of someone else's well-thought-out screen format or command syntax, they invariably feel the need to redesign the concept from scratch – thereby eliminating any possibility of establishing standards.

But my attention *was* caught recently by word of a new package called *Orbit*, not least because the authors, Vlasak, had relinquished their business of selling Apples, to market the package full time.

Orbit is a suite of commercial programs comprising Stock Control, Sales and Purchase Ledgers, Invoicing, and General Ledger, which can be integrated together. That is to say, the raising of an invoice also updates the stock level for the appropriate lines, and makes the necessary entries in the Sales and General Ledgers. It runs on any Apple kit.

Nothing new so far – except perhaps the word *any*, since it covers both Apple II and the new Apple III, *any* printer you care to mention, and *any* configuration of disks. That includes the small 5" disks, twin 8" jobs yielding 2.4 megabytes, even one or more of the new Profile Hard Disk units for Apple III. Vlasak have genuinely attempted to cater for all possible future expansion and, should you choose to upgrade your hardware at a later date, it is not necessary to re-enter existing information.

Orbit runs on both the long-toothed Apple II and new Apple III with Profile Hard Disk (right).

Furthermore, *Orbit* is designed to make use of multi-user configurations as and when they become available for Apple disks, with the requisite security controls already built-in. This approach should help to allay the fears of the buyer, worried about his software becoming obsolete.

The package itself is configurable, which is to say that when each package is installed, it is configured to the customer's requirements and hardware according to the answers given to a series of questions. These include accounting periods used, name of the company to be shown on each statement, and so forth.

In operation, each program shows a high degree of user-friendliness with all inputs properly validated and protected against illegal responses, and with on-screen references pointing to the page in the instruction manual should you get stuck.

One facility, known as 'partitioning', allows you to assign a reference code of your own design to every transaction handled by the system. As it is possible to divide this code up into partitions designated perhaps as Salesman, Division and Product Group, it becomes possible to perform fairly complex and valuable analyses of your company's trading. Indeed, should you feel the need to enhance this feature, or tie it in to your own database, Vlasak will supply a 'toolkit' of information and routines with which to access the files of data, directly.

There are two features which must be unique, and they relate to security, both to preserve the integrity of your information and to guard against mishaps or fraud. As we noted in the January issue *(How to Buy a Business System)*, such controls are sadly lacking in most commercial packages.

The first is a User Access Table. Each person who is to use the system must have their name and a unique password entered into this table. In addition, it must be specified precisely what each person is and is not to do. For example: Chloe the Clerk may enter an invoice and print out a statement but is not permitted to make adjustments. Higher up the scale, Alec the Accountant may print out reports/daybooks and alter account details, whilst only the Financial Controller can get access to the Final Accounts. At the top of the heap is a System Manager (who may even be the dealer) who is the only person allowed to re-configure the system, or make alterations to the user table.

Secondly, an internal function within the *Orbit* system keeps permanent track of everyone who logs on to the system, and what functions they perform. This historical record – which again can only be viewed by those with appropriate authority – is an excellent guard against fraud, and is also helpful to the dealer in analysing what has happened should the system apparently fail.

All in all, a very carefully thought out package, but what are the limitations? The only one I have been able to identify is the problem of Backup – making copies of your vital data to protect against data corruption or hardware failure. In this respect, *Orbit* is no worse than any other package, but I am surprised to find that it is no better.

Making daily backups is an essential, if annoying, discipline if you value the information on your system, and Vlasak say that their dealer training puts very strong emphasis on making customers aware of this.

But even the most disciplined of us would be inclined to overlook the process when time is short. My criticism is that *Orbit* contains no routines to remind you, force you or even check up on whether you have indeed made backups. All of this is a simple matter in programming terms.

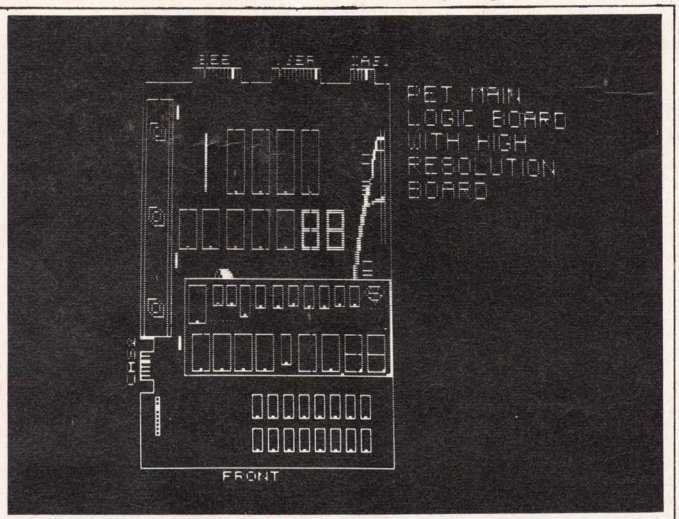
There is a further problem connected with backup, which really is the fault of the hardware. The major drawback of Winchester disks is the lack of any suitable backup medium; Apple's Profile is no exception. Vlasak say the solution is to backup onto a second Profile unit, though I somehow doubt that many people will be prepared to shell out another £2,200 just for this purpose.

The alternative is to backup onto floppy disk but this takes, wait for it, *thirty five* disks each time – or at least forty minutes at the end of each day.

This process would be so prone to operator error and recording irregularities that the whole method must be in doubt.

The software suppliers would seem to be in something of a no-win situation on this score, and the onus is now on the hardware manufacturers to provide the solution.

Orbit is without doubt a major step forward in business software and as such will do a great deal to improve the credibility of the micro for business use. For once the authors have thought several years ahead, and have approached the design from the outside in.



How better to demonstrate a high resolution graphics board than with an illustration of same? Supersoft's new HR-40 fits inside 3000 series PETs; there is also a version for Fat-40 models. Price? £149 + VAT from Supersoft, 10-14 Canning Road, Wealdstone, Harrow, Middx. Note the different sizes of the character fonts – and the sideways lettering.

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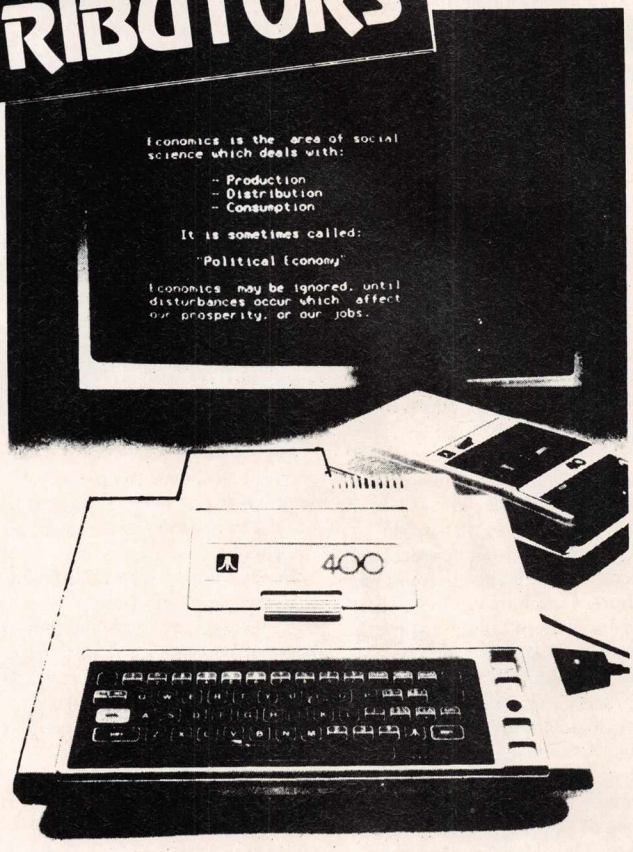

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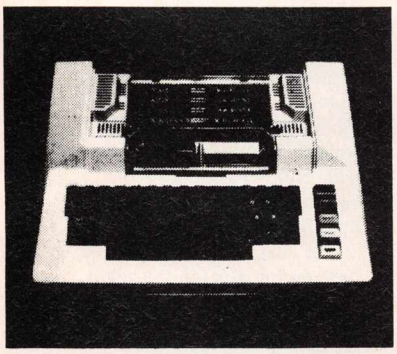

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*

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*

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Silicon Chip

Both shops are open for full demonstrations. Software is in cassette form or ROM modules. Also plug-in cartridges with higher resolution graphics than APPLE.
Compute magazine available at £2.25 per month.

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There was once a Chinese Emperor who was very fond of games – so much so that his economy was practically run on 'game theory' and his politics on the 'theory of probability'. Promotion in the army depended on one's skill at chess and the most important Court Official was the Imperial Games Master. But it was at social functions that this pre-occupation really became nasty. Imperial party games became – literally – a matter of life or death. Once the rules were explained – as time went on the games became progressively more complicated – the poor wretched guests would nervously start to play. The secret for success was to play well enough to impress the Emperor but not well enough to beat him because this would result in a severe ticking off. In other words their heads would be removed. Losers would suffer the relative indignity of a loss of face rather than a loss of anything else but consistent losers would never be invited to the Palace again. This might not seem such a bad thing but they would also have all their lands and possessions removed!

Tortuous exercise

I don't know if guests to my dinner parties in darkest Twickenham feel quite so threatened, but I certainly get some odd reactions when I phone them up to play a game of 'UK Politics 1984' or 'Waterloo' or some other tortuous exercise. "Oh a games party? What sort of games? I see.... well I'm not sure I'm very good at games really."

Must you be an expert programmer?

I don't have any professional background in computing. My programming knowledge dates from the acquisition of the PET some four years ago and I learnt both from books as well as my own mistakes. Most of my programming is in BASIC but I do occasionally dabble in machine code sub-routines to save program execution time. I have always been more interested in games and 'game theory' than computing. I will admit, however, that computing has become a total addiction. Just ask my wife.

What they're actually saying is they don't want to make fools of themselves. And more to the point, nobody likes to lose at ANYTHING if there are witnesses. In our house even a game of 'Monopoly' can become a trial of strength and games like 'Diplomacy' can break up friendships quite easily. The thing which frightens most newcomers is the presence of a PET computer. People are threatened by the unfamiliar and feel (with no justification) that the machine gives the home team – that's me – an advantage.

What equipment is needed?

Not a lot. I have a faithful old PET which was one of the very first to arrive in the U.K. (old ROMs, integral cassette, upgraded from 8K RAM to 32K RAM). Disks are not essential for my simulations since all the programs and data are stored in RAM. I also use a Commodore printer and a Sound Box. A useful addition would be a UHF Modulator and a large TV display so all the players can see what is on the screen without craning their necks!

"But that's unfair" they cry, "you programmed it so you know how to beat us!" This is simply not true. All the games that we play with the micro really depend on people and their reactions to each other. The very fact that I appear to know more about computers than they do – plus the fact that I have invented the games themselves – means that all the other players inevitably 'gang up' against me and I will stand no chance at all. This happens with such monotonous regularity that I now act as a sort of Imperial games master. This has several advantages. On one occasion I was successfully bribed by two participants to offer advice (cheap at the price) and on another occasion I was the only person sufficiently relaxed to drink all the wine and enjoy the meal!

New technology

You might well ask why anyone bothers to turn up at all if the entire evening becomes so fraught ... a sort of 'Ordeal by Dinner Party'. Perhaps all my friends are perverse in a masochistic way (if they're reading this then apologies!) I prefer to think it's because my wife is an excellent cook. Whatever the reasons, they DO turn up and we – mostly – have stayed friends afterwards. So what are these games and what does the computer do! I had better explain...

The first thing is that all the games are designed for the micro. I know it's quite possible to write programs for a computer to play 'Risk' or even 'Snakes and Ladders' but existing board games have survived for many years without such technical help, and in my experience, the computer tends to 'get in the way' of the game. Besides, 'Monopoly' on a small screen is a bore. New technology requires a new approach.

The second thing to remember is the whole aim of playing collective games. As I said earlier, the fun (if that's the right word) and the challenge come from the other participants. Games are about people and NOT machines. A bunch of humans staring blearily at a V.D.U. does not make for a good game. The excitement of playing on a machine so becomes a cross-eyed chore if the game can be better played across a table where everyone can see and talk to everyone else.

Strategic position

Several of my games therefore feature a real board or map on a table with the computer looking on from the sidelines. Any moves made on the table are logged into the computer so the machine knows what's going on. It's far more satisfying to move your block of wood, brass counter or model soldier physically across the table and plonk it down with a menacing thud in a suitably strategic position. Presentation is important. With a little imagination – and very little cash – you can make the playing area attractive for the participants. Stretches of dyed green cotton wool do wonders for landscapes in war games. I never use tiny cardboard bits for markers; ends of wooden dowels suitably sawn up and varnished give the game a lot more authority. The other advantage is clarity. People can see the whole game layout at a glance and don't have to peer at a small glowing screen.

For example, there is one war game I play called 'Invasion' where 5-6 players each control NATO divisions. The map is a green baize cloth covered in 185 large hexagonals. Each hex has a number on it to make the job of computer input easier. The object is for the participants to help each other to stop a Warsaw Pact invasion of Western Europe. The computer plays the Soviet Union and also prints out combat results and news reports. The great advantage of having a computer is to work out the intricate mathematics of modern combat without recourse to charts, tables and dice rolling. Also the enemy only discloses the whereabouts of its forces as they are 'found' by the NATO players.

Soviet silicon chip

This makes for a far more realistic game as the table display doesn't necessarily give the complete picture. Furthermore, all the players distrust the computer and so, by making the machine their enemy, they

Humphrey Walwyn is a man who plays VERY

genuinely tend to fight the Soviet silicon chip. I have of course programmed it to make life pretty hard for the players involved and if the tide of red blocks reaches, say, Amsterdam, tempers fly. The point is that unless they work together there is very little hope of their winning. "Why didn't you support me?" is a favourite cry. As Armageddon approaches, you soon discover who your friends are.

One player – who is a military man in real life – once sacrificed the entire Belgian army to safeguard the Northern flank. "I'm only looking after my own interests" he remarked. I like to think that some of my simulations have no bearing on real life, but I'm not sure. It's easier to contemplate the destruction of half of Europe over a bottle of wine!

Devising your own simulations

As I have said repeatedly in this article, games are about people. And people don't always trust or even like computers. Think of your game or simulation FIRST. Don't even begin to program until the game makes sense as an interactive exercise. Once you know what the basic rules are and the object of the game (e.g. is it to make more money than anyone else or does the winner simply have to survive?), then you will know what the role of the computer is. Make the rules SIMPLE. If it takes half an hour to explain to everyone what they're supposed to do, they'll lose interest. Lastly, always remember that people are fallible and will therefore make input typing errors (build in a number of fail-safe checks) and – no matter what they say – a surprising number of people will try to cheat. I use a second array of strings tied to each player's name that contains a password only known to that player so it's not possible to input someone else's moves!

Socialists v. Thatcherites

On a less military but even more acrimonious note, there's a game of politics. The board in this case is a line of squares up and down which you move to show your political leanings. If you're over to the left you're a socialist and to the right you're a Thatcherite. Opposite each square are parliamentary constituencies which broadly respond to the political placing of your marker. The object is to win the election by trying to please as many constituencies as you can. The computer is the electorate and is informed of each move by each player as they scurry across the board. When election time arrives, the micro becomes a sort of TV 'election night special' with results and all voting figures (complete with a flashing CHANGE sign when an MP is displaced). Players may join each others' parties or set up their own party or do nothing and have a drink.

This game – which we have now played many times, and is the most successful of the lot – is definitely NOT for the faint hearted. I did at one time let players choose real parties and express genuine political views. This led to two broken glasses and several people leaving 'rather early'. I now play with each player posing as an animal. We have brass horses, owls, dogs and others, and although some players still react in an animal fashion (!), I find that the game becomes more enjoyable when they don't have to put over real political views. If times get tough, you can always point out that they were bound to lose with a rabbit as Prime Minister!

Professional interest

No one likes to lose, however, and the most common losers tend to be those with some professional interest in the subject being played. Inevitably in this game it is the quiet man from the bank or the drama secretary who will win. The politician guest won't get a chance. In a way it's like the guests' antipathy towards me – the games organiser. In a political game, they get distrustful of real political experts and freeze them out of the action. Could there be a lesson there that non-professionals make the best politicians?

I don't know but, from the number of times we've played the game, I offer the following pointers for success:

1. The party that splits up always comes off worst.
2. The party that steers for the middle ground between hard left and far right will always win if given enough momentum (SDP please note).
3. If in doubt do nothing. The electorate distrusts political fidgeting about.

We did have a local politician once who succeeded in doing very well. I then discovered he'd been bribing fellow contestants to vote for him. His animal was a lizard ... he was rather embarrassed about it all and retired to drink his coffee in peace!

Radio stations

The worst occasion of professional ineptitude occurred during a game of 'Radiomania'. In this game 10-12 players form their own radio stations and attempt to capture the largest audience. The computer asks them for their operational budgets, their media programme policy, the station's location and their 'star' presenters on the air (that's if you have enough money to have David Frost present your breakfast show!) When everyone has told the computer what they want, the machine prints out how many people would be listening to you. Surprise, surprise ... out of a room full of media and broadcasting people, the only two clear winners were a literary agent and a housewife.

"Computer error," I shouted and hastily did a bit of re-programming. But then they both immediately repeated their success and completely wiped the board.

I'm therefore rapidly coming to the conclusion that in order to be good at something, it's better to know nothing about it at all. Tomorrow I shall burn all my computer textbooks and microprocessor manuals. That way I shall become a truly excellent computer programmer.

Of course it's only a game, but .....

How to write the program

Before you do anything else, think out your game. Let's take a simplified example: imagine 4-6 players posing as rival companies supplying and selling energy to the U.K. The object, say, is to build and develop energy "factories" and make more money than anyone else. Once you've worked out all the rules and how the game will be played, then start to program. I always start by defining what I want out of the machine first. Let's say that energy will be measured in Kilowatt/hours. Each player will need the following variables: his name, a fail-safe code, the amount of money he has, and the total amount of energy in KWH he is producing. Each "factory" will need the following variables: who owns it, where it is, what sort of plant it is (wind, water, tide, solar, nuclear, etc.), it's stage of development, its efficiency (% KWH/potential KWH), its cost, its potential for maximum KWH, its life time in years, etc...

Write all these down and then make a separate list of outside factors which may affect any of these variables. For example, weather, rising costs, National energy requirements over the next ten years and many more. Now comes the fun part .... start at the end and work backwards.

* Who has won? The player with the most money.
* Who has the most money? The player who produces the cheapest energy in sufficient quantities.
* How much energy is each player producing? Each factory: Efficiency x Potential/Adverse weather (if applicable) etc.
* How much is this energy costing each player? Running costs plus development costs (if in remote place), cost of connection to the grid.
* What affects running costs? And so on.
* What types of energy cost more to develop? How long does it take to develop?

All the facts you will need are available in your local reference library. I spend hours there before even sitting at the PET. "If in doubt, leave it out" is a good rule. Simplicity and moderate accuracy are vastly preferable to complexity and total un-playability. Not even the highly complex Treasury computer can apparently solve the country's financial problems, so what chance have you got on a micro?

Have fun doing it. If you get a buzz out of it, then the chances are your guests will too!

SERIOUS GAMES

TOMMY'S TIPS

Scrolling down

I have had an interesting tip from Adam Gawne-Cain of Oxford. He has found a way to make the screen of a 3000 series PET scroll downwards. I am sure that all 40-column PET users are familiar with the fact that when you use the INSERT key to extend a program line over 40 characters when editing, the lower part of the screen scrolls down a line to make room for the new, longer line. Adam's program makes use of this in an original way.

```
1000 S$=CHR$(148)+CHR$(19)+CHR$(19) : REM HOME
+ TWO INSERTS
1010 PRINT CHR$(148);TAB(38);CHR$(160):PRINTS$
1020 POKE 225,128 : GOTO1010
```

Line 1010 prints a 'shifted space' character near the end of the top line of the screen, which should be blank for the best effect. The string S$ contains a 'HOME' character and two INSERTs, which, when printed, push the shifted-space onto the next line, so BASIC makes the top line 80 characters long, and pushes the rest of the screen down one line. Line 1020 resets the top line to 40 characters.

FOR Fixation

One problem I quite often see when reading programs written by beginners is a fixation with the FOR-loop. Some programmers seem to be extremely anxious to use the FOR-loop at every possible opportunity. For example, suppose I want to print a string, A$, and then underline it with a row of asterisks. This is how it should NOT be done:

```
100 PRINT A$
110 FOR I=1 TO LEN(A$)
120 PRINT "*"
130 NEXT
```

A much more efficient method is this:

```
100 B$="******************************"
110 PRINT A$
120 PRINT LEFT$(A$,LEN(A$))
```

Line 120 will select the right number of asterisks from the string B$, depending on the length of A$. You should be careful that B$ is long enough to cope with the longest possible string in A$.

This technique of printing part of a string of characters using LEFT$ can be used in a great many ways. You can position the cursor on a particular line by setting up a string A$ consisting of a HOME character and 24 cursor down characters. To move the cursor to line 15, just print LEFT$(A$,15). Similarly, if you have a string of 80 spaces called SP$, this finds many uses when printing data, for 'padding' strings to separate columns, say or to blank out a message on the screen. Have a look at your latest program and see if you can make it a little bit faster by using this technique.

From whence called...

Dear Tommy,
I have an Apple and have been furiously beavering away trying to learn some advanced programming techniques. One tip I would love to have is this. I have a program containing a subroutine which is called from several points in the program. Is there any way I can find out the line which called the subroutine?
J. Gregory

The best way to do this is to have a variable, say LN, which holds the line number, and set this variable each time you call the subroutine:

```
100 LN=100 : GOSUB 1000
200 LN=200 : GOSUB 1000
300 END
1000 PRINT LN
1010 RETURN
```

You could write an assembler routine to PEEK at the stack, where the line number is held, but it really is not worth the effort.

An imperfect match

Dear Tommy,
I notice that some sophisticated business programs allow you to do special types of string matching, such that JO?ES will find JONES and JOKES but not JIBES. I would like to incorporate this into one of my programs but I have no idea where to start. Can you help me in this please?
P. Davenport

Try this subroutine, which compares two strings, A$ and B$ The variable M is set to one if a match is found, otherwise it is set to zero:

```
1000 IF LEN(A$)<>LEN(B$) THEN M=0 : RETURN
1010 IF A$ = B$ THEN M=1 :RETURN
1020 FOR I=1 TO LEN (A$)
1030 X$=MID$(A$,I,1) : Y$=MID$(B$,I,1)
1040 IF X$=Y$ THEN 1070
1050 IF X$="?" OR Y$="?" THEN 1070
1060 M=0 : RETURN
1070 NEXT : M=1 : RETURN
```

BASIC Restoration

Dear Tommy,
I do not really understand the need for the RESTORE statement when using DATA in a BASIC program. Also, is it possible to have several sets of DATA statements in a program and select which one applies at the start of a run?
R. Clarke

I must admit the RESTORE facility is not one I tend to use very much! The idea is that you can read all the DATA statements somewhere in your program, and then after using RESTORE you can read them all again. However, what I tend to do with DATA is to read it all into an array at the start of my program run, and then I can read it as many times as I want, forwards or backwards, or taking every third element as I please. As for 'selecting' DATA statements, this would in fact be one way of doing it. Say you have 4 sets of data, each set consisting of 10 elements. You could read the data into a 2-dimensional array, and by selecting one of the 4 rows of the array, select your data:

```
10 DIM A(4,10)
20 FOR I=1 TO 4 : FOR J=1 TO 10
30 READ A(I,J)
40 NEXT : NEXT
100 INPUT "SELECT DATA SET";DS
110 FOR I=1 TO 10
120 PRINT A(DS,I)
130 NEXT
```

This method has the advantage of flexibility in that if DS is

calculated by the program somewhere, because of a bug it may be incorrect. However, you can always change the value of DS as a direct statement as part of your debugging without restarting the program. Another way of selecting a set of data is to do some dummy READs to skip over unwanted data until you come to some you want:

```
10 INPUT "SELECT DATA SET";DS
20 FOR I=1 TO 10*(DS-1) : REM SKIP UNWANTED DATA
30 READ A
40 NEXT
100 FOR I=1 TO 10 : REM PRINT WANTED DATA
110 READ A : PRINT A
120 NEXT
```

Underlinings

Dear Tommy,
I am experimenting with a daisywheel printer on my PET 3032, but I am having difficulty with the underline character, CHR$(95), which always prints a line below where I want it. Is there a way of underlining text without having to invest in a word processor?
V. Hill

The problem here is that normally, when you print a line, the PET sends a carriage return and line feed to the printer, which feeds it onto the next line. You will need to consult your printer manual for a control character which will perform a carriage return without advancing the paper. CHR$(13) is the standard, provided your printer does not have 'Automatic Line Feed', which always performs a line feed after a carriage return. Assuming that CHR$(13) will do the trick, then when you want to print a line containing some underlined characters, instead of, say:

```
PRINT#4,PL$
```

we use:

```
PRINT#PL$;CHR$(13);
```

exactly as you do for printing to a disk file. The trailing semicolon means that the PET does not send its normal carriage return and line feed, only the carriage return we are forcing with the CHR$(13). After printing this line, the print head is at the start of the same line. You can now print the required number of spaces and underlines to achieve the effect you want.

This method is also useful for 'overprinting', printing one character over another to get some special effect, or printing a word twice to make it stand out, if your printer cannot do this automatically.

Integer con

Dear Tommy,
I have heard it said that integer variables in Applesoft are a 'con', because they are treated as floating point. Is this true, and if so what is the point? I always use integer variables wherever possible to try to save space, but it seems that I may be wasting my time!
G.M. Burns

I am afraid that you are right. The same is also true of the PET, and VIC, which also have a 'cut-price' Microsoft BASIC, but not some larger machines using a more expensive Microsoft BASIC. When an Apple uses an integer variable, it reserves five bytes in the variable table after the variable name, as for a floating point variable, but three of these are not used. When Applesoft evaluates an expression containing integer variables, it first of all converts them to floating point. This is because the rules for evaluating an expression containing both integer and floating point values get very complicated. To cut a long story short, integer variables take up one byte extra every time they are used (the '%' sign), and are actually slower than floating point variables. The good news relates to integer arrays. Each element of an integer array only takes up two bytes, so you can save memory (if not time) by making larger arrays integer whenever possible.

Loopy loop

Dear Tommy,
After spending a long time trying to find a bug in my latest program, I eventually tracked it down to a FOR-loop which began:

```
FOR I=1 TO N
```

When N=0, the FOR-loop still executes! Is this a bug in BASIC, and if so, is there a way round it?
D. Stimple

This problem is not really a bug, more a limitation of the particular BASIC you are using. Your BASIC only compares I and N when it reaches the corresponding NEXT statement, so whatever value N is the FOR-loop is always executed at least one. The only way round this is to test for N<1 before your FOR-loop:

```
10 IF N<1 THEN 100
20 FOR I=1 TO N
...
80 NEXT
100 ...
```

Infallible memory

Dear Tommy,
With the current popularity of the VIC and ZX81, the computer mags are full of adverts for add-on goodies. Among these are memory units, which are described as either 'static' or 'dynamic' RAM. Is a static RAM one which does not lose its contents when the machine is turned off, and if so, can they be added to other machines, such as the PET or Apple?
P. Hurst

No such luck! A memory which keeps its contents is described as 'non-volatile'; most RAM is most definitely volatile, as those readers with small children are probably aware: What does this plug do, Daddy? *(Reply censored – Ed).* The only way to get non-volatile RAM is to arrange for the RAM chips to take their power supply from a battery which is permanently connected, rather than the normal computer power supply. This is used in the Apple's "CPS Multifunction Card" which, amongst other things, maintains the current date and time, even when the Apple is turned off. But on to your question about static and dynamic RAM. These terms refer to the actual circuitry inside the chip, which is much too complicated to go into here. All the important differences can be summarised in a little table:

STATIC		DYNAMIC
Low	Number of bits on a given area	High
High	Power consumption	Low
Fast	Access Time	Slow ▶

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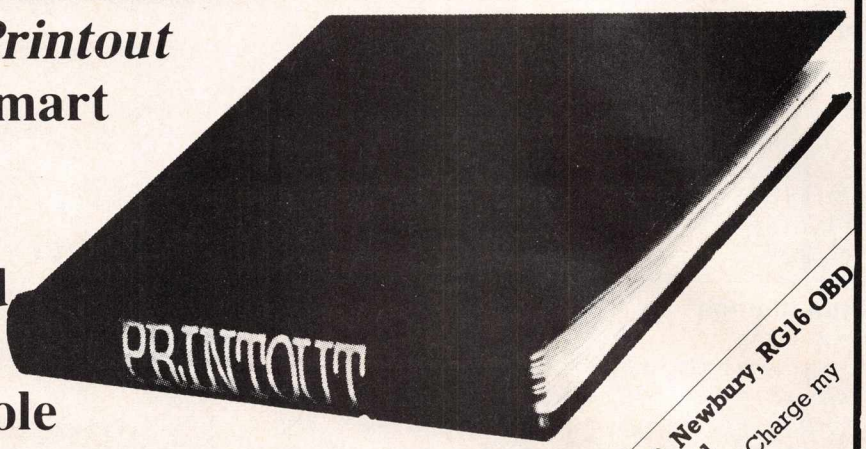

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TOMMY'S TIPS

◀ One drawback of dynamic RAM is that it needs a little extra circuitry to 'refresh' itself, otherwise it starts to forget things. A bit like the Editor, except that he forgets things after he has been 'refreshed'!

Flag day

Dear Tommy,
Could you please explain what a 'flag' is?
M. A. Ramsden

A flag is just a very simple kind of variable, which does not have a range of values: 1,2,3,4, etc., but only two values: YES and NO. It is normally used to pass information between programs, or between a peripheral and a program. For example, a printer connected to a computer may operate several flags inside the computer, such as BUSY, OUT OF PAPER and so on. When the computer sends a character to the printer, it will have to wait until the printer has printed it, printers being slow compared with a computer. To do this, the printer sets the BUSY flag until it is ready for another character. The computer can keep looking at the BUSY flag until it sees that the printer is ready for another character. If you watch athletics on the TV, you will see exactly the same system used by the officials in the relay races. The officials at the far side of the track are too far away to shout to the starter, so they wave a flag at him when all their athletes are ready. When all the flags are up the race can start.

Saucy object code

Dear Tommy,
I thought that the terms source and object code only applied to assembler, but now I see them being used referring to BASIC programs. Can you explain this please?
S. Mooney

These terms are not only applied to assembly language, but also to any compiled language such as PASCAL or FORTRAN. With the recent growth of BASIC compilers, the terms source code, meaning the original text keyed in by the programmer, and object code, which is produced by the assembler or compiler and actually executed by the processor, will be cropping up more and more often.

We apologise for delays...

Dear Tommy,
I have seen a business program that advised you of the likely time involved in a major processing task such as a sort. How can the computer know in advance how long a calculation will take?
F. R. T. Ray

The computer cannot, but the programmer does (or should anyway!) The time taken for a sort, or an operation involving copying a number of records from one disk drive to another can be calculated fairly easily, so it is a simple task, if N records are involved, to write a line which says:

```
10 PRINT "THIS COPY WILL TAKE ";N/200";"MINUTES APPROX"
```

so you see it is all a big fiddle!

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CARING FOR YO

Far too many problems with microcomputer systems – particularly in business applications – arise because the computer has not been properly cared for. The wrong environment or lax operating procedures can play havoc with sensitive devices like floppy disks. Now a new book has been published by microcomputer guru Dr. Rodnay Zaks called "Don't – or How to Care for your Computer" (SYBEX).

The contents cover subjects ranging from Security and Documentation to Printers. While the chapters on Hard Disks and The Computer Room are of more relevance to the minicomputer user, we can well recommend most of the procedures as being suitable for the business microcomputer user.

Here we have published several extracts from the book which you would do well to have pinned up on the wall by your computer.....

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Handling Diskettes

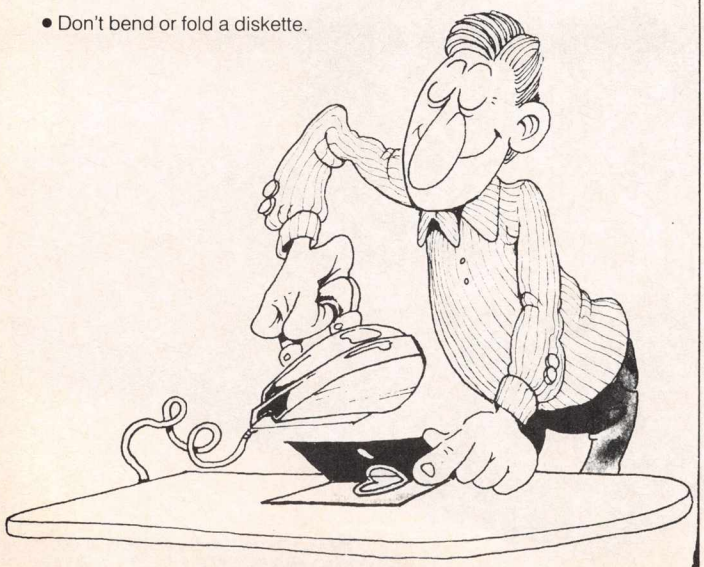
Once you understand the nature of your diskette and are aware of the main dangers, proper diskette handling is quite simple. Most importantly, you must respect the physical and magnetic integrity of your diskette.

Remember the four main characteristics of a diskette:

- It is fragile.
- The data is recorded on a magnetic surface, which is sensitive to electromagnetic fields.
- The magnetic surface is exposed to the environment through the openings in the jacket.
- There is only one correct way to insert a diskette.

Let us examine the rules resulting from these characteristics:

- Respect the physical integrity of a diskette.
- Don't bend or fold a diskette.

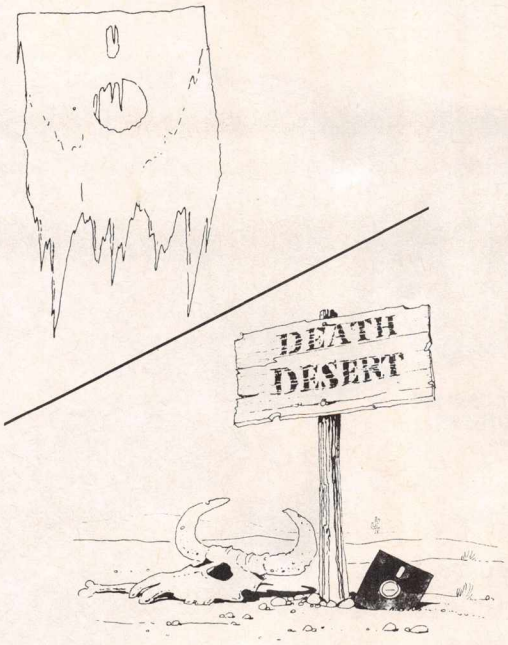


ENVIRONMENT

Diskettes must be used in a proper environment. Here are the main enemies of your diskette:

- temperature extremes
- dust
- liquids and vapors
- electromagentic interference.

Let us examine each of these constraints in turn.



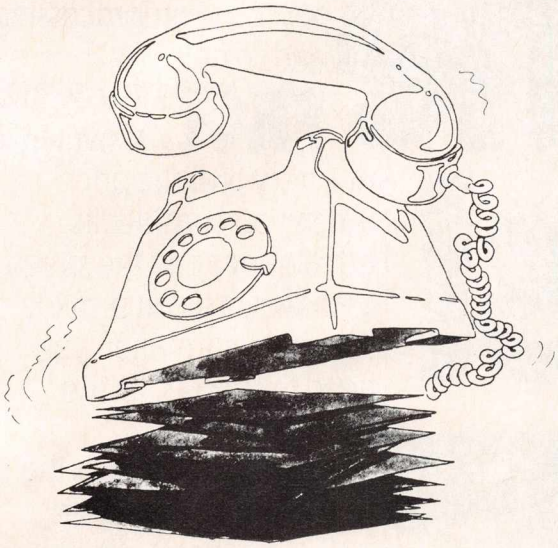
Vapors

Avoid placing solvents close to diskettes as chemical fumes may affect the magnetic coating of a diskette. Dangerous fumes encountered in office environments include fluids for duplicating machines, nail polish, and some adhesives.

UR COMPUTER

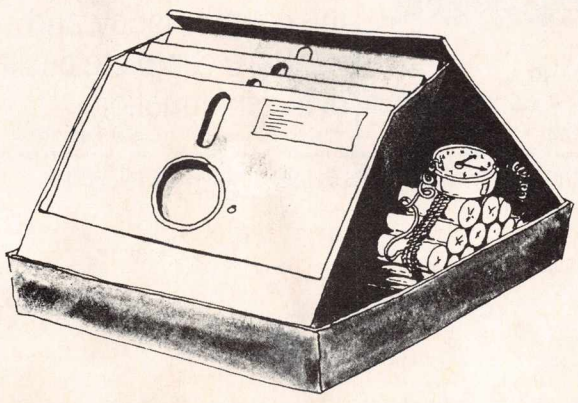
Electrical and Electromagnetic Interference

Electromagnetic interference (EMI) is the name given to electromagnetic radiations that interfere with recorded data. Data can be destroyed or even wiped out entirely if a strong electromagnetic field or electrostatic field is applied to a diskette. Strong electromagnetic radiations are emitted by transformers and coils. A diskette should never be placed in close proximity to a magentic coil (such as those used in telephones) or a degaussing coil (such as those around a color television tube).



DON'T Let Them Lie Around

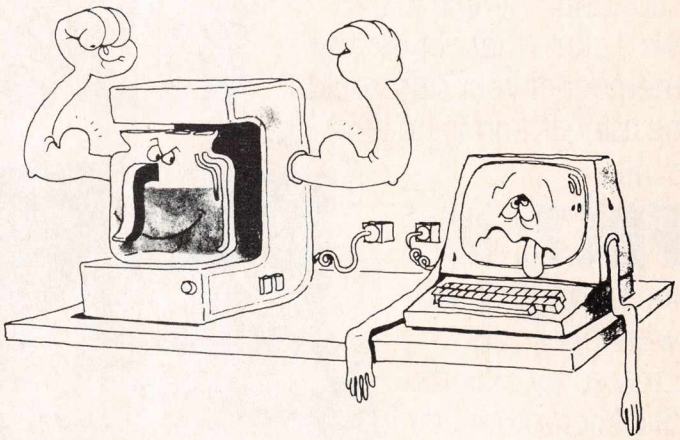
When not in use, a diskette should be stored in a protective envleope and preferably filed away. Leaving a diskette lying flat and unprotected on the top of your computer is an open invitation to disaster. Dust will accumulate on the diskette. Usually, no immediate effect will occur as the dust particles will be captured by the inner lining of the diskette. However, once more dust has accumulated, or pressure is applied to the lining of the disk jacket, one or more specks of dust will scratch the disk surface and damage data. Later on, when the data is used, because it is damaged, it will cause erratic system behavior and there will be no ealsy explanation for this behavior. Again, this is the time bomb effect.



Power Supply

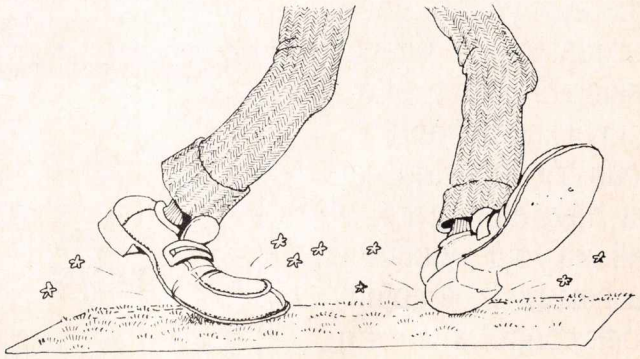
Brownouts. In some areas of the country, "brownouts" are common during period of heavy electrical use. During a brownout, the power company deliberately reduces the line voltage to avoid an overload situation. When this occurs, the voltage may drop by 8% (or even more). This drop will cause a computer failure. When brownouts are a problem, *power conditioners* must be used to restore sufficient voltage.

Short-lived brownouts can also be caused by switching on a powerful device that is connected to the same power line as your computer. This may occur within the computer room itself (for example, when a coffee pot is turned on), within the building itself (for example, when a vacuum clearn is turned on), or sometimes because a large machine is turned on in a nearby building connected to the same power line. The flickering of the lights in the computer room is an obvious indication that a short duration brownout has occurred. Even a short-lived brownout will cause a computer malfunction.



Static. Interference with proper computer operation may also be caused by static electricity. Static electricity will disrupt the operation of any electronic component. On a dry day, 10 steps on a nylon rug can build up from 10,000 to 20,000 volts of static electricity in the body. By simply rising from a chair insulated from the floor (rubber casters), you can generate 10,000 volts. If you build up the voltage and point a finger at a component or a board you may "french fry" the component, i.e., cause its immediate destruction with a static electricity discharge. Touching a key on the keyboard, the frame or any peripheral of the computer, will cause a sufficient discharge to disrupt the computer's operation or even damage the computer permanently. Static electrcity is a serious danger for any computer installation and should be carefully avoided.

We have examined all common electrical and environmental problems along with recommended procedures and precautions. We will now review the equipment available to correct these problems.



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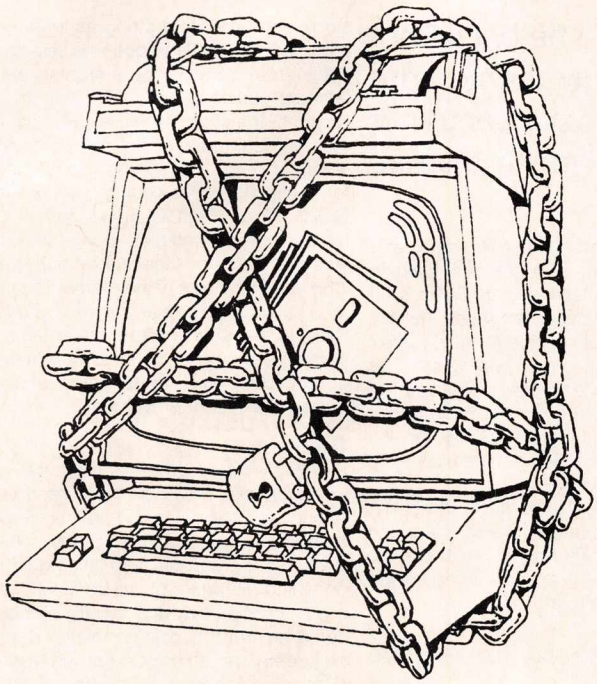
CARING FOR YOUR COMPUTER

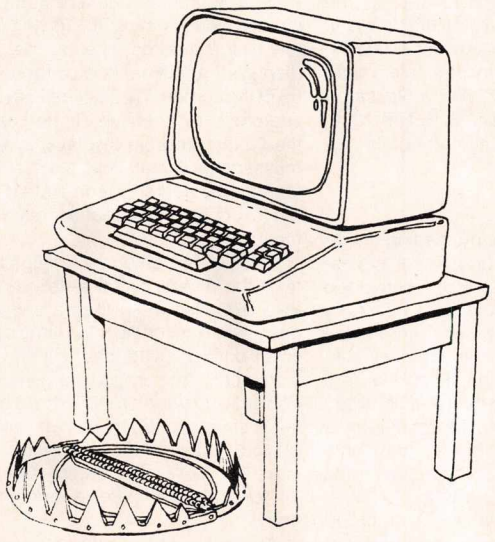
Security

Securing information within and around a computer system can be accomplished by various means: psychological, legal, physical, organisational, and computerised (i.e., programmed). Some common methods will be reviewed here.

Programs and data must be secured against accidental damage and unauthorised access or copying. Preventing damage to a program or to data can be accomplished by following proper procedures. In particular, it can be accomplished by backing-up every new program received and by



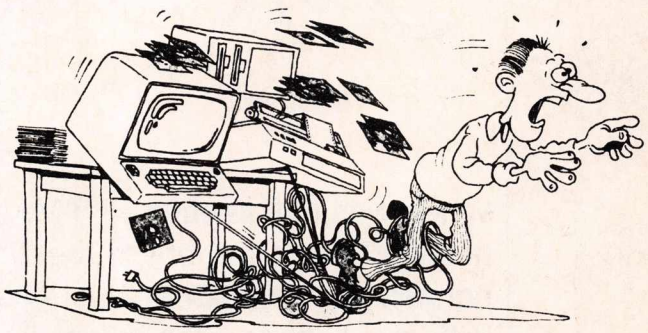
creating backup copies of new data. Physical protection of storage media such as disks and tapes is accomplished by storing them in an appropriate manner, as explained in previous chapters. Securing programs and data against unauthorized access is a more difficult task, but it can be achieved. In most cases, it can be done by erecting a variety of barriers.



When additional security is required, it is possible to use a program that records the time at which the computer is being used and the (alleged) name of the user.

Sophisticated operating systems and file management programs also allow users to protect their files selectively by making them read-only, executable-only, or even totally inaccessible except to the owner of the file. These features cannot be added by the user. They are part of the file system, i.e., generally part of the operating system.

The Computer Room



Routing The Cables

If certain items of equipment, such as the printer or the CRT terminal, are located away from the main computer, remember that the interconnection cables must be routed through secure and safe paths. Whenever this can be prevented, cables should not be left to lie on the floor. In an office environment, it is usually easiest to route long interconnection cables through the ceiling whenever space exists between soundproofing tiles and the actual masonry of the building. When such a procedure is used, the electrician should be told to avoid routing the cables next to power lines, light fixtures, powerful coils or transformers. In particular, interconnect cables should not be routed close to fluorescent fixtures.

Dust and Liquids

Don't let dust or liquids come in contact with the computer equipment. It is best to disallow all liquids from the computer room. In addition, if a hard disk or a tape drive is used, it is best to disallow all smoking within the computer room. Sustained smoking in close proximity to a disk or tape drive will contaminate it. However, the likelihood of damage to a diskette is less than to a hard disk or tape.

Consider the following measures in order to keep dust out of the computer room:

- Seal all windows.
- Reduce traffic through the room.
- Keep coat racks outside the room.
- Don't allow your janitorial service to enter the computer room. Use a special lock.

MEMORANDA

When was my meeting with Mike? Will I be back from holiday before the board meeting? How many more squash games before Christmas? Use *your* computer with *our* diary program to answer questions like these every day.

MEMORANDA, although written for a PET, is a personal diary program that is easily adaptable for use on most micros. Care has been taken to use only standard features and to eschew any that might cause conversion problems. Naturally, this has led to a compromise between the sophistication of the program and its convertability. With the suggestions for adding your own enhancements to the program, I hope that the end result will prove of use to a wide variety of micro owners.

By Bob Chappell

While aiming for simplicity, it was considered necessary to omit the use of data files since the way these are implemented varies considerably from micro to micro. Information vital to the program has therefore been stored in embedded DATA statements and read into arrays at the start of the program. This means that the user will need to insert his or her own personal data in these statements and will need to take a fresh copy of the program whenever any of these statements are changed.

Birthdays & holidays

The personal information consists of three elements: the event (or memo) itself; the category type; and the date. The memo can consist of any characters and length, subject only to the limitations of your own micro. The category type consists of a single letter, being the initial letter of the categories you have set up. For example, B for birthdays, H for holidays, etc. It was felt that users would find this method far easier to use than having to remember the meanings of specific numeric codes. The only constraints are that the category letter should be unique, that H is not used since it is utilised within the program to deal with the special Holiday category and that there is enough room in the array to hold them.

The program has been set to hold 50 category names and 100 events, dates and categories. To use all 50 categories would mean using two-letter category types so it would probably be better to reduce the size of this array to something like 20 initially. All of the personal data array sizes can be changed without affecting any other part of the program since it recognises the limits of a set of data by reaching an asterisk (or any other unique character you wish to use) in the relevant DATA statements.

Category names are stored in the DATA statements starting at line 1130 and the end of this data is signified by an asterisk. The personal information is stored starting at lines 1150 and is in the format:

Memo, Category Letter, Start Date, Finish Date

The Start Date and Finish Date must be in the format DDMM where DD is the day number and MM the month number. Leading zero may be omitted from the day number but must be present in the month number, e.g. 8th June must be entered at 0806 or 806. The Finish Date is never entered except for the Holiday category where it is identified within the program by the presence of H as the category letter. Thus, a holiday entry might appear as MADRID,H,107,3107 while, say, a birthday entry might appear as BEN,B,1210. Again, the end of these memoranda is signified by an asterisk.

DATA statements

The program commences by reading the information in the DATA statements into the appropriate arrays. The dates are converted into the total number of days from 1 January while the data is being read and stored, this method of holding the date information making searching simpler. The categories are then listed on the screen and the user invited to select one. In addition to the categories created by the user, the program generates two extra ones. The first of these allows the user to search on all categories at one pass. For instance, what memoranda are recorded for 1st June to 10th June, regardless of category?

The second extra category allows the user to search for a particular piece of text, from a single character to a string as long as your micro will permit. If this option is selected, the user has the choice of searching only the leftmost portion (equivalent in length to the length of the string specified) of each micro or to search for the string of characters anywhere in each memoranda, e.g. both the former and the latter would pick up the memo GOLF AT 10.30 if GOLF was specified, but the former would not pick up this memo if OLF was specified since these are not the leading leftmost characters of the memo. The search for a string occurring anywhere in a memo is likely to be slow if there are a very large number of memos to be examined. A method of speeding this up is given under the Suggestions for Improvement.

Searches

If a single category is selected, the search will only take place on that category (the "string" and "all category" options search all categories regardless). The user is then invited to supply a start and finish date range on which the search is to be limited. These are entered as day and month, and leading zeros are not necessary. Invalid dates are picked up and an error message displayed. If the memoranda cover a leap year than the 28 in line 1090 will need to be changed to 29. The program assumes all dates to be within the same year. If a single day is to be searched, the start and finish entries will be the same.

The program then uses this information (type of search and data range) to select all memoranda meeting these criteria. Only a few of the records meeting the criteria are displayed at a time, to prevent any scrolling up of the screen. The user indicates when the search is to continue. If no matches are made, the program displays an appropriate message. In either event, a message indicating that the search is complete is given and the user, at his indication returned to the menu.

The Holiday category is slightly different from the others. Since a holiday is likely to take place on more than a single day, the user, when inserting his data, can enter a finish date after the start date in the DATA statement. The program automatically recognises and handles this extra information by the H category. When a holiday memo is displayed, both start and finish dates are shown. Thus the user is saved from having to make 14 separate entries for a fortnight's holiday entry!

Whether a single category or special option, or single or range date is shown, the headings and displays are automatically adjusted to reflect this.

A Personal Diary Program

Absent mindedness

Although the program is liberally sprinkled with REM statements, these can safely be omitted as they are not referenced within the program. The Memoranda program, even without the improvements suggested, can be a valuable aid, particularly to those of us who suffer from recurrent absent-mindedness. The main snag is that we still have to remember to run the program regularly!

Suggestions for improvement

1. To speed up searching of large amounts of data, particularly if the string search is to be used, the data could be sorted into date order at the start of the run and the start point found quickly, possibly by means of a "binary chop" routine. Equally, the search would finish immediately a record was found whose date was greater than the specified range.

2. The addition of files would make the program more useful. The user could then insert, delete and amend more conveniently. The old file would be read in at the start and a new file written at the end if changes had been made. For this purpose, disk files would be far more efficient (not to say faster and more reliable) than tape based files.

3. If disk files were used, there might be some advantage in accessing the file as it was needed rather than reading the whole file into memory. Data held in memory is faster to access but limits the amount of data available, simply because one is constrained by the limitations in memory size.

4. The program could be extended to cover more than one year and a facility added to delete old items and carry over fixed ones to the following year, e.g. birthdays and anniversaries.

5. On large files, a facility to abandon the search after a certain number of 'hits' had been made might be useful. With the sorting facility above, the data would always be presented in date order making this possibility more helpful.

6. A calendar facility could be added so that the program would also automatically tell you the name of the day of the week referenced. If it could also print out the whole calendar for any year, you would save quite a bit on Christmas presents, given you had a printer!

Program Outline

Lines	Description
50-150	Present the categories on the screen and obtain selection.
170-240	If selected, obtain the string search criteria.
260-310	Obtain the date range (this is then converted into days).
330-630	Search for and display matches

Subroutines

650-700	Heading routine – headings are displayed at each new screen.
720-740	Await a key press before continuing.
760-810	Date validation.
830-850	Convert day and month to total days.
870-890	Convert total days to day and month.
910-950	Error messages and delay loop
970-1080	Initialise and read data into arrays, converting dates to days.
1090	Data for number of days in each month.
1100-1110	Data giving names of the months.
1120-end	Category names data terminated by an asterisk, followed by Memoranda data (in the format Memo, category letter, date(s)) – this is also terminated by an asterisk. The user should substitute his own data here. As long as all the category names come first (plus an asterisk) and the memoranda data follows the above format, category names and memoranda data can be in any order within themselves. The special category for holidays is recognised within the program only by the category letter. The user must therefore have this category starting with an H in the category name or amend the references to "H" within the program to tie up with another category name, e.g. the category might be called Vacations and the category type would then by V. The user does not have to have this category and could delete all references to the second element of array TD.

The only special PET facility used is the reversed heart which is the character for Clear Screen.

Arrays

DM	– number of days per month.
M$	– names of the months.
CL$	– names of the categories.
E$	– the memoranda (events).
C$	– category type per memo.
TD	– memo date expressed as ddmm (day and month). Element 1 contains the start date, element 2 the finish date (element 2 only used for the Holiday category). These dates are converted at the start of the program from the ddmm format to total number of days from 1st January.

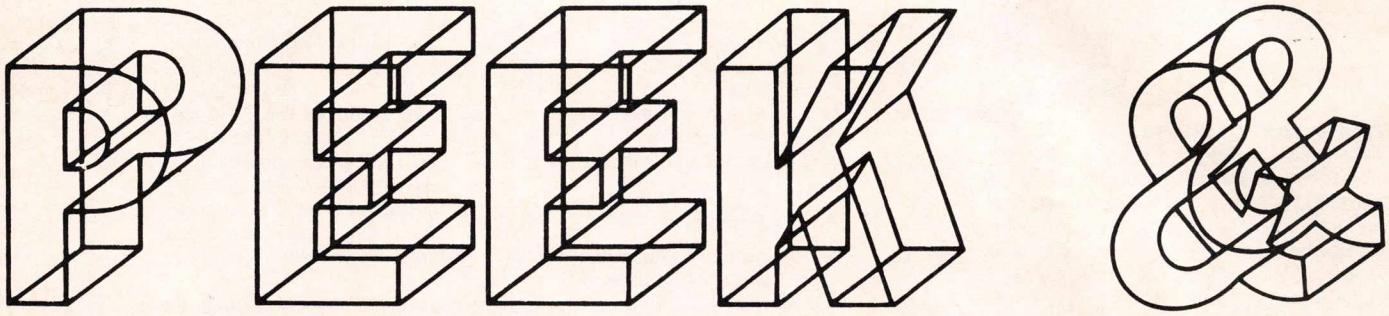
Major Variables

TC	– total number of categories
TE	– total number of events (memoranda).
SD	– start date expressed as total days from 1 Jan.
FD	– finish date expressed as total days from 1 Jan.
Z	– = 0 if only one category selected. = 1 if all categories selected. = 2 if string search on leftmost part of memo selected = 3 if string search on whole memo selected.

```
10 rem memoranda bob chappell 8.1.82**
20 dimdm(12),m$(12),cl$(50),e$(100),c$(100),td(100,2)
30 print"";tab(12);"memoranda"
40 gosub970
50 rem menu**************************
60 x$="":print"";tab(12);"memoranda"
70 printhd$
80 forj=1totc:printj;cl$(j):next
90 printprinttc+1;"all categories"
100 printprinttc+2;"search for a piece of text
110 printprinthd$:printinput"please type the appropriate number";n$
120 n=int(val(n$))
130 ifn<1orn>tc+2thengosub910:goto50
140 z=0:ifn=tc+1thenz=1:goto260
150 ifn<>tc+2thenx$=left$(cl$(n),1):goto260
160 rem string search selected********
170 z=2:print"":print:print:print"please enter the string of characters
180 print:print"for which you wish to search":printhd$:print:inputtx$:print
190 l=len(tx$)
200 printhd$:print:print"will these characters appear anywhere"
210 print:print"in the text or only at the beginning of"
220 print:input"a record (please type a or b)";w$
230 ifw$="a"thenz=3:goto260
240 ifw$<>"b"thengosub930:goto200
```

▶ 79

What are PEEK and POKE and how do you use them on the ZX81? **Tim Hartnell** unravels two more of the computer world's mysteries with the aid of a draughts program and some Space Invaders.



While many aspects of BASIC are relatively easy to grasp, PEEK and POKE can prove harder to understand. This article will, hopefully, remove a little of the fog surrounding the two words.

There are two ways PEEK and POKE are often used on the ZX81 – to store (and retrieve) information, and to put things on the screen, or check to see what is on the screen at a particular position.

I'd like you to imagine that the 'brain' of the ZX81 is the sorting room of a post office.

There is a slot for every envelope that comes into the post office, and each slot is marked with an address – a number – which corresponds to the number on the envelope. You can look inside (PEEK into) an envelope, if you know where to find it by knowing its address, or you can put something (POKE it) into an envelope.

That is, when you want to look at what is in a particular envelope, or the contents of the envelope at a specific address, you PEEK into it; and you POKE into the envelope when you want to put something at that address. This may still seem foggy, but bear with me, try out the examples, and it should become clearer.

Every part of a program you type into your ZX81 is stored at a specific address. In the following program, for example, the question mark after the word REM in line 10 is stored at the address 16514. The second question mark is stored at address 16515 and the third question mark is stored at address number 16516.

Enter the program now, and run it a number of times, looking at line 10 each time the program LISTs.

```
10 REM ???
20 LET A=16514
30 LET B=A+1
40 LET C=B+1
50 LET D=INT (RND*58+2)
60 POKE A,D
70 POKE B,D-1
80 POKE C,D+1
90 LIST
```

Amazing, isn't it? The computer POKEs (using lines 60 70 and 80) a series of three characters into the addresses 16514, 16515 and 16516. The address 16514 is always the first address after the word REM in the first line of a ZX81 program. The equivalent address on the ZX80 is 16427.

This can be used in practice by storing some information in the REM statement, and later looking at it using POKE. Type in, as a direct command, PRINT PEEK 16514, and you'll get the number of the character which is first after the word REM in line 10. Enter, also as a direct command, PRINT CHR$(PEEK 16514) and you'll get the character which appears first after the word REM in the first line of the program.

Draughts board

In this next program, DRAUGHTS, the board is stored in the first REM statement. As the game progresses, the changed board is POKEd into the first REM statement, and from this (using the routine from line 425 to line 470) is then PRINTed out, using the PEEKs of line 450. When the human player moves, the move is POKEd into line 10 using the routine line 220 to 250, and then the board is reprinted using the routine 425 to 470. When the computer moves, its move is POKEd into line 10 with the routine starting at line 400. The REM statement, as you'll see if you interrupt the game while it is in progress, changes after each move.

If you want to play a new game, the first REM statement must be changed back to the starting positions of a game of DRAUGHTS, so the routine at 5050 to 5070 PEEKs into the second REM statement (item by item) and POKEs this into line 10. As you'll see when you RUN this program, the whole PEEK/POKE process is remarkably quick.

You move by entering the number of the line down the side where your piece is, followed by the number across of the square. You will then get the prompt TO? and then you enter the number down and across of the square you wish to move that piece to. If you capture a computer piece, you'll be asked CAN YOU MOVE AGAIN? (that is, can you make a further capture). If you cannot, simply hit NEWLINE. If you can, hit any key and then NEWLINE.

You'll find this program plays pretty well at the beginning but tends to fall away a bit at the end. You may like to teach it to play a little better.

So, from this program, we can see that PEEK and POKE are useful for storing and retrieving information.

They can also be used to get and put information in the display file, which holds what will appear on the screen. Enter and run the following little program, which makes a character move randomly – more or less diagonally – on the screen.

ZX 81 POKE

```
  10 REM AAA 23456789 1 X X X X1
2X X X X 23 X X X X34   45
  11 REM AAA 23456789 1 X X X X1
2X X X X 23 X X X X34   45
  12 FAST
  17 GOSUB 5000
  19 GOTO 430
  20 LET R=PEEK B
  30 LET S=PEEK (B+D(Y))
  40 LET T=PEEK (B+2*D(X))
  50 RETURN
  55 LET Z=0
  60 FOR B=16528 TO 16607
  70 FOR X=1 TO 4
  80 GOSUB 20
  90 IF ((X<3 AND R=61) OR R=13)
 AND (S=52 OR S=12) AND T=0 THEN
 GOTO 300
 100 NEXT X
 110 NEXT B
 120 FOR A=1 TO 400
 130 LET B=INT (RND*80)+16528
 140 FOR X=1 TO 4
 150 GOSUB 20
 160 IF ((X<3 AND R=61) OR R=13)
 AND S=0 THEN GOTO 400
 170 NEXT X
 180 NEXT A
 190 PRINT "YOU WIN";A
 200 SLOW
 202 PRINT AT 0,0;"FROM?"
 205 INPUT G
 207 PRINT AT 0,4;" ";G;" TO?"
 210 INPUT H
 215 PRINT AT 0,0;"                "
 220 POKE 16516+H,PEEK (G+16516)
 230 IF H<20 THEN POKE H+16516,1
2
 240 POKE 16516+G,0
 250 IF ABS (H-G)=18 OR ABS (H-G
)=22 THEN POKE 16516+(H+G)/2,0
 260 PRINT AT 17,0;"CAN YOU MOVE
 AGAIN?"
```

```
 270 INPUT A$
 275 PRINT AT 17,0;"
     "
 280 IF A$<>"" THEN GOTO 430
 285 FAST
 290 GOTO 60
 300 POKE B+2*D(X),R
 310 POKE B,0
 320 POKE B+D(X),0
 330 LET B=B+2*D(X)
 340 IF B>16597 THEN GOTO 490
 350 FOR X=1 TO 4
 360 GOSUB 20
 370 IF ((X<3 AND R=61) OR R=13)
 AND (S=52 OR S=12) AND T=0 THEN
 GOTO 300
 380 NEXT X
```

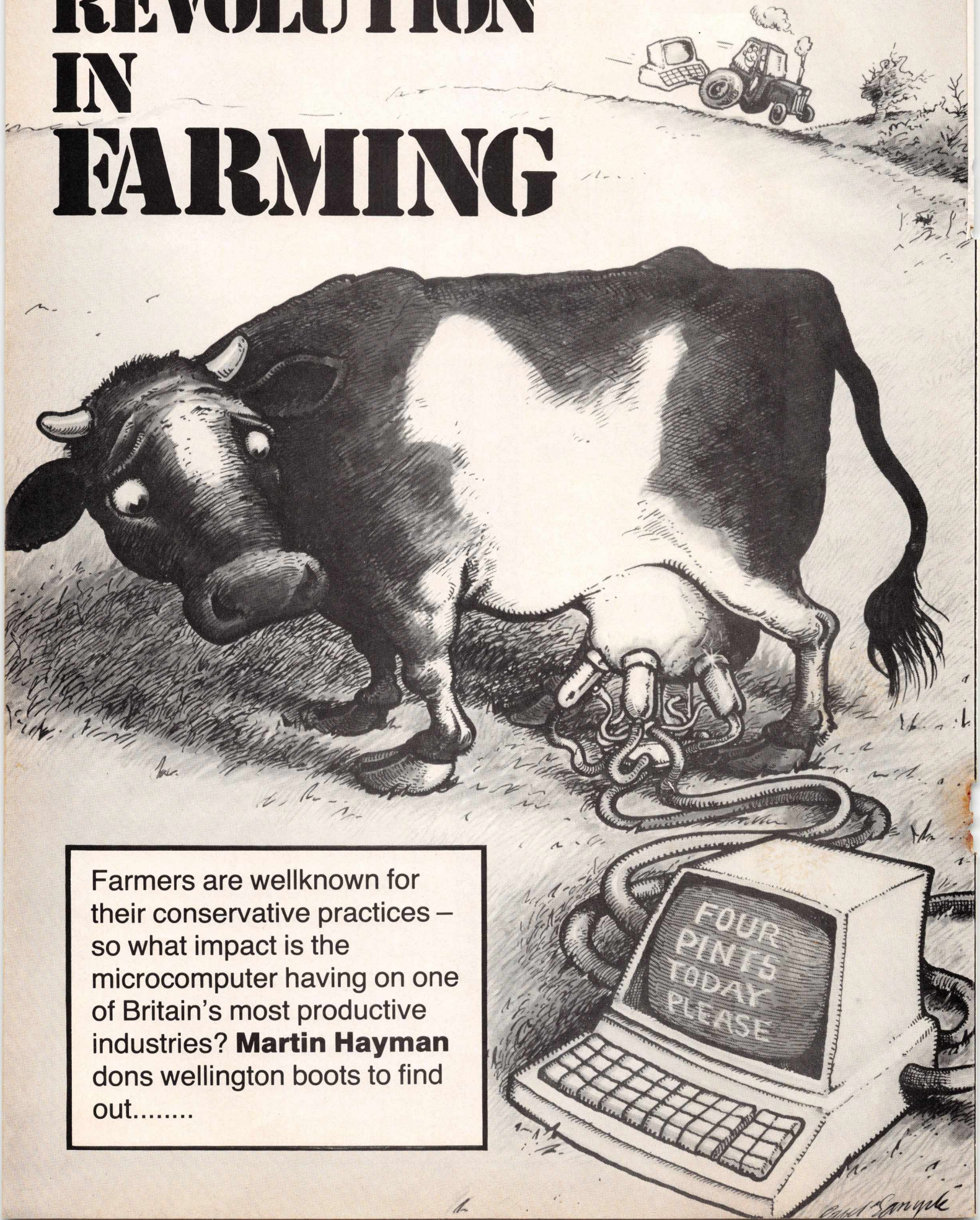
```
 390 GOTO 430
 400 POKE B+D(X),R
 410 POKE B,0
 420 IF B+D(X)>16597 THEN POKE B
+D(X),13
 425 SLOW
 430 PRINT AT 6,8;
 440 FOR A=16517 TO 16616
 450 PRINT CHR$ (PEEK A);
 460 IF 10*INT ((A+4)/10)=A+4 TH
EN PRINT TAB 8;
 470 NEXT A
 472 PRINT
 475 IF Z=1 THEN GOTO 55
 480 GOTO 200
 490 POKE B,13
 500 GOTO 430
5000 DIM D(4)
5010 LET D(1)=11
5020 LET D(2)=9
5030 LET D(3)=-9
5040 LET D(4)=-11
5050 FOR J=16626 TO 16725
5060 POKE J-109,PEEK J
5070 NEXT J
5080 LET Z=1
5090 REM "DRAUGHTS"    ADAPTED
T HARTNELL FROM ZX80 PROGRAM
 BY G D CHARLTON, ROMFORD
5100 RAND
5000 RETURN
```

```
  10 REM POKE/PEEK DEMO
  20 REM MICROCOMPUTER PRINTOUT
  30 LET K=27
  40 LET A=0
  50 LET B=0
  60 POKE 33*A+B+1+PEEK 16396+25
5*PEEK 16397,151
  70 LET M=A
  80 LET N=B
  90 LET A=A+INT (RND*2)
 100 LET B=B+INT (RND*2)
 110 IF A>15 THEN LET A=0
 120 IF B>15 THEN LET B=0
 130 POKE 33*M+N+1+PEEK 16396+25
5*PEEK 16397,K
 140 IF RND>.85 THEN LET K=K+1
 150 GOTO 60
```

Lines 60 and 130 are the important ones, which show you how to use PEEK to find out where to POKE. That is, the routine (PEEK 16396 + 256*PEEK 16397) finds out where the display file start address is, and the other part (33*A + B + 1) counts along the screen to the place where you want to go. Line 60 POKEs a character 151 into the screen, and line 130 POKEs another character into the same spot. The POKE position is then changed, and a new 151 is POKEd into place. This leaves an irregular trail of changing letters

▶ 75

THE COMING REVOLUTION IN FARMING



Farmers are wellknown for their conservative practices – so what impact is the microcomputer having on one of Britain's most productive industries? **Martin Hayman** dons wellington boots to find out.....

Many agriculturalists – if not the more traditional farmers – now refer to farming as an industry. This is understandable in the case of the so-called 'concrete farms', characteristically pigs and poultry, which are run under strictly controlled environments indoors. But what about the mixed general farm so beloved of the city dweller? Whatever happened to the shepherd with his flock, his pipes, his heart full of love?

Decision making

Today's farmer in Britain is part of one of our most efficient, productive and certainly largest industrial sectors. The total turnover in England and Wales is £8,000 million a year. Today's farmer is as likely to be a hard-nosed businessman as anyone sitting in an air-conditioned office. The fact that he is wearing muddy boots does not diminish his need for business planning aids, of which the microcomputer is undoubtedly one of the most important. Because of the nature of his holding he is likelier to be able to deploy a micro to good advantage.

It may well be his own property; even if it is not, as a manager, his mistakes are likely to be glaringly obvious where those of a middle manager in a corporate business enterprise might be concealed. His decision-making is probably as time-critical as in the motor industry: he can't afford to have the wrong product at the wrong time. He's hedged around with rules and regulations: the Common Market may have conferred some advantages by way of grants, but it has increased his paperwork enormously. And, like any other enterprise which demands, at various points throughout the production cycle, large inputs of cash, he needs to know exactly how and when to borrow to maximum advantage.

Expensive money is bad news for farmers: at November 1981, farmers in England and Wales owed the Big Five high street banks £3,500 million. This is not merely for capital equipment replacement (though, with a standard Ford tractor edging above £10,000 and a combine harvester up to £50,000, this is an important factor) but for running costs – fertilizer and feedstuffs. If a farmer has, say, borrowed at current rate in November on the basis of a good return on his crop the following season, it is critical that he be able to predict what margin he is going to be left with when he sells his product. That is exactly the sort of area for which financial modelling software is so effective, so it comes as no surprise to find that one of the most useful aids around is a dedicated Visicalc for farmers, called, not surprisingly, Agricalc.

On-farm computers

A popular image of the farmer is that he is both conservative and secretive. In both respects the microcomputer suits him well. It is no longer a novelty but a mainstream technology; and it frees him from the need to commit more than a fraction of the information on which he makes his decisions to outsiders. The emphasis in computing for farms has changed over the last decade. Large-scale planning exercises on mainframes, such as the Ministry of Agriculture's Reading installation, are losing ground fast to 'on-farm computers'. ICI's Mascot system, for instance, was used around 1,000 times in 1970-9. Its disadvantages were manifest. An adviser would be despatched to collect data from the farm, taking one day. Local oddities would then be sorted out by head office, taking another half-day. Then a skilled agriculturalist would need to be on the case to explain the conclusions of this 'linear planning' activity to the farmer, and to discuss methods of implementation. It can be seen that if indeed the farmer is jealous of his independence and of his personal working methods, such an approach might lack appeal. Nevertheless, its principal areas of application have direct relevance; many microcomputer applications are descended from mainframe techniques.

Mascot offered programs to analyse:
– correct cropping and stocking
– the effect of a new crop or livestock enterprise on the farm
– the effect of cost and price changes, including a sensitivity analysis
– labour/machinery substitution
– the effect of increasing or decreasing farm size
– the costs and benefits of co-operation

Increasing automation

There are several areas here which no longer interest farmers so much as when Mascot was first written. There is less enthusiasm for capital investment; co-operation is not such a burning issue, although the number of holdings has declined to around 100,000 in England and Wales; and mechanisation in a large arable farm has in many cases reached its limit – that is, it is not possible to shed any more labour. The specialised, concrete-based farms are a different matter although here, as in certain other areas such as dairying, microprocessor technology (rather than microcomputer) may still have scope for increasing automation.

The three main areas in which the mainframe had its uses are, however, equally applicable to microcomputer techniques. They are: decision-making, planning and control. To take them in order: decision-making is the process of choosing one of a number of options, based on a combination of knowledge and judgement. Such decisions may be strategic or tactical. Increasing the acreage of one crop would be a strategic decision; it would have repercussions on other parts of the farm system. Tactical decisions, on the other hand, are those which are made from day to day, involving perhaps allocation of feedstuffs or the source of purchase of fertilizers. The effects of such decisions would be localised but would necessarily impact the overall budget and profitability. The advantage of a computer system in the decision-making process is to compel a more disciplined approach to gathering information, permitting more accurate and swifter judgement. Previously, according to Richard Esslemont and T. Rehman of the University of Reading's Farm Management Unit, who have written a penetrating analysis of the subject, farm managers have tended "to rely upon rules of thumb or a keen observation of their neighbour's successes".

Cash flow

Planning is to decision making as metaphysics is to physics; that is to say, it is a commitment to adopt certain decision-making processes in order to achieve a sense of purpose. Long-range 'optimisation' computer techniques such as Mascot are generally too remote to interest the average farmer but more limited – and conventional – techniques such as Cash Flow are especially useful to farmers.

Cash flow forecasting is not generally programmed so as to seek maximum profit but it does allow several different propositions to be evaluated, often as far ahead as three years, and a profit-and-loss account to be drawn up. In practice this means that the security-free loans which are promoted by feedstuff manufacturers and banks can be compared for their long-term effectiveness for a particular set of circumstances. Esslemont and Rehman suggest that farmers can thereby benefit by changing the timing of purchases and sales; changing farm policy; studying the costs and benefits of various sources of finance; planning tax payments – in fact the usual panoply of 'what-if' questions familiar to any user of Visicalc. Clearly, in order to benefit from such a computer application, the farmer must already have committed himself to serious and detailed consideration of the way he assesses the business performance of the farm. Clearly, the better a farmer is organised with respect to specific business methods, the greater the productivity improvements likely to be conferred by 'going computer'.

Specific reminders

What about the variable factors which are particular to farming? Rehman and Esslemont suggest that "Plans for spraying cereals, harvesting potatoes, silage making or planning to hire a new farm foreman will not involve the use of computers and programs as we understand them now", but in future this is the direction which farm systems will take.

The arithmetical elements of projection on the basis of current performance are not hard to program, but more specific reminders that, for example, "the bulk tank capacity is overloaded by a new plan for milk production or when an animal's limited dry matter intake cannot cope with the daily rations that form the foundation of the plan" are useful aids to improve judgement and remind the systems user that the exercise has real constraints – and would also improve confidence on the part of the sceptical farmer who has previously tended to make his plans by hunch. They recommend therefore that when a farmer proposes to buy a computer system, he uses some foresight and specifies some planning and budgetting capability to help him plan, as well as tackling the standard requirements of accounting and payroll.

The third area where a micro can be of use to a farmer is in controlling the business. This is a day-to-day exercise which to many people characterises the role of the manager. By contrast with the modelling system which allows targets to be set for planning purposes, control systems interact directly with the actual work of the farm, and may to some extent supplant the supervision

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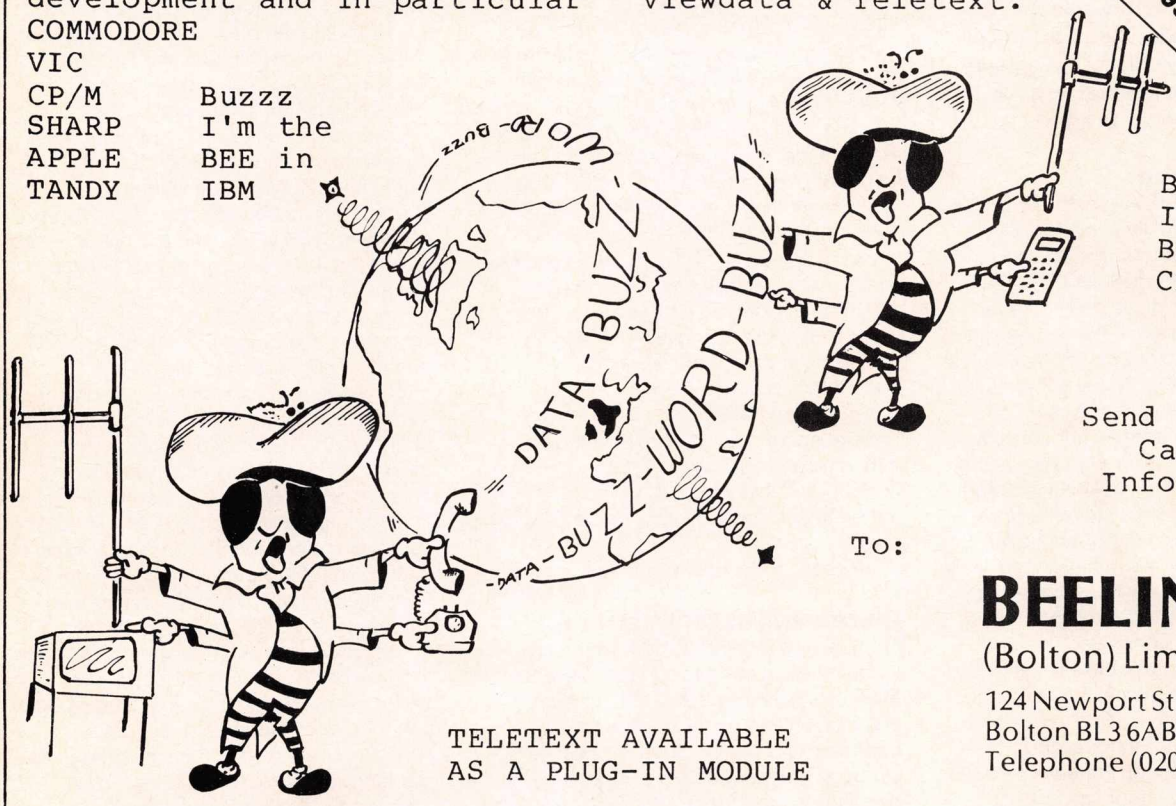

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of the manager on the spot, though not entirely. Some farm systems are being developed which make, for example, dairying a semi-automated process, but these are in an early state of development and are not reliable enough to supplant skilled labour at this time. (See panel). But in some areas the financial type of analysis characteristic of office planning may feed back information which helps to eradicate bad or innefficient practices which have become ingrained with the passge of time. "The process of food production at the farm level has not yet been so automated as to make control an office and paper operation. A balance between this type of control and on-the-spot supervision is necessary," observe Esslemont and Rehman.

Reactive judgements

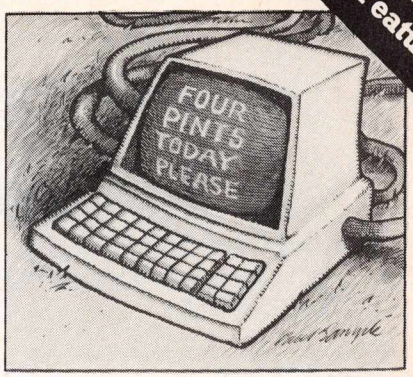
Since this type of application is reactive, it must be capable of integrating easily into the farmer's life and demand little in the way of computing ability on his part. Obviously, too, robustness is of the essence. This means plain, easy-to-read instructions and maximum simplicity of data entry, and easily understood printouts which contain only the information needed to make reactive judgements. Since control measures current performance against previous performance, a database of past performance must be built up and this will involve keying in records for the type of activity in which the farm specialises.

This is an area which in the past has argued the involvement of external specialists, maybe a bureau operator but as systems for farmers become cheaper and software more sophisticated (i.e. easier to use) engaging external specialists has become less favoured. Systems supply for farms is a booming business. Where in 1979 Esslemont and Rehman feel unable to recommend any more than six specialist suppliers of software and systems, the Agricultural Development and Advisory Service listed 20 such suppliers at the end of 1981. Mr Keith Butterworth, one of ADAS's Regional Farm Management Advisers based in Newcastle-upon-Tyne, said that such suppliers were likelier to have their roots in farming than in computing – much the same story as we hear from most users of applications software, where the likelier success stories are from those software houses which understand the client's needs thoroughly and speak his language.

System brief

One expert who specialises in farming systems is Dr. Charlie Pugh, who originally trained with the Reading University Farm Unit, and went on, via experience in Canada, to become a computing consultant to farmers and also runs his own dairy business in Cornwall. In a recent pair of articles in the specialist journal *Power Farming*, Dr. Pugh evaluated, on paper, several quoted systems which had been submitted, as if for tender, to the magazine. The brief for the system was for an extensive holding of four farms, to which a fifth was shortly to be added. The computer was to take the following functions in hand: records and information required per farm for financial control (yearly, monthly, current and stock control); enterprise monitoring for dairy cows, pigs and for ration formulation and feed planning; and for Payroll. Five companies invited to tender were also asked to state their policy with regard to program maintenance; machine maintenance; staff training; guarantee period; payment terms and conditions of contract; updating and expansion of the system.

The detailed results, well worth reading for any farmer seriously considering a micro and how to go about specifying his own needs, were published in *Power Farming* (October/November 1980). Quotations were received from Farmdata, Farmfax, Farmplan, Farm Systems and Parwest and showed a wide variety of approaches to hardware, support training and guarantee. Three of the firms offered more or less pre-packaged systems based on Apple II Plus or Tandy TRS-80 micros, equipped with a variety of



peripherals but inevitably at least two disk drives. In all cases at least 48K RAM was specified; the two more expensive, custom-designed systems suggested 64K and, as a possible option for the better-heeled, a hard disk, which pushed the price of this Zilog-based system up to around the £17,000 mark. These, note, are summer 1980 prices; the hard disk option may now be cheaper. It should certainly be considered. The disadvantages of numerous floppies lying around a farm office could be considerable.

Test drive

Dr. Pugh, who commented on the usefulness of the systems, makes the point that it is extremely difficult to compare paper specs; a thorough test-drive is recommended, along with serious discussion with the proposed supplier about his maintenance terms and training. The best computer system in the world is no good unless the driver understands how to use it. He recommends: "Obtain expert advice on whether your farm can justify a computer system and will be able to deal with its operation. If at all possible, have a trial with one or more systems. At least a month of intensive use is needed. Check out how long your proposed supplier has been in business. See at least two which are broadly similar to your set-up. Check their results, particularly the back-up services of training, maintenance and up-dating which are critical to successful installation."

The sort of comparison exercise suggested by Dr. Pugh may be difficult to organise among such a traditionally secretive group as farmers, though it is notable that Farmplan, who offered the Apple system, suggested that software support could be taken care of via their Users Group at the very reasonable subscription price of £250 a year – much less than the other quotes.

But in short, the message is "Beware". There are many pitfalls in buying a micro for business if you are a first-time user: many of the sellers are first-time suppliers. There are more cowboys around than in Marlboro country (I refer to the micro suppliers, not the dairy farm). A recent report by the University of Lancaster, *Small Computers in Small Companies,* finds that in a 100 case studies of small businesses, a quarter of those who had installed a micro had experienced installation problems and nearly three out of five had had some kind of hardware or software problem in the first six months; three-quarters found that their system, a typical cost of which was around £15,000, so hardly of negligible cost, had broken down at some time. Generally

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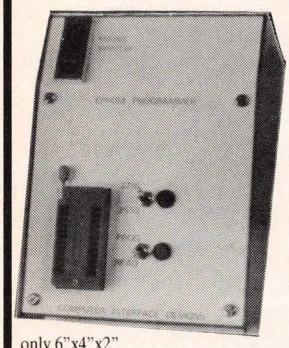

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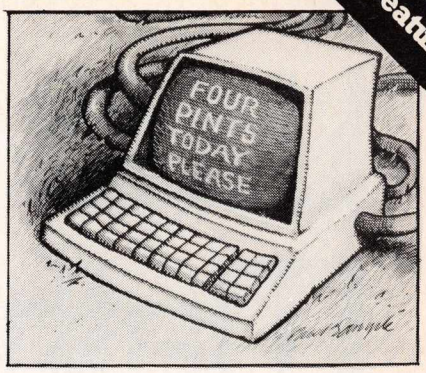
speaking, hardware breakdowns were covered by a service contract, usually at around 10% of purchase cost, but software was a different story: here three out of five said they had had some problems, and only half would agree that it had been an unqualified success.

Small-scale calculation

An easier way in might well be to adopt the "small is beautiful" approach. ADAS has developed its original computer-based work with its Hewlett Packard HP 10s for the HP30 and 31 hand-held programmable calculator and sells a range of application-specific programs for a minimal price. They have now changed their allegiance and most regional farm advisers now carry a Texas Instruments TI59. Details of these can be had from ADAS's local advisers, who are also the contact point for working "up the tree" to the more specific and expert advice which can be had from the specialist On-Farm Computing Team, whose chief is Peter Russell in Reading. This sort of small-scale calculation aid, while obviously of no use for payroll and planning applications, can nevertheless bring savings on, for example, fertilizer purchase and use. Farmers talk about the "treadmill of technology"; once the land is heavily supported with chemical fertilizers, the process becomes irreversible and their continued use mandatory. Yet studies in the US have shown that as much as 35% of agrichemicals there go to waste – by mistiming the application, or using the wrong kind, or even applying when the wind will blow it into the hedgerows.

Telesoftware

Alternatively, some farmers may prefer to wait, if their computing needs are not immediate, for the likely developments in videotex. For the user who needs to access a program only once a week, say, there is little point in purchasing a £15,000 system when the program he wants may be available as a telesoftware routine. Farmers are exactly the sort of business sector which British Telecom hopes to woo with Prestel, and there are already several specialist databases for farmers, including IPC's Agriview, which gives up-to-the-minute reports on the prices fetched by stock, the purchase price of fertilizers and feedstuffs, and the prices fetched at second-hand auctions of farm machinery. With a certain amount of local processing power, or even by using large-scale processing power accessed through Gateway, farmers could have a tailor-made service to, say, give them a guide price for a certain item of machinery on the second-hand market, or the most advantageous rates for certain kinds of fertilizer. These developments, however, rest on the provision of sizeable agricultural databases which are at the moment likely to be run by, and hence tied to, certain large agrichemical concerns, such as CIBA-Geigy or BOCM, or quasi-governmental organisations such the Milk Marketing Board or the Pig Marketing Board.



Green Thumb

Some useful progress has been made in this area by the Danes, who have a form of distributed data processing for farmers in Schleswig-Holstein, by the French with Teletel (though what use it can be to the notoriously conservative peasant farmers of France is questionable), by the Canadians with their Manitoba "Grassroots" project, and by the Americans with "Green Thumb". The latter is especially interesting. The "Green Thumb" box is made by Tandy and sits on the TV set as a videotex adaptor. About 100 were distributed by the University in Kentucky City to Kansas farmers, who would only be able to access information on the database after submitting a local weather report. This sort of trade-off of information looks a promising way forward. The following firms are listed by ADAS as suppliers of systems for farmers. New firms are constantly being added to the list; for lastest details, as well as further information on suppliers' specialities and general advice on farm microcomputing, contact Keith Butterworth at Newcastle-upon-Tyne (0632) 869811 or at Leeds (0532) 674411.

ADAS publishes two helpful booklets, the first general, *Introduction to On-Farm Computing*, the second specific, a list of suppliers from which this is information is drawn, *Systems and Programs*.

CASE STUDY

Bridget's Farm, a holding of 300 dairy cows, could be described as a "farm of the future". It is an attempt to apply microprocessor technology to the fullest extent to control dairying, which itself has received much attention from farm computing experts since the Ministry of Agriculture's Daisy herd management system was written for the Department's mainframe at Reading. It is funded jointly by the National Institute of Agricutural Engineers and Elsmere Electronics, a subsidiary of Forward and Bland, the milking machine manufacturers, which is typical of the kind of links between government-backed research institutes and private industry, characteristic of the best of British agriculture.

Environment problems

Bridget's Farm, at Marshworthy near Winchester, features AFMS80 – Automated Farm Management System for the 1980s – a prototype, perhaps, for total micro control of types of work which have hitherto been regarded as beyond the scope of electronic technology because of the environmental problem. "Once you take the microprocessor into the environment of the cow, you've got an altogether different system," remarked the farm director, Edwin Mundy.

Each cow is identified by a radio-controlled "transponder" slung around its neck, which identifies the cow to the micro on its arival in the milking parlour. Its milk yield is automatically measured and is then input direct to the micro, giving an individual milk record for each cow. The beast is then fed with a given level of food concentrate programmed by the micro; finally it is weighed on an automatic weighbridge which rejects obviously erroneous data (a variation of plus or minus 30Kg – six legs on the weighbridge).

Mr. Mundy originally envisaged that the system would be fully implemented after about 18 months but progress has been slower than anticipated, principally because electronics and high-pressure hoses do not mix well. The transponders have needed more insulation, and there have been problems with the radio signal in an all-metal building. Progress on the software has also been rather slower than expected: the daily event action list program has yet to be implemented. There have been rather more breakdowns than usual in the recent cold weather. But despite the problems, about which Mr. Mundy is quite frank, at least one farmer has taken up the system which, like most micro systems, is likely to yield closer control, better information and hence better productivity.

Suppliers:

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Upthorpe Computer Programs, Didcot	0235 850747

Who Needs Maths Anyway?

Is it possible to learn about computers without a working knowledge of mathematics? Yes – say the manufacturers. No – says **Richard Nichols**, after five disastrous days with a ZX81.

It might have been W.C. Fields (and if it wasn't, it should have been) who said 'If at first you don't succeed – quit.' I have a feeling that he was speaking directly to me. It's a fact that some people are infuriatingly blessed with that instinctive understanding which grants them a carefree and intimate relationship with all things mechanical. Remember the Fonz? In *Happy Days?* When the jukebox stopped and all attempts at restarting it failed he would simply touch it and away it went. I, and most others, I suspect, would have been in the ignorant and helpless crowd looking on, marvelling at his rapport, his style, and the ease with which he manages gadgets. Also at the fact that his christian name is Arthur, but that's another story.

Trepidation

Now that you've got the general picture you can see that it was with some trepidation that I decided that a computer of some description was rapidly becoming vital to the cause. The cause, in this case, being a book. Research for this project has been taking place in a rather haphazard manner for the past three years, but then it's a complex book, and minor trivia such as earning a living have tended to intrude somewhat. Even so the amount of material amassed so far has gradually become a heap of exceedingly tatty bits of paper, newspaper cuttings and cigarette-packet memos to myself which, exposed to the inclemency of the mobile junkpile I choose to call home, has all the integrity and consistence of a *Tiswas* script.

What was called for was a method of storing all this information in a manner which neither I nor my haphazard approach to life in general could disrupt. Further benefits to be gained from the computer were also evident. Having once stored the relevant facts they could be recalled at will in almost any order or combination which I desired and the program allowed. Since the book is tied to a 24-hour timespan through and around which several variable factors and characters revolve, it would make sense to write the program accordingly. Then, when all the information was in place, tied to the time-base, I could simply press the relevant buttons and demand to know the precise location and condition of A at any moment, or the location and condition of B at the same moment. I could even pick a moment and demand to know where everybody was, and what they were up to. In this way it appeared that I could arrange for the computer to do all the work; I need only type out the results and collect the fame and fortune at the end of it. Which is as it should be.

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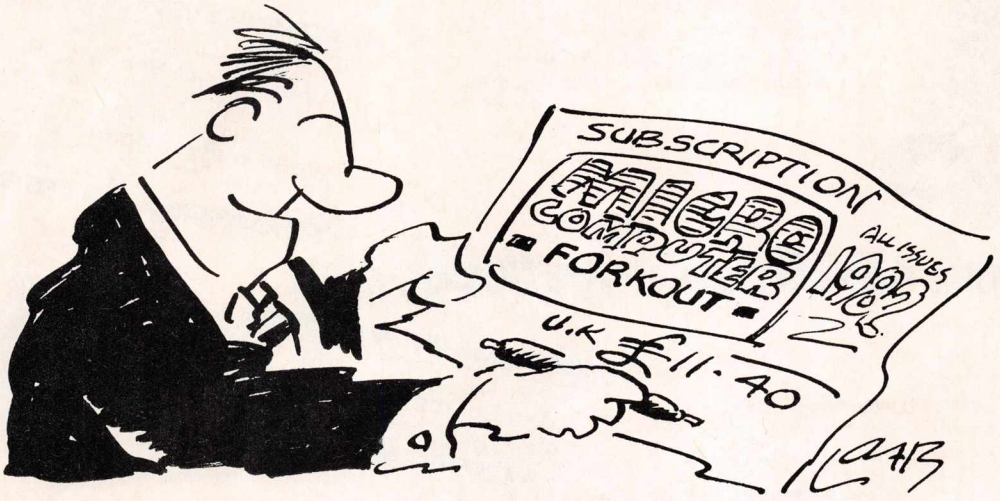

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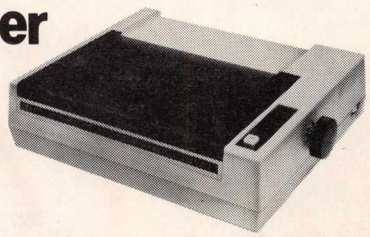

Who Needs Maths Anyway ?

◀redundancy, resting on its microprocessors, or whatever computers rest on. Accordingly I settled for the small and comparatively cheap Sinclair ZX81. Russell had one, and waxed enthusiastic; he'd taught it a series of profanities which it displayed to order at singularly innappropriate moments, and this had a certain charm. Rob, who has more letters after his name than in it, all related to Cambridge degrees in computer sciences of one sort or another, wasn't quite convinced. The deciding influence was the listening bank, who having listened sympathetically, if not enthusiastically, to all the arguments in favour of a giant American sports car, were not so sure about computers.

The ZX arrived, with the extra 16K memory pack, all wrapped up in that white crispy stuff which makes opening presents so much fun. The instruction leaflet is 212 pages long ...

The first chapter is plugging it all in. Anyone with TV games could manage this without help, so I did. What the book didn't say, and should have done, is that you can't read the screen even after the set's tuned in unless the brightness control is at maximum. It was some time before I discovered this by accident and with some foreboding; if Sinclair have forgotten this what else have they left out? The two leads thoughtfully provided with the unit, for storage of information on a cassette, are very wonderful indeed. Except they don't fit my cassette recorder. Never mind, that's a bridge to be crossed at a later date, when we know what we want to say to the cassette and how to say it.

Multiplicity of purpose

First – the destructions. The simplest of things to begin with, like using the computer as a calculator and making it add 2 and 2. First type PRINT. If you can find it. The unit is minute, and the keyboard no bigger than a desk calculator, but capable of much more. Consequent upon this is the multiplicity of purpose ascribed to each key; three if not four functions. To begin with, then, you start searching for the key you want. Found PRINT. It's a function of P which happens automatically at the start of an operation or which can be produced later by pressing FUNCTION, which is shifted NEWLINE. The SHIFT key is on the left. Ten minutes gone and I've found three command keys, but still not added 2 and 2. But the screen does say PRINT, which means I can proceed. 2 is easy, because the numbers are at the top. Plus, on the other hand, is not so easy... 1 EDIT, 2 AND, 3 TO, 4 PLOT, 5 UNPLOT, IF, INPUT POKE. POKE? What the hell does POKE mean? SIN, COSIN, TAN, I know them. PEEK? PEEKS and POKES? This is looking good. ABS? That's plastic. PLUS! Found it. Now the screen says PRINT 2 + 2 at the bottom. Now tell it NEWLINE, or it doesn't know you've finished, and voila! The answer's 4. What next?

Cursed Cursor

The book says type PRINT ++2 to get PRINT ++2 with an L cursor, except I've got PKK2. Is that why they're called cursors? Where's the ERASE button? I want a command function that says ERASE. RUBOUT. Is that it? The book's no help. Keywords, History Lessons, Exponential Functions. What's an Exponential Function? Oh God. Having been thrown out of every conceivable form of scholastic endeavour which is even remotely connected with sums I have the feeling that things may be getting out of hand, a bit. Alright, a lot. It doesn't tell you have to erase and start again. I've finished doing 2 + 2.

Ah, got it. RUBOUT's a shifted character. Back one space...got it. Back again one space....it's going forwards, the rascal. Damn. Press NEWLINE and see what happens .... bloody thing. All I want is ERASE. How do I get 4 off the screen? Help! Ah! It's gone.

Now, type ++2 and ... what's this S? The computer thinks I've fouled up. So let's correct it by moving the cursor and playing RUBOUT. Great! It works. Now, am I ready for bigger things? Or have I got to spend weeks playing sums with the rotten thing?

'Clear the computer by pressing NEW'. Great! But why is it in Chapter 10, and why

ZX Keyboard: confusing to beginners

have I found it by accident? Why do I have to wait until Chapter 10 to find out how to clear the screen? Mistakes are the first thing I'm going to make. And it can't only be me who's this dumb, can it? And where the hell is NEW anyway? Why isn't there a little diagram every time a new command is introduced, so berks like me can find it easily? This keyboard is jolly complicated. Hasn't cleared it anyway. All I want to do is get this stupid sum off the screen. Aha! Turn the whole thing off .... and then turn it on again... and it's all brand new. Right. NEWLINE means 'gimme the answer'. Just use it as a calculator. Onwards....

Colossal cheek

Blimey. BASIC. Somebody's got the colossal cheek to call this BASIC. Let's have a look through the chapters..... Telling the computer what to do, Functions, Strings, Variables, When the computer gets full.... it's never going to get full at this rate. 'All the programs we have seen so far have been fairly predictable...' They must be joking.

'Clear the computer using NEW and type in and run this terribly amusing little program.' 10 PRINT 'Shall I tell you a joke?' It can't bloody spell. 'Shall I tell you an ache?' Stop. Cancel all this. Start again. PRINT. It only says P. Why does it only say P when I want it to say PRINT? Why isn't the keyboard like my typewriter? And why hasn't it got proper keys? These 'touch-only' buttons are all very well, but you really have to touch them hard if you want it to take any notice of you. It'd be much nicer with real keys that went 'thunk' when you hit them, instead of printing something you didn't want and still can't get rid of without unplugging and starting again.

In fact the whole thing's a bit odd. There seems to be no way of correcting errors until you reach chapter 10, but I need them now, in Chapter 3. Worse still, another disturbing, and far more important thing has come to light here. To begin with it's the method of teaching. I can recall the various space agencies and science fiction films all talking about contacting alien life. They said that it would be silly to expect Martians to speak English, or even to comprehend any earthly form of language. However, if they were capable of spaceflight then they'd be certain to understand maths. Therefore the broadcasting of mathematical information was much more likely to indicate to them the presence of intelligent life on earth than anything else. Sinclair seem to have adopted the same attitude; they're trying to teach me how to use the ZX by showing me how to do sums with it. This is all very well for anyone who understands sums even vaguely. However.... Winston Churchill, who was nobody's fool, did express the disbelief that anyone could take two random numbers, mix them up with a series of mathematical signs and predit the result with any degree of accuracy. I know what he meant. Thus explaining the ZX via trigonometry is a waste of time. I don't even understand the sums when they're not on a computer. Making me do them on one therefore volunteers no further information about the use and application of the machine than the rather complicated circuit diagram on page 162 of the instruction book.

Complicated maths.

This bit's easier. Chapter 6. "LET EGGS = 58 (& NEWLINE, of course)'. Of course. Eggs I can deal with. Type it in. Now type 'PRINT EGGS'. And up comes 58 at the top of the screen. Now we're getting somewhere. I can teach it to remember stuff. If you want to know the price of six eggs type 'PRINT EGGS/2' and it says 29. Smashing. It works. At last. And now, 'should you want to know the square of the sine of the price of one egg, type 'PRINT SIN(EGGS/12)**2'. Who in the hell wants to know the square of the sine of the price of a bloody egg? Quite frankly, in the words of Rhett Butler, I don't give a damn. Neither do I entertain the slightest desire to perform complicated mathematical operations upon the person of an egg. All I want to do is remember the time and where six or seven people are, plus what they're doing....

For the purposes of this magazine, being a family affair and all, we have skipped a vast chunk about here. In the main it consisted of a variegated admixture of profanity and confusion occasioned by two main constituents. The first of these, and I'm not too proud to admit it, is a defiant refusal ▶

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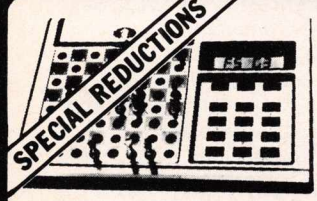

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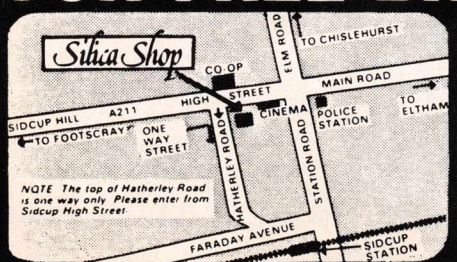

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Who Needs Maths Anyway ?

◀ on the part of the pupil to have anything to do with sums. I've got on very well without them up until now, and I see no good reason to alter this habit in order to gain the submission and obedience of a collection of silicon chips at this advanced period in life. The second, and I'm not too reserved to point it out, is the rather inadequate instruction book with comes with the ZX.

Groping in the dark.

Criticism of this tome falls in two parts. One of them you are, having read this far, already familiar with and that is the obstinate refusal of the author of the said instruction book to introduce purchasers to their new toy via any means other than a strictly mathematical approach, during which the square root of the cosine of the price of one egg may be correctly determined by reasonably simple means. Quite why any sane person should entertain such an obviously unhealthy interest in the various functions of the price of an egg (or any other form of dairy produce for that matter), is, like the mathematics involved, entirely beyond my comprehension. The other is obvious enough, given the book's overwhelming concern for, and relish of, obscure mathematical tricks. The English is faulty, and equally obscure. Which means that even if I had a basic knowledge of sums I may well be groping in the dark a bit.

Add that to a strange mix of priorities (why aren't the correcting of mistakes and erasure of unwanted data explained right at the start?) and the total misconception that pupils not only understand sums but are possessed of a perverted desire to perform them on the unlikeliest of subjects, and you can see that computers are not that easy. The method is clear. This is how you add two and two. Easy. But teaching you how to use the computer by showing you how to do sums is all very well if you understand sums to begin with. I don't. Neither do I understand the ZX81, and I've been playing with it for five solid days. PRINT TAN(45/180*PI) gives you tan 45(1). Fine, if you know that tan 45(1) is to begin with.

Storing words

To be honest and fair, which after five days of mental gymnastics with this plastic demon is the last thing I feel like being, it gets easier later. But even then, when you get on to strings, which are at least words, and therefore comprehensible to simple people, they are not left unscathed by the interferring hand of the numerate magician who wrote the instruction book. Having taught the pupil to store words in the machine he then goes on to show you how the computer can ascribe a numerical value to each string in order that you may compare one with the other and also, presumably, discover without trouble the square of the sine of the length of a string.

Gradually I am beginning to understand the plight of Patrick McGoohan, relentlessly pursued across the sands of Port Merion or wherever, by that vast plastic bubble, who insisted for at least 13 Episodes of *The Prisoner* that he was not a number. Even such a distinguished opponent of Big Brother and the computer age was finally sucked into the gaping maw of the computer, however. After weeks of determined avowals to the effect that he retained personality above digits, he was still found asking 'Who is number one?' Had he been taken in, or what?

Big Brother

With 1984 just around the corner, and Big Brother probably the geezer behind you in the bus queue, it looks as if computers have already taken over the world. I am forced to face this fact. I already know that I exist only as a number to computers all over the country; at the DVLC, the Inland Revenue, DHSS, TVLRO, my employers and even the wonderful credit card company which allowed the purchase of the ZX 81 in the first place. And the conspiracy doesn't stop there, because it now seems that even my own personal computer regards me simply as a number. It hurts me to realise that my own computer could tell you the sine of the square of its owner. To be honest I was becoming more or less resigned to being only a number. But I draw the line at being the sine of the square of myself.

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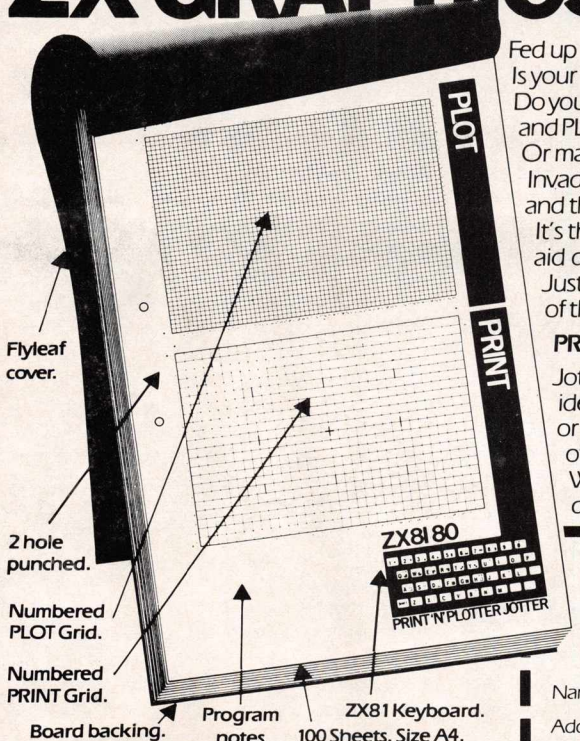

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DO YOU NEED DATABASE?

What is a database, and should you be using one? **John Gowans** investigates this growing market and concludes that you have to be very careful indeed when buying a database package.....

I admit defeat. My Synonym Finder, that much-used source of so much elegant variation, has no record of 'database'. 'Data' and 'base', yes, but no trace of their trendy combination. We're going to have to get at a definition from other directions, and if you think you've seen jargon before, you ain't seen nothing till you see some of the phrases concoted by database definers.

For instance, try this one on your pianola: "It is essentially a one-to-many relationship between records. It may be supported by pointer chains, indexes, or physical contiguity, or implied by the presence of corresponding key fields." Meat and drink to the database whizz – it is obviously a definition of the word 'set'. The Synonym Finder didn't tell me this either; it comes from a glossary written by a skilled Scicon man around four years ago, and I defy any beginner to figure it out.

Theoretical constructs

But you can understand the definers' problems. For a start, databases – and the database management systems that run them – are theoretical constructs that have little to do with physical reality, like degree-level mathematics. In my University maths course, the lecturer restrained himself from using numbers in an example because we hadn't defined what a number was; in this case the number '2'. These higher plans need rigour in their definitions, and although you might think you know what a number is you would have a tough job writing your definition down with the precision required. No wonder I packed in my maths degree.

This theoretical digression is meant as a kind of warning to readers who want to find out about database management from the primary sources, notably the 1971 report of the Conference on Data Systems Languages (Codasyl). It is tough going, and makes no concessions to the uninitiated. Let's hope this *MicroComputer Printout* attempt is a bit clearer.

First off, databases themselves. In common parlance the term is used to mean any collection of data about anything, replacing the older 'data bank' that used to be applied to computer systems the writer or speaker didn't approve of – viz, "I'm recorded in the police data banks." But a database is really a collection of data that is related in various ways and which can be interrogated in various ways through the database management system programs. We'll go into the relationships and the interrogation later, but for now the big point is that the data in a database is stored in a structure that makes it easier to get the information you need out of the computer. The user need have no idea how and where the data is physically stored, but only needs to work out the structure that suits his data and the information he needs to extract from it.

It is the structure of the prospective database that causes all the theoretical tangles and dumbfounding definitions, since this is the abstract construct that needs translation into reality if you are ever going to get what you want on the screen or printer. And if you are going to buy one of the increasing number of self-styled database management packages on the market, the structures it allows you to create must be the major concern.

These packages are designed simply to let the user get answers to any questions he wants to ask about the data he has stored. For instance, if you were running a computer magazine you might have file of subscribers's names and addresses; a file of contributors and the subjects they've written about; a complete index of what's been published in the magazine since the year dot; and a file of payments made to contributors – all ready to go on the computer. But this information needs to be organised so that you can ask questions like "How many subscribers are there in Devon with subscriptions expiring in May?", or "Which contributors have written articles published about the Apple, are not subscribers, and have not been paid for two years?" (sorry Richard, no offence). If you organise it properly, a database and its management system would be able to give you fast answers to these and many other more ludicrous questions.

Self-styled

The observant reader will have noticed the phrase 'self-styled' applied to database management systems on the market. This is not intended as a sideswipe at software firms, but as another warning to the reader – many of these products come nowhere near the Codasyl specification for such systems, good though they may be. We have got to draw lines somewhere.

The first thing to figure out is whether you need a database management system – henceforth shortened to DBMS – for your application. It's a new area in computing, particular in microcomputing, and computers were manipulating files of data long before the DBMS appeared. Old is not necessarily bad, and perhaps your data lends itself to old methods. Before going on to the different types of DBMS (both Codasyl and non-Codasyl), let's look at tried and tested techniques of organising your data storage.

In days of old, when tapes were sold, serial and sequential files ruled OK. In the first, records – that is, little blocks of related bits of data – are stored one after another on the reel of tape, jammed up together, and in no particular order. In the second, the files are made up of records jammed together in an order determined by one item in each record; by one customer number, account number, or part number for example. Serial files are fine for things like payroll, where you have to go through the whole set of records anyway to do payslips, updating the amounts as you go, but for answering queries about particular records they are useless. If, say, you had a serial file of names and addresses you would have to go through the whole file to find the postcode for one address.

Key items

Sequential files made this kind of thing easier, thanks to the Indexed Sequential Access method (ISAM). As described above, sequential files have their records sorted into order depending on some key item or other; and a separate index file is formed to contain a list of the key items together with their locations in the main file. So, if you want to find the address of a customer whose record is stored using customer number as a key, all you have to do is put in the right number for that customer. The computer will sort through the index file, find whereabouts in the main file the record with the number is, and go straight there to get it out for you.

But even ISAM makes some unwarranted assumptions about the questions you are going to ask about your data. Such as, in the example just described it is assumed that you know the customer number that goes with the record you want to look at. And if, in

the same example, you wanted to get a list of customers who lived in Manchester, or who owed more than £500, you just couldn't do it without looking through the entire main file for the little relevant lumps of data.

So how can database systems help? The main thing is that they let you get at the same data by different routes, so that you don't need to know the one key fact about what you want – the customer number for example.

The simplest form of a DBMS for microcomputers uses a simple structure which is called various things like a file type database, an inverted database, or multi-index database. These definitions are a real bind. This structure is the one most commonly used in microcomputer databases, and at any one time the user has access to just one big file ordered like a sequential file according to the value of one key item in each record. But, and here it is a big but, the user is not restricted to searching through just one index file. A number of items in each record can be used as retrieval keys, and each item chosen as a key has its own index file so the computer can find particular occurrences.

Reports

You might have noticed that explaining this kind of thing leads you into all kinds of corners. Let's have an example: Say you're still in business as a computer magazine proprietor, and you have a big file of subscribers (you hope) made up of records consisting of name, address, and the date the subscription was taken out. Now, with this database you can say that the name, the town part of the address, and the month part of the subscription date are the keys, and tell the computer that. It creates index files for each, as described earlier; and then you can find out things and produce what are called reports – really the answers to the questions you want to ask about the data. For instance, you could sort the file into alphabetical order of subscriber name, or into chronological order of subscription date. You could look for all occurrences of 'Bristol' in the addresses, and print out the associated names. You could make a list of all subscribers whose subscriptions will expire in the next three months. And all this without having to know where any of the information is stored, just the structure and the search keys you have imposed on it.

Most commercial packages have this kind of database management, including Jinsam from Hini Micro-Systems of Riverdale, New York – this runs on the Commodore PET, and if the company's adverts are to be believed it has been "selected by NASA, Kennedy Space Center, With Multiple Applications Related to the Columbia Space Shuttle Project." The capitals are theirs, the meaning is anyone's guess.

Others of this type are Microconductor for Microcomputer Technology, which runs on the TRS-80 and the Apple II; Information Master from High Technology for the Apple; and Profile I, II, and III for the TRS-80; this last is put together by Radio Shack itself. Nor are State-of-the-Art packages restricted to US origin, with many good examples coming from software houses in this country. A glance through the advertisements of this magazine would be productive, though I cite DMS, The Administrator, and Silicon Office as good examples.

Esoteric structures

You will certainly discover that the prices vary a lot even for this simple type of system, and this confusion will continue. The trouble is that you are not just paying for the information storage and retrieval facilities, although that might be all you get in the really cheap DBMS. You have to check up on a lot of other things as well; whether you can choose the format you enter data in and the format in which your reports are printed out; whether the DBMS interfaces to other programs like WordStar for word processing or mathematical routines for doing calculations on the data; how easy it is to command the system to get the data you want out of it; and what kind of fiddling around with files it lets you do.

This is one field where what you get does not necessarily depend on what you pay, since some commercial DBMS packages might be slow at sorting and retrieving data but have wonderful editing and formatting facilities – one good example of this is the Information Master package for the Apple already mentioned. But one thing you can be sure of is that once you move into the more esoteric database structures you are going to be paying a lot more.

The next step up from the simple systems we've looked at is an obvious one. They can only handle one file of records at a time, and the next batch can deal with more than one. This can be handy. For instance, in our example you could combine the subscribers file with the magazine contributors file, and do a combined search of both at once to find out, say, how many subscribers are contributors or vice versa, and create a cross-reference file showing this. And, of course, you could do searches and sorts on the contributors file in its own right.

There are fewer examples of this type of set-up. There is FMS-80 from Systems Plus of Mountain View in California, which runs on any CP/M machine and costs $750; and Selector IV from Micro AP of San Ramon, California, which also runs under CP/M and costs $550.

Real heavies

And finally come the real heavies, the relational and network DBMS packages. This is theoretical city Arizona, and much of the blame must be placed at the door of Dr. Edgar Codd, IBM's database king. He has been described as "the inventor and deity" of the relational approach, and the same source describes his work as "the piece of Codd that passeth understanding."

I'm glad I didn't say that. After all, I've got to try to explain the stuff.

Now the usual explanation of relational databases says that they allow the user to look at data as tables, however the data is stored on disk. I always find this a bit confusing, although the alternative – a structure that relates every item of a record to every other item of every other record – is not much better. Okay, let's try to see how it's done.

Not surprisingly, we start with a table, no surprise since in this context the word 'relation' means a two-dimensional table, like a two-dimensional array. This first table lays out all the data that will go on the database, with each column, being one of the key pieces of information that you might use. One example I've seen is a programming personnel file where the columns are the programmer's name, the languages he is familiar with, the number of years he has used each language, this job title, experience in the company, his hourly pay, the project he is working on, and the manager of each project.

Now if you start filling this table in, starting with the name column, you end up with a basic table of data. But this won't do for our relational structure, since each programmer can know more than one language and work on more than one project – and this violates the relational database rule that every column must have just one value in each row. For example, under 'language' you couldn't have a row with both Cobol and Fortran in it.

Rearranging the table to make this happen is the first stage in what is called normalisation; the next stage is to work out which col- ▶

Many people wrongly use the word Database in place of Databank – when referring to large collections of information used for purposes of which they don't approve.

umns depend on which other columns and then to split these up into other relations, each with its own key. Then, finally, you build up any other relations you need to get the information you need, and this final form is called the third normal form.

Tables turned

This all sounds a bit of a mess. But what you end up with as your database structure is a set of two-dimensional tables showing different relationships between items of data. For instance, in the above example you end up with four tables: one has employee name, job title, experience, and pay as its columns; the next has employee, languages known, and language experience; the third has employee and the project worked on; and the last has the project name and the manager of the project.

Forgetting detail, the normalisation procedure gives you some set of tables, or relations, that enables you to get at anything you like, by extracting information from one relation and carrying this on to the next appropriate relation, and so on. In the example we are using, one question might be "What is the Cobol experience of senior programmers working on a project managed by such and such manager?" The DBMS could go to the project/manager relation to find which projects are managed by the particular manager; then to the name/job title/experience/pay relation to find which of these programmers has 'senior programmer' as his job title; and then to the name/language/language experience relation to find out whether the programmers know Cobol, and if so, what experience they have in that language. And, bob's your uncle, there is your answer.

Well, at least I've succeeded in showing you how complicated relational DBMSs have to be – and how careful the user has to be in designing the structure he wants in the first place.

There are very few relational DBMSs about for just this reason, especially (of course) for micros. Even IBM, Codd and all, has only just made a tentative step into relational systems with its recently-released SQL/DS. But there are a few, including the Condor Series 20/DBMS from Condor of Ann Arbour in Michigan, which runs on any Z80 machine and costs $695; Quest from Software Products International of San Diego, which costs $490; Request from United Software of America, which runs on the PET and the Apple and costs $225 (I find myself doubting the relational qualities of a DBMS for that price, but there we are); Sequitur from Pacific Software, which runs only on the 16-bit Onyx hard disk micro under Unix and costs – wait for it – $3,495 (I can believe that one); and dBase II for CP/M from Ashton-Tate, costing $700. Several of these products are imported into the U.K. by individual dealers or software houses.

And now we come to the only Codasyl-compatible micro DBMS, from a company called, oddly enough, Micro Data Base Systems Inc. This is what is called a network database, as all Codasyl types are. With a network system the user can navigate his way through a set of files, jumping from one to another as required. For example, if the user is in a parts file at a particular parts number, he could jump to the supplier/parts file to find the suppliers of that part, and then jump to the suppliers file to find the suppliers' address.

Query language

MDBSI (the company) supplies its MDBS.DMS (the product) with the option of adding a program that provides a query language – a common feature in big computer DBMSs and on some micro versions. A query language is generally English-like, and allows the user to type in something like 'Find all parts numbered between 124 and 278 with a stock level between 100 and 200' and get the right answer.

The query language is the interface between the user and the DBMS, and in relational and network systems allows the user to navigate his way round the structure of files or relational tables without writing any retrieval programs.

This, believe it or not, is just scratching the surface of DBMS and database theory. The information revolution means that more and more data will need to be organised in more and more ways, and like it or not the micro will be at the sharp end.

Micro DBMSs are still in their infancy, but watch out for developments. And watch out for the advertising copy as well. Here's another goody: "can be a view of the data structure which differs from the basic physical hierarchy defined in the original database definition".

That forms part of a definition of the word 'logical'. I think I just flunked another test.

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PART 2

How you can achieve some very sophisticated programming techniques using simple BASIC strings. **Mike Gross-Niklaus** explains .....

In the first part of "Strings and Things", the fundamental tools for handling strings were explained. You saw how to format output for any printer, how to split up strings containing packed information and how to scan a string character by character, together with an application which reversed first and surnames in a list.

In this article I will show you how I use strings to create sub-languages, call named subroutines, and pass groups of parameters to subroutines. While these techniques might be called sophisticated, the means of achieving them is quite simple, provided you have grasped the concepts described in the first part of this article.

Creating sub-languages

Let's start by reviewing how you can use string functions to bite off fixed length chunks of a given string. One application of this is a routine which returns the abbreviated month name, e.g. Jan, Mar, Dec, given the month number. The trick is to set up the ordered abbreviations in a string, ensuring that 3 letters, no more and no less, are used for each month's abbreviation. I create such a string in the preliminaries block of of my programs.

```
1000 REM PRELIMINARIES
1010 DA$="JANFEBMARAPRMAYJUNJUL
     AUGSEPOCTNOVDEC"
```

Then at any point thereafter in the program, the following expression will return the month abbreviation for month M in MN$:-

```
5040 MN$=MID$(DA$,M*3-2,3)
```

This expression, you may recall, takes a substring out of DA$, starting at M*3-2, and taking 3 characters. Thus if M were 1, the substring would start at character 1*3-2 (=1), so MN$ will be "JAN", while if M were 8, the substring would start at character 8*3-2 (=22), and MN$ will be "AUG".

I use a similar technique to format reports extracted from a mass of information held in an array. Suppose for example, an array holds 25 figures and a parallel string array holds their titles or descriptions. And further suppose that I want in one report to print titles and figures for items 1,7,11,12 and 13 only, listed with the titles starting at column 1, and the figures starting at print column 40 with the exception of item 13's figure, which I want to start at print column 50. In other words, a typical financial report.

This we will assume is just one of several reports I may want to produce from the array. Another might require figures 13, 18 and 19 lined up at print column 40, figure 15 lined up at column 50 and figure 25 at column 60. Diagrams 1a and 1b show what the two reports might look like.

To do this using a separate routine for each report is wasteful of memory. For a combined routine however, we need a way of specifying what items are to be printed and in which column the figure field is to start. Provided these are available we can write one routine which selects and formats any sub-group of information from the arrays.

Formatting string

The trick is to create a formatting string which the report-producing routine dissects or parses so as to obtain the details for selection and formatting. *(Parsing,* by the way, is the jargon word for testing whether a set of characters form a logical command and interpreting what action is to be taken.) Provided you write a parsing routine to match, you can use whatever conventions you like in this formatting string. For example, to produce the report of diagram 1a, you could write:-

```
FS$="01-40,07-40,11-40,12-40,13-50,"
GOSUB 40000
```

You will have created your own sub-language which tells the report routine to print items 1,7,11,12 and 13 with the figures starting in column 40 or 50. In this case the language assumes preset field lengths for titles and figures.

To parse the format string requires the same technique as used for the month abbreviations. A full print routine for dealing with arrays DA$ and DA is shown in LISTING 1.

Let's look at this routine in detail.

Line 40010 is a useful technique, provided you have a machine (such as the Commodore PET) which lets you use the same routine to print to the screen or a printer. If DV=3, (PET SCREEN device number), the output will go to the screen. DV=4 will send it to the printer provided you have set it up as device four.

Line 40020 is a loop to scan the formatting string. The INT business is to ensure that all portions of the string are processed. See Mikes Muses this month for more information.

Line 40030 extracts the 'Ith' portion of the formatting string. I include commas in my

ITH STRINGS

Programming Technique

strings to make them more readable during program development, but it isn't part of the formatting information. Line 40030 therefore extracts only 5 characters, ignoring the separating commas.

Line 40040 extracts the required solution and formatting parameters from the portion. The array element to be printed is specified in the first two characters and the start column for the figure field in the last two characters. Once again I include the hyphen merely for readability and the parse routine ignores it.

Line 40050 prints the title for the specified figure, padded out to 39 characters with the spaces contained in SP$, (Set up in my preliminaries block of course) and further padding to ensure that the figure field starts in the right place. For example, if PC is 40, then no extra spaces are printed so the figure field will start straight from the title, i.e. in column 40; whereas if PC=50 then ten extra spaces will be printed and the figure field will start in column 50.

Line 40060 processes the specified figure, DA(EL), to align the decimal point. Subroutine 50400 is one of my standard subroutines, shown in LISTING 2.

Line 40070 handles the next portion of the format string and line 40080 effects a return from the Print Report subroutine.

Subroutine 50400 is a good example of nesting string functions within each other. Line 50410 rounds the figure to two places of decimals. Line 50420 deals with the case of the figure being zero.

Decimal alignment

The main alignment is carried out in line 50430. To understand it we must examine it from the inside and work outwards. 'Z+.005* SGN(Z)' ensures that a 5 is added in the third decimal place whether the number is positive or negative. The extra digit is added to ensure that trailing zeros in the first or second decimal place are included. For example, STR$(1.50) would result in "1.5" but adding the extra digit ensures that STR$(1.505) gives "1.505" and we can chop off the third digit later on to give "1.50".

RIGHT$(" "+.....,10) right aligns the string, including the third decimal digit, in a 10 wide field.

LEFT$(.....,9) chops off the third decimal digit.

You can devise your own conventions and meanings for format strings provided you also write the appropriate parsing routine as in the above example. You need not restrict yourself to formatting applications. For example you could use a sequencing string to determine in which order a set of subroutines is to be processed. For example:-

```
 2010 SQ$="1542" : GOSUB 40100
40100 REM SEQUENCER
40110 FOR I = 1 TO LEN(SQ$) :
      SG=VAL(MID$(SQ$,I,1))
40120 ON SQ GOSUB 45100, 45200, 45300,
45400, 45500, 45600, 45700
40130 NEXT I : RETURN
```

will cause subroutines 45100, 45500, 45400, and 45200 to be obeyed in that sequence, while on another occasion in the same program you might have:-

```
3010 SQ$="4612" : GOSUB 40100
```

which will cause routines 45400, 45600, 45100 and 45200 to be obeyed.

Passing parameters

Very often a subroutine needs several parameters. Suppose for example you have a routine to print a message somewhere on the screen. You might want to specify the line and the column within the line at which the message is to start or whether it is to be centred on the line, and whether it is to be in normal or "reversed' display mode. Normally you might write code along the following line:-

```
Z$="WOW!" : LN=5 : CO=14 : DM=0 :
GOSUB 20000
```

meaning "Print 'WOW!' on line 5, starting in column 14 and display in normal mode". Whereas:-

```
Z$='WOW!" : LN=5 : CO=0 : DM=1 :
GOSUB 20000
```

might mean "Print "WOW!' centred in line 5 in reverse display mode".

Another way of doing this is to use a parameter string and a technique similar to that shown above using formatting strings. In this case, however, the parameters are not in a fixed format or of a fixed length. Instead they are separated in the parameter string by, say, commas. An unpacking routine places the various parameters into a parameter array from which they are extracted by the subroutine which requires them. Such an unpacking routine is shown in LISTING 3.

Line 50510 initialises a collection string, (Z$), and a parameter array pointer (EL), then scans each character of the parameter string in turn.

Line 50530 checks to see if it's a comma, (the parameter item separator). If not, it adds the character to the collection string and moves on to the next character.

Line 50540 deals with a comma. The contents of the collection string are copied to the element of the parameter array currently pointed at by EL. The collection string is re-initialised and the array pointer moved on one.

Line 50550 moves on to the next character in the string gets copied to the parameter array.

In use you might code along the following lines:-

```
 3050 Z$="WOW!" : PS$="5,14,0" : GOSUB
20000
20000 REM PRINT MESSAGE
20010 GOSUB 50500 : REM UNPACK
PARAMETERS
20030 etc.
```

My own PRINT MESSAGE routine uses letters as well as numbers:-

```
4010 Z$="TEST MESSAGE" : PS$="25,C,R"
: GOSUB 20000
```

would cause "TEST MESSAGE" to be printed in reverse display mode in the centre of line 25 at the bottom of the screen.

Calling subroutines by name

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heavy, don't panic! They are a distillation of many hours of programming and experimentation. It may well take you an hour or so to see exactly how they work.

To finish up with, let's tackle an apparently very sophisticated problem with a very simple bit of string coding. You will undoubtedly have met the problem where you code something like:-

```
IF A=B THEN..... : REM SORT ROUTINE
```

where you can't put in the line number because you haven't yet written the SORT routine. There have been a number of very clever machine code routines written which either add extra parsing on to the front of the BASIC INTERPRETER whenever it meets a GOSUB, so as to allow such things as 'GOSUB SORT' : or which process the parameter immediately following a SYS call to achieve the same result, e.g. SYS 826 SORT. Both methods then scan the program lines looking for REM SORT or some-such and effect a GOSUB to that line.

You can achieve the same effect with very simple programming in BASIC, by setting up a SWITCHING routine along the following lines:-

```
40300 REM SWITCHING ROUTINE
40310 IF Z$="SORT" THEN 50800
40320 IF Z$="PRINT" THEN 20000
40330 IF Z$="EVALUATE" THEN 25000
40340 etc etc
```

The line numbers after the 'THEN's can be filled in when the appropriate routines are written.

In the main body of your program, you can write:-

```
Z$="SORT" : GOSUB 40300
```

or

```
Z$="EVALUATE" : GOSUB 40300
```

without any thought as to what line numbers the SORT or EVALUATE routines occupy. Moreover, if later you decide to alter the positions of these subroutines, you don't have to wade through your program looking for GOSUBs to amend, (SHUT UP!! you smug BASIC AID or TOOLKIT owners!!). Only the line number in your switching routine (in this case 40300) have to be changed and they are all in the one place.

So that's it – my 'mind dump' on the Wonderful World of Strings. Most of the ideas stemmed from looking at other peoples' programs and as always, I advise you to follow through as many programs as you have time for, provided you know what they achieve. I look forward to hearing from you about your own favourite string routines.

Diagram 1a

```
 1 Phone Bill                150.00
 7 Post, stationery           12.00
11 Coffee and tea supplies     6.00
12 Cleaning, towels, etc      50.00
13 Office running expenses              218.00
```

```
13 Office running expenses 218.00
15 Tea and coffee payments              7.50
18 Petty Cash               56.00
19 Electricity and Gas     120.00
25 Total of office costs                        386.50
```

Diagram 1b

```
40000 REM REPORT
40010 OPEN 1,DV
40020 FOR I = 1 TO INT(LEN(FS$)/6+.5)
40030 SS$=MID$(FS$,I*6-5,5)
40040 EL=VAL(LEFT$(SS$,2)) : PC=VAL(RIGHT$(SS$,2))
40050 PRINT#1, LEFT$(DA$(EL)+SP$,39); LEFT$(SP$,PC-40);
40060 Z=DA(EL) : GOSUB 50400 : PRINT#1, Z$
40070 NEXT I
40080 CLOSE 1 : RETURN
```

Listing 1

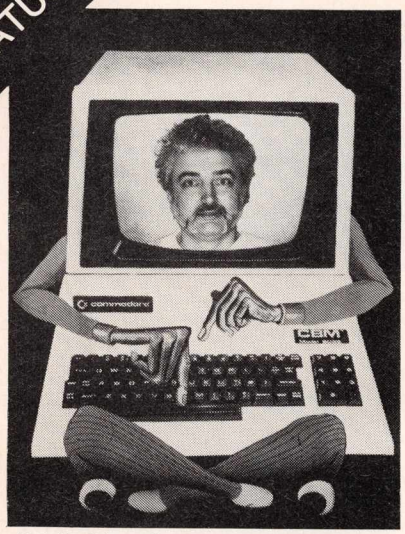
```
50400 REM ALIGN
50410 Z=INT(Z*100+.5)
50420 IF Z=0 THEN Z$="       0.00" : RETURN
50430 Z$=LEFT$(RIGHT$("          "+STR$(Z+.005*SGN(Z)),10),9)
50440 RETURN
```

Listing 2

```
50500 REM UNPACK PS$ INTO PS$()
50510 EL=1 : Z$="" : FOR I = 1 TO LEN(PS$)
50520 C$=MID$(PS$,I,1)
50530 IF C$<>"," THEN Z$=Z$+C$ : GOTO 50550
50540 PS$(EL)=Z$ : Z$= "" : EL=EL+1
50550 NEXT I
50560 PS$(EL)=Z$
50570 RETURN
```

Listing 3

PET FEATURE



DISK DO

PET supremo **Jim Butterfield** discloses two of his favourite and most useful disk routines. One for checking on the veracity of a particular disk and the other for changing your drive number without recourse to a soldering iron!

Disk Checkout

Before I take a diskette "on the road", there are two things that I often want assurance about. First, are all the files good? Secondly, are the empty blocks in good condition?

This program tests the disk for these two properties, and adds a third: it will reclaim a scratched file if desired, if the file is still intact on disk.

The program is constructed to work on 2040, 4040 and 8050 disks. On 2040's, however, it can only usefully perform the first of the three activities. Although not fully checked out, it also works on the single drive 2031 unit. In this case, reply S (for Single disk) when asked DRIVE NUMBER?

Checking Files

There's more to checking a file than seeing if it is there. Some of the questions that need to be asked are:

- Are all the blocks of the file OK?
- Are all blocks allocated?
- Is there conflict with any other file?
- Is the block count correct?

This program checks all of the above. In doing so, it has turned up a minor bug in the disk system: files joined with CONCAT and APPEND are likely to have the wrong block count. This doesn't hurt anything, but gives you misinformation on your directory listing.

File names are shown on the screen as the files are checked. If trouble occurs, the program will continue to the next file. See the note below on errors.

Checking blocks

If you plan to write on a disk, and aren't sure everything is in good order, option 2, checking blocks, is convenient.

The program reads all blocks and ensures that they are in sound working order. 2040 type disks (DOS 1) can't be checked in this way; when a 2040 diskette is new-ed, all blocks are not written. This program checks by reading, not by writing; it can't do a valid job if some blocks have never been written.

The blocks and sectors are shown on the screen as they are checked. If there is an error, the program will stop with an error notice. See the note below on errors.

Un-scratching

The program searches the directory for the names of scratched files and asks you whether you want to recover any file. When you say YES, you will be asked to identify the file type – this information was lost when the file was scratched. Then, a number of checks are very carefully made:

- Are all blocks good?
- Are all blocks free?
- Is the block count correct?

If the file passes all the above tests, the unscratching takes place, and the disk is asked to perform a VERIFY/VALIDATE/COLLECT which re-allocates the blocks.

Only one file can be reclaimed during a run. Multiple runs can unscratch many files, one at a time. I did it this way to provide an extra level of protection, but you may change the program to allow mutliple un-scratches if you wish.

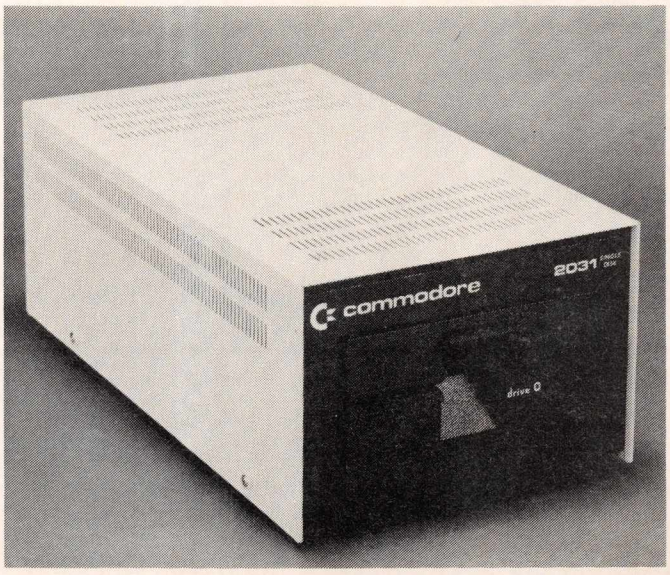
The program

The program is written entirely in BASIC, so a user can modify it to his particular needs. Except for a very small part of un-scratch, the program does not write to the disk; it only reads. Be aware, however, that closing a direct channel will force a BAM write to take place; this makes it desirable for a program to run through to completion rather than be stopped halfway through. See the error note below.

The Block Availability Map (BAM) is printed, and this may be an interesting thing to view for users who are not aware of the disk's organisation. The centre track (track 18 or 39) is reserved for the directory, and file space is allocated close to this centre track where possible; this minimises drive head movement. When a file is written on a track, it is not written to consecutive sectors but "hops around" in order to optimise speed.

The program decides what sort of disk it has, based on information supplied by the diskette itself. Thus, a 2040 diskette placed into a 4040 drive will be recognised as being 2040 format.

The directory is read from disk the "hard" way – as a bit



These utilities will work on all Commodore disk units including the new 2031 single drive.

CTOR

map. This allows us to see things that a "normal" directory won't tell us, allowing us to find file starting locations and to see scratched files if we wish.

This program won't attempt to read a disk which is bad format. If you can't initialise a disk, this won't help you.

Error procedures

If you find a problem on a disk, get it out of your inventory as quickly as possible. Copy the files you can salvage over to a fresh diskette. Diskette problems don't solve themselves: once a disk in in trouble, the errors can propogate and eventually harm your good files. It won't happen often; but none of us need to have it happen even once.

Summary

I find the program handy. I hope you will too. The most important factor is that now I can use one program for all disk units.

```
100 print"disk checker  - jim butterfield"
110 dim a(255),c%(77,28),d%(1),n$(224),t%(224,1)
      ,s%(224,1),l%(224),r%(77)
120 d%(0)=58:d%(1)=42:z$=chr$(0)
130 data 1,17,20,24,19,30,17,35,16,0
140 data 65,17,20,24,18,30,17,35,16,0
150 data 67,39,28,53,26,64,24,77,22,0
160 b$=chr$(17):input"drive#";d$
     :if d$="s"then d$="0":b$=chr$(3)
165 if d$<>"0"and d$<>"1"goto160
170 open 15,8,15,"i"+d$:gosub3020
180 open 3,8,3,"$"+d$:gosub3020
190 a0=1:get#3,a$:a=asc(a$+z$)
200 read a1:if a=a1 goto240
210 f%=f%+1:if f%=3 goto280
220 read a1:if a1=0 goto200
230 goto220
240 read a1:if a1=0 goto260
250 read b1:for j=a0 to a1:r%(j)=b1:next j:a0=j:goto240
260 if a=1 or a=65 then d1=1:t9=35:s9=3:d9=18
270 if a=67 then d1=257:t9=77:s9=4:d9=39
280 if t9=0 then close3:print"?? disk type ??":stop
300 rem    set and print bam
310 print"          free block map"
320 for j=1 to d1:get#3,a$:next j
330 for j=1 to t9:t1=0
340 if j=51 then get#3,a$,a$,a$,a$
350 get#3,a$:c=asc(a$+z$)
360 print right$(" "+str$(j),2);" ";
370 k1=0:for k=0 to s9-1:get#3,a$:a=asc(a$+z$)
380 for l=0 to 7:a%=a/2:d1=a-a%*2
     :if k1<=r%(j) then c%(j,k1)=d1:? chr$(d%(d1));
390 a=a%:t1=t1+d1:k1=k1+1:next l,k:print
400 if t1<>c then print"?";
410 next j
500 rem    do specific job
510 print:close3:print "    choose --"
520 print "1. check all files"
530 print "2. check for bad spots"
540 print "3. recover scratched file"
550 print "  your choice? ";
560 get x$:if x$=""goto560
570 x=asc(x$)-48:if x<1 or x>3 goto560
580 print x$:open 2,8,2,"#0":gosub3020
590 on x goto600,1000,1100
600 rem     check files
610 t=d9:s=1
620 gosub2000
630 for d=2 to 255 step 32:if a(d)<128 goto670
640 d3=d3+1:t%(d3,0)=a(d+1):s%(d3,0)=a(d+2)
      :l%(d3)=a(d+28)+a(d+29)*256
650 if a(d)=132 then t%(d3,1)=a(d+19):s%(d3,1)=a(d+20)
660 n$="":for k=d+3 to d+18:n$=n$+chr$(a(k)):next k
     :n$(d3)=n$
670 nextd
680 t=a(0):s=a(1):if t=d9 goto620
690 for d=1 to d3:l%=0
700 print n$(d);
710 t=t%(d,0):s=s%(d,0)
720 if t>t9 or s<0 then t=0
730 if t<1 or s>r%(t) then ?" bad chain":goto850
740 if c%(t,s)=1 then ?" unallocated blocks":goto850
750 if c%(t,s)>1 then ?" conflict "
     :n$(c%(t,s)-1):goto850
760 c%(t,s)=1+d
770 gosub3000
780 l%=l%+1
790 for j=0 to 1:print#15,"m-r";chr$(j);b$
     :get#15,a$
800 a(j)=asc(a$+z$):next j
810 t4=t:s4=s:t=a(0):s=a(1):if t<>0 and e=0 goto720
820 t=t%(d,1):s=s%(d,1):t%(d,1)=0:if t<>0 goto720
830 if l%<>l%(d) then ?" bad block count":goto850
840 ?:?chr$(145);"                              ";chr$(145)
850 next d
860 print:print d3;"files":goto1600
1000 rem   scan sectors
1010 if f%=0 then ?"sorry .. can't do it":goto1600
1020 for t=1 to t9:print"track";t
1030 for s=0 to r%(t)
1040 print chr$(145);tab(11);" sect";s
1050 gosub3000
1060 next s
1070 print chr$(145);"                          ";chr$(145)
1080 next t
1090 print"disk ok":goto1600
1100 rem    unscratch
1110 k=0:print"i will look for discarded files..."
1120 t=d9:s=1
1130 gosub2000
1140 for d=2 to 255 step 32
     :if a(d)<>0 or a(d+1)=0 goto1190
1150 if k=0 then print"do you want to recover:"
1160 get x$:for k=d+3 to d+18:print chr$(a(k));
     :next k:print "? ";
1170 get x$:if x$<>"y"and x$<>"n"goto1170
1180 print x$:ifx$="y"goto1220
1190 next d
1200 t=a(0):s=a(1):if t=d9 goto1130
1210 print"that's all ":goto1600
1220 t6=t:s6=s:d6=d:t=a(d+1):s=a(d+2)
     :l%(0)=a(d+28)+a(d+29)*256:l%=0
1230 get x$:print"is this file:"
1240 print" 1. sequential"
1250 print" 2. program"
1260 print" 3. usr"
1270 if a(d+19)=0 goto1290
1280 print" 4. relative"
1290 print"  which number? ";
1300 get x$:if x$=""goto1300
1310 x=asc(x$)-48:if x<1 or x>4 goto1300
1320 print x$:x=x+128
1330 if x=132 then t%(0,1)=a(d+19):s%(0,1)=a(d+20)
     :if t%(0,1)=0goto1230
1340 if t>t9 or s<0 then t=0
1350 if t<1 or s>r%(t) then ?" bad chain!":goto1500
1360 if c%(t,s)=0 then ?" allocated blocks!":goto1500
1370 gosub3000:l%=l%+1
1380 for j=0to1:print#15,"m-r";chr$(j);b$
     :get#15,a$
1390 a(j)=asc(a$+z$):next j
1400 t4=t:s4=s:t=a(0):s=a(1):if t<>0 and e=0 goto 1340
1410 t=t%(0,1):s=s%(0,1):t%(0,1)=0:if t<>0 goto1340
1420 if l%<>l%(0)then ?" bad block count!":goto1500
1430 t=t6:s=s6:d=d6
1440 gosub3000
1450 print#15,"m-w";chr$(d);b$;chr$(1);chr$(x)
1460 print#15,"u2:2,";d$;t;s:gosub3020:goto1700
1500 print "sorry - it won't work"
1600 close 2
1610 input"** set time to verify/collect disk";x$
1620 if asc(x$)=78 then end
1700 close 2:print#15,"v";d$:end
2000 rem    grab full disk block
2010 gosub3000
2020 for j=0 to 255:print#15,"m-r";chr$(j);b$
     :get#15,a$
2030 a(j)=asc(a$+z$):next j:return
3000 rem    read block
3010 print#15,"b-r:2,";d$;t;s
3020 rem   set error status
3030 input#15,e,e$,e1,e2
3040 if e<>0 then print"disk error:";e;e$,e1;e2
3050 return
```

DISK CHECK Listing.

Spaces have been added to the listing to aid legibility; it may be necessary to close them up to fit some of the longer lines. The number of spaces between quotation marks in lines 840 and 1070 is not critical – 20 spaces is sufficient.▶

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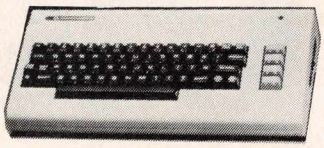

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DISK DOCTOR

◀ Device Changer

CHANGE DISK changes the device number of any disk: 2040, 4040, 8050 or 2031. It is an adaptation of a Commodore utility program.

Why would you want to change a device number logically? You can dig into the innards and restrap the disk to a new device number if you wish. "Logical" changes are temporary and vanish when power is removed from the unit.

Disk copies

The most usual reason is a temporary hookup. In order to make copies or do some similar job, you want to hook together two or more units. Maybe you've borrowed an 8050 from a friend for the afternoon; he wouldn't be pleased to find the unit restrapped when you return it.

The trick is to arrange for the program to search out the right place to do the disk unit change. There are three different sets of locations which are used on various disks: 12/13 on the early 2040 and 3040 units; 119/120 on 2031 units; and 50/51 on 4040s and 8050s. We find out which one is correct by PEEKing the innards of the disk and seeing which set of locations contain the correct (old) numbers. When we find the right one, we make the change.

For those users interested in "innards": the disk units check the device strapping once only at power up. It stores the computed "listen" and "talk" addresses in RAM memory, and from then on will use only the computed values. So we can change RAM, and the new device number will be operational until we cut the power.

```
10 rem**************************************
11 rem*
12 rem* change cbm disk   dec 29 /81
13 rem*
14 rem* this program changes the disk's
15 rem* device number to the number that
16 rem* is given by the operator. this
17 rem* can range from 9 to 15. this is
18 rem* a soft change; thus a reset of
19 rem* the disk will cause it to restore
20 rem* to the hard device number.
21 rem*
22 rem* this program is applicable for
23 rem* any 2040, 3040, 4040, 8050 or 2031
24 rem*
25 rem* this version by jim butterfield
26 rem*
27 rem**************************************
99 data 12,50,119,0
100 input"old device number";d1
110 if d1<8 or d1>15 goto100
150 input"new device number";d2
160 if d2<8 or d2>15 goto150
200 open15,d1,15:rem command channel
210 a$=chr$(d1+32):b$=chr$(d1+64)
220 read a:ifa=0 then print"disk not recognized!":goto310
230 print#15,"m-r"chr$(a)chr$(0):get#15,x$
    :if x$<>a$ goto220
240 print#15,"m-r"chr$(a+1)chr$(0):get#15,x$
    :if x$<>b$ goto220
300 print#15,"m-w"chr$(a)chr$(0)chr$(2)
    ;chr$(d2+32)chr$(d2+64)
310 close15
```

Listing: CHANGE DISK program.

Spaces have been added to the listing for legibility; you may need to close them up as you enter the program.

COMMAND-O ON TRIAL!

If you own a PET or CBM computer with disks then you ought to have a COMMAND-O chip. It's got all the facilities of that other chip (can't think of the name), plus BEEP, EXECUTE, INITIALIZE, PRINT USING, AUTO-REPEAT - and you can scroll a program listing up and down the screen! There are lots more functions, but perhaps the best way to learn about COMMAND-O is to use one. If you order a COMMAND-O chip from SUPERSOFT before 31st March you'll qualify for our special money back offer. Just return it in good condition within 10 days and we'll refund your money in full! COMMAND-O is for Basic 4 users only and costs £59.95 plus VAT. It fits in the UD3 or UD12 socket and comes with a comprehensive, but readable manual.

ARROW is a chip that will be of particular interest for committed tape users - because it will LOAD, SAVE and VERIFY at 7 to 8 times normal speed! There are lots more features for just £30 plus VAT, but since we're making the same money back offer why not try it out. Don't forget to tell us which machine you own (it works on all models except the original Old Roms) and which socket is available.

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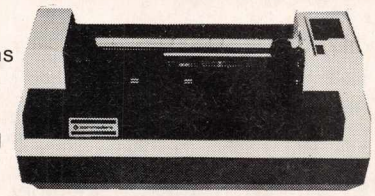

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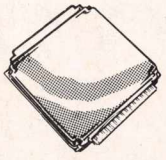

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FOR BEGINNERS

Read this and instantly understand every article in this issue.
Dazzle others with your deep knowledge of computing.
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There is a great definition of the difference between **Hardware** and **Software**: if you can kick it then it's Hardware! Hardware is the electronics and the casing in which they are mounted. Software is the **programs** you run on the computer. It's like a Hi-Fi system - the amplifier, record deck and speakers are all hardware, while the music you play on it is software.

The hardware of a microcomputer will consist of several parts including a **keyboard** for typing in instructions and a Visual Display Unit or **VDU** for displaying results. This could be your own T.V. set, or a specially modified screen built into the computer. On it you will be able to display **alphanumeric** characters (A-Z, 0-9 and punctuation) and special **graphics** characters for diagrams and drawings. These characters range from simple lines and squares, to intricate games symbols. The higher the **resolution** of your graphics, the finer the lines that can be drawn, and the smoother the curves appear.

Inside, the computer consists of **Integrated Circuits** (I.C.s) or 'chips' - small, solid-state electronic devices, encased in black plastic. The most important of these is the Central Processing Unit or **CPU**, which performs all the calculations and manages the whole system by shuffling information around its parts. The two most common 'models' of CPU are the MOS Technology **6502,** used in Commodore, Apple, Acorn and Atari microcomputers, and the Zilog **Z-80** used by Tandy and Sinclair amongst others. Two other popular CPUs are the Motorola **6800** and Intel **8080**

The computer has two types of memory. Random Access Memory or **RAM** is temporary memory - anything stored in it is lost when you switch the computer off - the technical term is **volatile.** RAM is used to store all the **commands** (instructions to the computer) you type in, the program which it is currently running and all the **data** to which that program refers. This data consists of **variables;** a variable is just one item of information and has a name which identifies it e.g. PRICE and a value - 5, perhaps. **Integer** variables can only cope with whole numbers, **Floating Point** variables can cope with decimals as well. **String** variables are not numbers, but strings of characters (such as someone's name or address) which can be **sorted** into alphabetical order, or **searched** for references to a particular word or 'phrase'.

ROM (Read Only Memory) is permanent memory - you can't alter it, and switching off won't erase it. ROM is used to store the special programs that tell the microcomputer how to behave.

These include the **Operating System** which enables the CPU to manage the keyboard screen and memory all at once. Operating Systems vary greatly from machine to machine though there are a few standard ones including **CP/M** and **Unix.** The advantage is that applications programs written on one computer using one particular operating system should be compatible with any other running the same operating system, regardless of its individual design.

There are other types of memory, such as **PROM, EPROM, EEPROM** and even **EAROM,** each with their own redeeming features, but these are generally only used in specialist devices, or for development purposes prior to full-scale production.

All forms of memory are measured in the same units. A **Bit** - short for Binary Digit - is the basic unit of computer memory, and can only be used to store a '0' or '1' - equivalent to being switched off or on. These are compounded into larger units to store useful information. Eight Bits form a **Byte** and most CPU's process one byte at a time. A byte is usually the equivalent of a single digit or character, but can represent something more abstract.

Some of the newer and more advanced CPU's, like the 68000 and Z8000, process 16 Bits at a time, a considerable increase in speed. A typical process might be carried out in approximately a millionth of a second!

Exactly 1024 Bytes makes one kilobyte or **KByte** - so that a 32K computer in fact has 32x1024 or 32768 bytes of memory. The reason for that strange number is that it can conveniently be expressed in **Binary,** which is the numbering system used by computers.

The CPU is only capable of very crude operations - such as adding two digits - but can execute them at very high speed. To make it perform any real function, the CPU needs to be given a long list of instructions - a program - written in a form it can understand; this is called **Machine Code.** Unfortunately it is almost incomprehensible to humans, consisting of rows of digits, the result being very slow programming and many errors!

Various **high-level languages** for computers have therefore been developed, which are rather closer to English, and hence easier to program in. **FORTRAN** is a language suited to Engineering calculations, whilst many business programs are written in **COBOL.** By far the most common language, and incidentally the easiest to learn, is **BASIC;** fortunately it is *fairly* compatible from machine to machine. The most standard is called **Microsoft** BASIC and is found on PET, Apple and many others. Of increasing popularity is **PASCAL,** which is harder to learn, but better for writing large programs, and inducing good 'program discipline' in new programmers.

Programs written in a high-level language have to be converted to Machine Code before they can be run by the CPU. There are two types of special program that carry out this translation. The first is the **Compiler** which translates your whole program into Machine Code before executing it. An **Interpreter** works through your program line by line, translating and executing as it goes. Typically an Interpreted program will run 10 times slower than a compiled one, but will use up less memory because only one version is stored. Interpreters are more useful if you are developing a program, since the discovery of an error - a **Bug** in computer jargon - does not necessitate recompiling the entire program. The precise difference between Interpreting and Compiling takes rather more explanation. Those interested should read our article "Compiling For Speed" in the July issue.

If a computer is designed to handle a number of different programming languages, the various Interpreters and Compilers will be stored in RAM. Machines which only run BASIC, however, generally have an interpreter in ROM. This kind of software, permanently embedded in Hardware, is sometimes called **Firmware!**

And so back to hardware. The I.C.s are held in place on a Printed Circuit Board, or **PCB,** which is a stiff card with many fine copper tracks that interconnect the components. Indeed some cheap computers, called **Single-Board** computers, *only* consist of a PCB. You need to be a dab hand at soldering to assemble the components into a working computer.

Protruding from the extremities of the PCB are the **Interfaces** which allow the computer to exchange information with other electronic devices. This exchange is known as **Input/Output** or I/O. An interface will consist of several lines or wires - called a **bus** - to handle the data and sundry control signals needed to synchronize the timing of the various operations. The sequence of events involved in exchanging a piece of data is called the **protocol** - a term doubtless derived from the ritual dance of diplomacy. This terminological jest is carried a stage further with one particular sequence of events in an interface being known as a **handshake;** this signifies that the transaction is complete!

There are several common interfaces as well as a number of obscure and non-standard ones. Unless you buy a special conversion box, you can only connect together devices having the same interface. **IEEE 488, RS232** and **S-100** are some of the most widely accepted standards. The first of these is a **parallel** bus, meaning that 8-bits are transmitted simultaneously down 8 lines. The second is a **serial** interface, so called because the bits are transmitted one after the other down a single line; this is more economical for transmission over long distances. S-100 has one hundred lines but is only used for connecting together PCBs inside one box. The number of bits sent per second is called the **Baud Rate.**

These interfaces are most frequently used by a microcomputer for communicating with its **peripheral** devices. They are also used when communicating with other computers, which is termed **Networking.**

The most common peripherals are listed below. A **Cassette** unit **Saves** programs and data from computer memory on cassette, so that they can be **Loaded** back again when required. A **Disk Drive** does the same, employing a circular piece of magnetic material called a **Floppy Diskette.** This has a higher storage capacity than cassette and allows faster access. See *"Do You Need 'Disk'?"* in this issue.

A **Printer** is used to create permanent copies of information on paper, and will usually offer either high speed or high print quality. The differences are explained in *'How to buy a Printer'* (August issue). Finally, a **Modem** is a small unit that converts electronic data into audio tones and back so that information can be sent over an ordinary telephone line.

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See Features on Databases, and Program Generators in this issue of *MicroComputer Printout*

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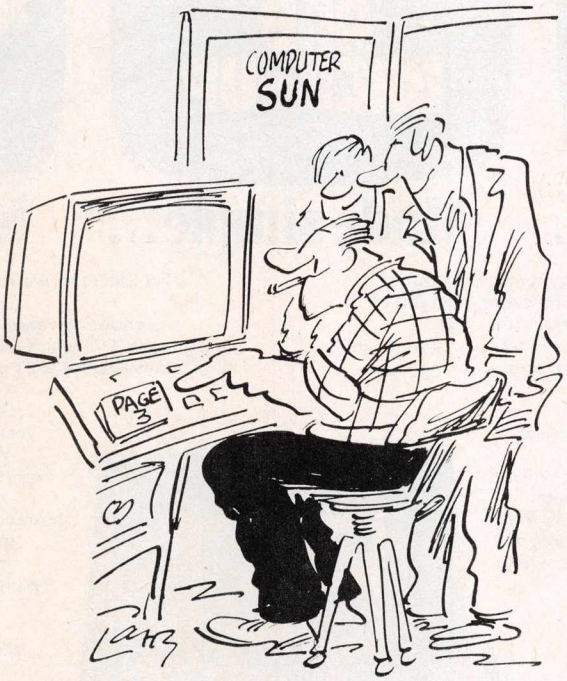
MIKE'S MUSES

Computer Folklore – The old old story!

Some of you will have heard this tale, but bear with me while I re-tell it for the multitude of new computer enthusiasts who have sprung up in the last two or three years.

Long, long ago, when computers were called electronic brains: when you could walk about inside them and toast muffins on the glowing valves, a certain Regional Electricity board installed one of these wonder machines to automate the billing of its consumers. The software not only calculated the amount due and printed the invoice and address but also checked for evidence of payment and if necessary, sent out the red reminder slips and the dreaded "Unless within 7 days...we will cut your supply and take legal action" letter.

One day a certain doughty traveller who spent much of his time in foreign climes returned to his home after a three month absence to find a bill for the electricity consumed. Now because he had been away so long, he had in fact consumed no electricity at all, and was pleased and amazed to see that the wonder electronic brain had worked out this fact and submitted a bill for £0.00s.00d. (Yes, it really was that long ago, before the coming of our modern monopoly money). "What a clever machine!", he exclaimed as he crumpled the bill into a ball and flung it into the wastepaper basket.



Back at the Regional Board's head office, the computer waited the stipulated number of weeks for our hero to pay his bill, and then sent out the red printed reminder for £0.00s.00d. The programmers had forgotten to tell it that zero amounts due could be ignored. With a puzzled laugh, our traveller flung the reminder into the bin.

Again the computer waited the specific time and then sent out the "We'll cut off your...." letter. Trembling with rage and possibly fright, the consumer rang the board. After many hours of backtracking and cries of incredulity that such a thing could happen, and then further hours of brain bashing working out how to put matters right, the board rang him back. "It's a fault in our computer program", they said. "The quickest way of getting it to stop pestering you would be for you to send us a cheque for £0.00s.00d: we'll punch in the details of the cheque number and bank account together with the invoice number. That should hold things together until our programmers do a bug correction run in a few weeks time."

So our hero sent them a cheque for £0.00s.00d, and duly received a receipt from the now satisfied electronic marvel. And that could have been the end of the story .....

.....except that our hero's bank also had a computer! And the programmers had not foreseen the need to process a cheque for £0.00s.00d! So it was rejected and returned by the bank's computer to the computer of the Electricity Board. "A returned cheque", thought the Board's computer. "It must have bounced." Without further ado it sent a sternly worded letter to our hero, informing him that his cheque for £0.00s.00d had bounced and what was he going to do about it?

More deliberation followed and the Board called in outside consultants to assist in solving the problem. This they duly did, and instructed our consumer, who slowly made his way to the nearest Board showroom, alternately banging his head against every street light and rolling about on the pavement in hysterical laughter. "I've been instructed by your head office to come here to pay my electricity bill", he spluttered handing over the latest request for £0.00s.00d. "They told me to pay cash!!"

Stranger than fiction

I'm pretty sure that the above tale has had many embellishments added and now contains as much fiction as fact, but certainly a zero bill was printed and sent out. You'd think that by now we would have learnt the lesson, but recently a little bird told me of a similar error in a very modern and complex computer network. Two computers in the network, so I am told, had worked out a particular figure but the two results disagreed about the umpteenth decimal place. In other words the two results were for practical purposes the same but nevertheless an error was reported by the network. The result, as you may have seen on television or in the press, was the postponement of the Space Shuttle launch due to 'software incompatibility in the computer system.'

Cast out the beam in thine own eye!

And after we've had a good guffaw, and felt terribly superior, we'd better check over our own programs. The chances are the same error exists (latently perhaps) in over 60% of any serious programs you've written. Consider the following statement in BASIC.

```
IF A=B THEN ....
```

Seems innocent enough doesn't it? But try entering LISTING 1 into your machine and running it. You would expect it to print "EQUAL", but instead (at least on most micros) it prints "NOT EQUAL"! Why? ▶

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◀ Most micros work in floating point binary to approximately five bytes of accuracy and translate their results to decimal with a maximum accuracy of 9 or 10 digits. Two results can be printed which translate to the same rounded decimal value, although the binary versions are in fact different.

A straightforward way of avoiding what from now on I shall call "The Shuttle Bug" is to consider the degree of accuracy required, subtract one quantity from the other and check that the result is less than the accuracy level specified. Listing 2 shows the kind of thing required.

```
10 A=1/25 : B=.04
20 PRINT A, B
30 IF A=B THEN PRINT "EQUAL" : END
40 PRINT "NOT EQUAL"
```

Listing 1

```
10 A=1/25 : B=.04
20 PRINT A, B
30 IF ABS(A-B)<1E6 THEN PRINT "EQUAL" : END
40 PRINT "NOT EQUAL"
```

Listing 2

Prize Problem – Tight Fit?

A cupboard has dimensions XC, YC and ZC. Three packages have dimensions X1, Y1, Z1, X2, Y2, Z2 and X3, Y3, Z3. Write a program which checks to see if the packages, lying flat on one side or another, can be fitted into the cupboard.

Assume the cupboard and packages are 'box-like', (Rectalinear parallelepipeds!). Include cupboard dimensions and several sets of package dimensions as data statements. The first program drawn at random on March 15th which processes my test data dimensions correctly will win the *MicroComputer Printout* Silver Space Invader Badge.

Personalised dates

Keen-eyed readers will have noticed the error that crept into my last column: Mr. A.R. Gould was, of course, the winner of the Roman Numerals competition set in the December issue, with his excellent piece of coding.

The first correct entry to the Personalised Dates competition set in January was that of:-

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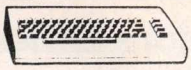

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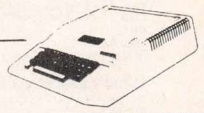
- ★ On cassette (add $3.00 for diskette)

	U.S. & CANADA	FOREIGN
TINY Basic Compiler OLD/NEW/4.0 ROMS/8032 with 8K memory	$25	$30
TINY Basic User's Manual (refundable with software order)	$ 5	$ 7

PET & APPLE II USERS TINY PASCAL



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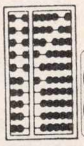

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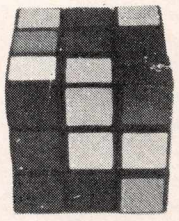
FOR THE 16K OR ABOVE



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ZX 81

43◀ (full stops, then zeros, through the numbers then through the letters). RUN it and you'll see what I mean.

Feeble Space Invaders

Our final program, SPLATTER, is a very feeble version of SPACE INVADERS designed just to show how POKE can be used to create moving graphics. Of course, the PRINT AT function on the ZX81 would do the task as well, and almost as quickly. In fact, PRINT AT is used to fire at the little invader near the top of the screen. Once you understand how the POKE function works in this program, you might like to rewrite the fire subroutine (starting at line 5000) to use POKE.

The program sets up a shape near the top of the screen, which moves at random. About halfway down is you (an inverse space). The "Z" key moves you left, and the "M" moves you right. When you think you're underneath the invader, you press the "A", and a little plus sign rushes up the screen. If you hit the invader, your score will be incremented, and the time – which is being updated while you are playing (the variable is called TIME, it is set to zero in line 9080 and incremented in line 75) – value is reprinted. You have to hit five invaders in the shortest possible time. Play it over and over again, trying to reduce the time figure, and when you're tired of this, rewrite the fire routine so that it uses POKE.

This then, briefly, covers two important uses of PEEK and POKE, for storing and retrieving information from a REM statement, and for moving things around the screen.

```
   10 REM SPLATTER
   20 GOSUB 9000
   30 LET M=A
   50 LET A=A+INT (RND*4-RND*4)
   60 IF A<2 THEN LET A=2
   70 IF A>30 THEN LET A=30
   75 LET TIME=TIME+1
   76 POKE 33*B+M+1+PEEK X+256*PE
EK Y,0
   80 POKE 33*B+A+1+PEEK X+256*PE
EK Y,129
   90 LET E=C
  100 IF INKEY$="Z" AND C>2 THEN
LET C=C-1
  110 IF INKEY$="M" AND C<30 THEN
 LET C=C+1
  115 POKE 33*D+E+1+PEEK X+256*PE
EK Y,0
  120 POKE 33*D+C+1+PEEK X+256*PE
EK Y,128
  130 IF INKEY$="A" THEN GOSUB 50
00
  140 GOTO 30
5000 FOR U=10 TO 4 STEP -2
5010 PRINT AT U,C;"+";AT U,C;" "
5020 NEXT U
5030 IF C<>A THEN RETURN
5040 LET U=U+1
5050 PRINT AT 18,0;"SCORE IS ";U
5060 PRINT "TIME IS ";TIME
5070 IF U<5 THEN RETURN
5080 PRINT "END OF THE GAME"
5090 STOP
9000 REM ASSIGN VARIABLES
9010 LET A=3
9020 LET B=3
9030 LET C=15
9040 LET D=15
9050 LET X=16396
9060 LET Y=16397
9070 LET U=0
9080 LET TIME=0
9090 PRINT AT 18,0;"SCORE IS ";U
9100 PRINT "TIME IS ";TIME
9110 RETURN
```


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Software Survey

PROGRAMS THAT

"The end of programming as you know it". This statement seems to be typical of the publicity surrounding the current influx of program generators – programs which claim to lead the non-technical computer user through the previously complex task of writing software, by means of English question and answer techniques.

Everyone who has been reading the computer press over the last few months will have heard of The Last One, probably the most publicised program ever. There are several other similar products which may have escaped the casual observer – Pearl, Genesis, Nucleus, CORP and Adds Manager are just some of them. Let's start by taking a look at what a program generator is, and why YOU might want to use one.

Fundamental language

Ever since computers were invented, back in the halcyon days of valves, and rooms the size of the Albert Hall to house them, programmers have been devising ways of simplifying the task of writing software. Initially, it was necessary to code every command in binary (long strings of 1's and 0's), the fundamental computer language. This level of programming is called machine code. In order to assist the programmer, the binary numbers were condensed into either octal or hexadecimal, which cut down the number of characters required to enter an instruction, and also made it far easier to remember the codes.

The next development was an assembler, which allowed the use of nmemonics – usually three or four letter representations of the instruction – together with labels for subroutines and other, more human features. From the assembler we progressed to the use of "high-level" languages such as COBOL, FORTRAN, BASIC and the like. These languages were developed for specific types of user; FORTRAN for the scientist, COBOL for the businessman, BASIC for teaching programming, and their vocabularies were made as close as possible to English words. Once the erstwhile programmer has written his "source code" in one of these high-level languages, he invokes either a compiler or an interpreter, depending on the machine, the language and the application in hand.

The compiler or interpreter then converts the high-level instructions into a whole sequence of machine code steps, which the computer can then execute. Since there is a limit to the number of different words a language can contain, owing to the size restrictions of the computer's memory, this conversion process lends itself to generalities and must be less efficient than programming directly in machine code, step by step.

Series of menus

A program generator produces code in one of these high-level languages by prompting the user, often by means of a series of menus, for the design of the program he wishes to create. The screen layout, the size and type of the input fields, the shape and content of the printed reports, the calculations to be performed on the data, and so on are all defined by means of these menu screens. Once all the parameters have been set up, the generator will "write" the program in whatever language is being used – in other words, the program replaces the programmer bashing the keyboard, and manufactures the program instructions directly from the parameters it has been given. It does this by selection from a range of standard pieces of program, which it will fit to the requirements of the user.

BY PETER WOOD

No matter how the user wishes the screen display to appear and what he wants to do with an input, for instance, the same routines can always be used to create the display and to cause an input to be requested at a particular point in the program. This standardisation must inevitably lead to an even less efficient use of the machine than that achieved by normal high-level programming, and the results will often be slower in operation and larger in size than a manually written program, although that is not to say that this always matters.

How complex?

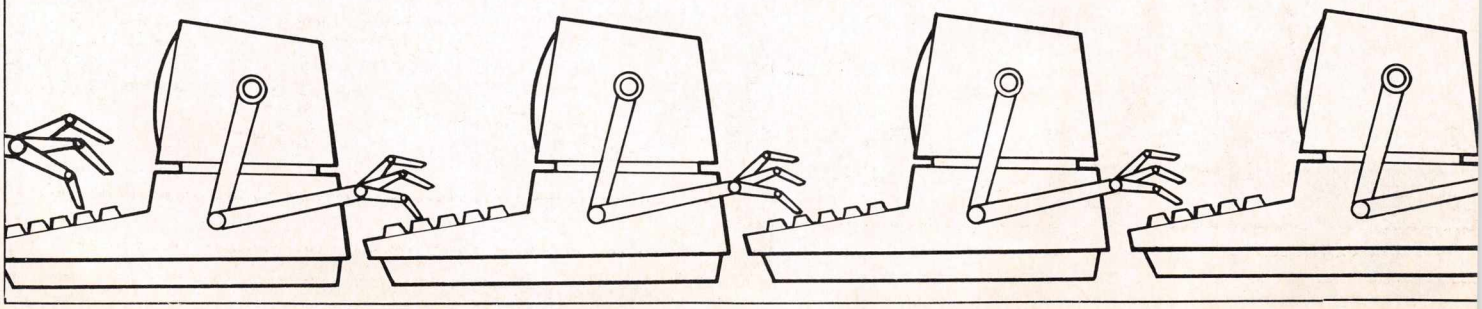
Another critical point is – how easy are these programs to use? There is little point in using a piece of software to generate code for you, if the ritual you have to go through is as complex as writing the code manually. Certainly menu selections such as "set pointer to the contents of a file field" do not inspire confidence in the first-time user, and cause furrowed brows in many experienced computer professionals' normally placid features. It is obvious that a program cannot be universal in nature without being as complex as that which it attempts to replace, if not more so.

The answer must be some sort of compromise. The facilities provided by a program generator are always more restrictive than a true high-level language, but the user is not constrained to learn 60 or 70 BASIC statements and the pedantic syntax that connects them. The majority of these programs seem to provide the facility to create screen formats (in the same way that you might lay out a manual record card), report formats (akin to simplified word processing), and calculations to be performed on the data in the record cards. This boils down to a sort of database program written to your own specifications.

Programmers tools

Whether you can really manufacture all the software necessary to run your business, including, say, ledgers, payroll, stock control and so on, is extremely dubious. Even more to the point, if you have no understanding of the code generated by the program, the only way to make changes to applications is to recreate the program from scratch, as against making small additions to the program directly as a programmer would. There are plenty of program generators around on larger machines, and have been for some time, but these are always used as programmer's tools, to take the drudgery out of performing the tedious tasks that always occur in writing a large application. Program generators on micros can certainly play the same role, but don't make the mistake of thinking that they replace the requirement for skill and understanding of the hardware and the task in hand.

A good high-level language can be used to achieve almost anything a micro is capable of, and a good program generator can speed up the programmer's job of writing applications, but surely the user won't want to slog through the same old menu screens every time he wants to create a new program, or even amend an old one? You still need to know why you are doing what you're doing, or else produce programs suitable only for parrots!



WRITE PROGRAMS

Redundant programmers?

"Won't this make programmers redundant?" Well, what is a programmer? In real terms he is the guy who enters code to a pre-set format, using routines he's used a thousand times before, following a specification laid down by a systems analyst – but using his imagination and creative skills to improve, adapt, innovate and above all create elegant program code that works as quickly and efficiently as possible. There is no way that an automated process can replicate these skills unless it has recourse to the same well of knowledge that the experienced human programmer uses all the time. Undoubtedly, in some future time, the heuristic computer will easily perform this job, but 1982 won't see it on your table-top!

If you sit down and take a look at the areas in which micros are used, they probably fall into the following broad categories:- Scientific, Business, Education and Hobby. Neither educationalists nor hobbyists are likely to want to fork out for a program generator when it is far more rewarding and educational to write programs from scratch. (Both these categories are also generally much shorter of funds than the other two!) Scientific users may often also have "business" uses for their micros, but this aside, the tasks performed in research establishments and the like are probably fairly specialised, and require suitably specialised programming, often in machine code. This leaves by far the largest market area for the program generator – "business".

Commercial applications can also be generalised into four sub-categories as follows (although the 1% who use their machines for more esoteric tasks may be insulted at being left out!):- (1) Book-keeping – ledgers, invoicing, payroll, etc. (2) Financial modelling – VisiCalc and friends. (3) Word Processing. (4) Record-keeping – stock control, personnel files, service records, mailing addresses, and so on. The book-keeping tasks are by their very nature highly standardised – everyone has to do their payroll in much the same way, for instance – so the many off-the-shelf packages available on virtually every micro will nearly always do the job. Financial modelling is well catered for, with programs like VisiCalc, MicroModeller and MARS providing a wide spectrum of facilities for every budding gnome. Word Processing is a favourite micro application and has already threatened the older-established dedicated machines, so there's no room there for innovation either.

This leaves only the record-keeping tasks, historically the area where most users require tailoring of programs or bespoke applications to be written, usually without realising that their requirements are in principal very similar to Fred next door, just with different labels on the boxes! Any computer with a disk and printer attached is good at storing data in records and pulling it back again by selective criteria and printing the results. What really matters is how understandable this process is to the operator and how flexible the program is that does it.

Murphy's Law

If you decide that you want a name and address file for mailing your customers with new products from time to time, then you have to decide how much information you are going to store, and by which parameters you are going to want to retrieve that data. Murphy says that six months later, after you've entered fourteen thousand names, you decide you also need to store the customers' telephone number, which you forgot to specify to the software house that wrote the program (you will recognise that this never happens in real life, of course). The result is a costly bill for altering the program, and either an awful lot of re-typing or another bill for converting the old data file into the new format. This is where a program generator could be used, providing that you, the user, appreciate the risks involved in dipping your toes into the cold water of program design! Given sufficient enthusiasm and hard graft, the results could be very gratifying, especially if you're the sort of person who changes your mind every other week on the type of system you want!

There are several programs which perform an essentially similar task to the program generators, although in some cases a far more satisfactory way, and without claiming to be anything more than sophisticated database programs. Silicon Office, for example, provides more facilities than any of the program generators, but does not claim to do away with programmers! However, let's take a brief look at some of the code generators on the market.

Marketing strategy

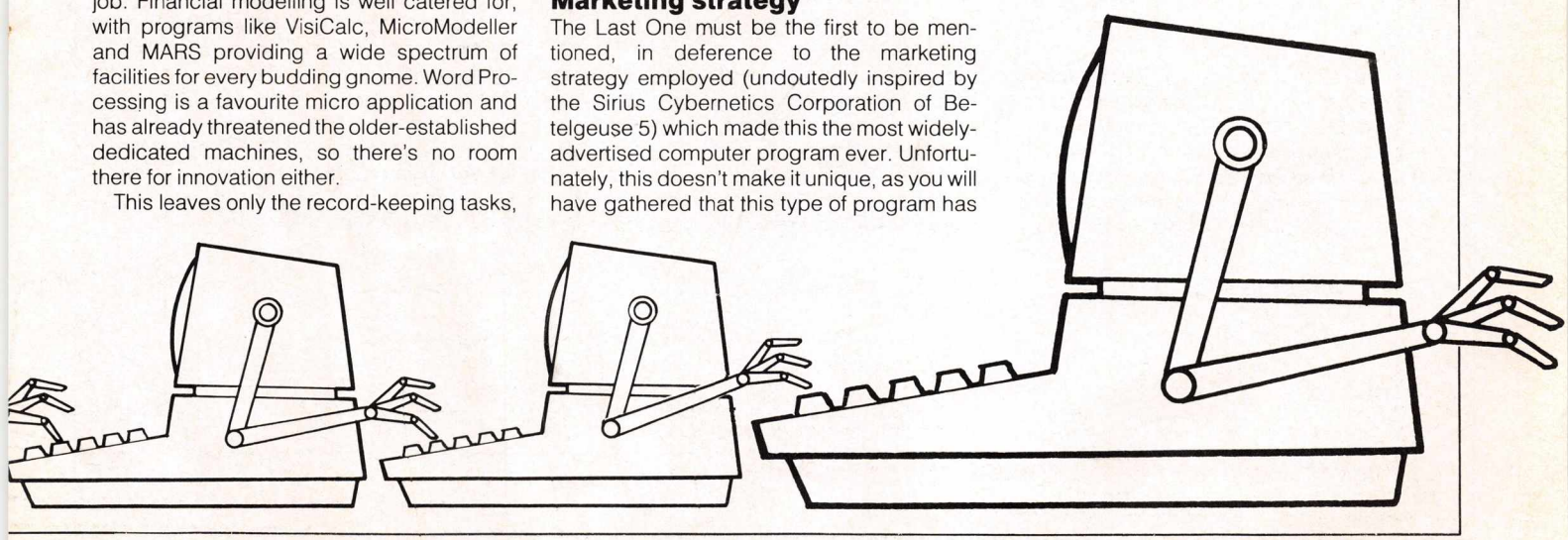
The Last One must be the first to be mentioned, in deference to the marketing strategy employed (undoutedly inspired by the Sirius Cybernetics Corporation of Betelgeuse 5) which made this the most widely-advertised computer program ever. Unfortunately, this doesn't make it unique, as you will have gathered that this type of program has been around on mainframes for years, albeit in not quite the same style. The code generated is in BASIC. The Last One, from D.J. 'Al' Systems Limited, is apparently available on quite a number of micros, although it was developed on an Ohio Scientific, and Ohio are now supplying it as standard on their machines. Price: £260.00 + VAT from many micro dealers.

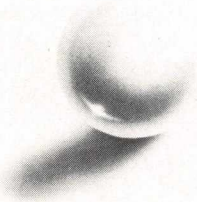
Nucleus, from Compact Accounting Services Limited, is marketed on a slightly lower profile, and is available for CP/M machines and the Rank Xerox 820, also generating code in BASIC. Priced at £1,000.00 + VAT it is available only from the authors. Compact also supply a different version of Nucleus for the Adds Multivision system, which is again priced at £1,000.00.

Forms-2 is another CP/M program, this time from Micro Focus Limited, and generating its programs in CIS COBOL. It is also available for the Apple II, and is sold through dealers and distributors for many 8080, Z80 and LSI-11 systems. The marketing for this product is very realistic when compared with many of its rivals, with comments like "FORMS-2 ... is a COBOL source code generator to help you build interactive applications with ease." Price: £100.00 + VAT.

Micro fad

There is also Genesis, Pearl, Quickpro (from The Software House), and CORP (from the unlikely named Maromaty and Scotto Corporation!) No doubt readers will soon be writing in with more and more names of program generators, and we will be playing spot the press release on an almost daily basis. However, just like every other micro fad, the market will eventually settle down, and those that are still around will, by definition, be the ones that work and are actually useful. In the mean time, it doesn't seem terribly likely that the unemployment queues will be filling with destitute programmers, nor that everyone will suddenly stop writing standard applications.





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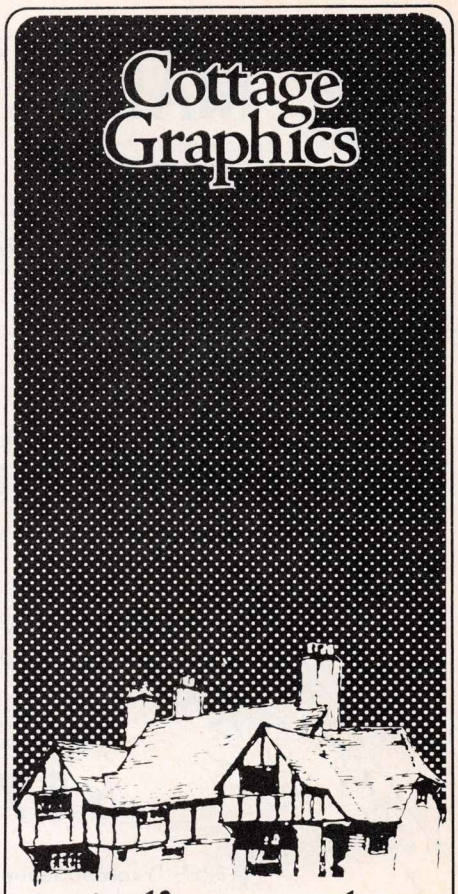
A Personal Diary Program

```
250 rem**obtain date range***********
260 print"":print:print:print
270 print"date from which the search is to start":printhd$
280 gosub760:sd=ad:print:print:print
290 print"date on which the search is to finish":printhd$
300 gosub760:fd=ad
310 ifsd>fdthengosub920:goto260
320 rem**search*********************
330 gosub650:hc=0
340 forj=1tote:ifx$="h"or(z>0andleft$(c$(j),1)="h")goto370
350 iftd(j,1)<sdortd(j,1)>fdgoto610
360 goto380
370 if(td(j,1)<sdandtd(j,2)<sd)or(td(j,1)>fdandtd(j,2)>fd)goto610
380 y$=e$(j):hc=1
390 ifz=0andc$(j)=x$goto490
400 ifz=0goto610
410 ifz=1goto490
420 ifz=2goto480
430 ly=len(y$)-l+1:v=0
440 fork=1toly
450 iftx$=mid$(y$,k,l)thenk=ly:v=1:goto460
460 next:ifv=1goto490
470 goto610
480 ifleft$(y$,l)<>tx$goto620
490 printy$:lc=lc+1:ifz=0goto520
500 y$=left$(c$(j),1):fork=1totc:ifleft$(cl$(k),1)=y$thenprintcl$(k);:k=tc
510 next
520 ifx$="h"or(z>0andleft$(c$(j),1)="h")goto550
530 ifsd=fdandz=0goto600
540 ifsd=fdgoto590
550 td=td(j,1):gosub870:lc=lc+1
560 ifx$="h"or(z>0andleft$(c$(j),1)="h")goto580
570 goto590
580 print" -";:td=td(j,2):gosub870:lc=lc+1
590 print
610 iflc>15thengosub720:gosub650
620 next:ifhc>0thenprinttab(10);"search complete":printhd$:gosub720:goto60
630 printtab(5);"search complete - none found":printhd$:gosub720:goto60
640 rem headings*********************
650 print"searching for ";:ifz=1thenprint"all categories":goto68
660 ifz>1thenprinttx$:goto680
670 printcl$(n);" category"
680 td=sd:ifsd=fdthenprint"for";:gosub870:goto700
690 td=sd:print"from";:gosub870:td=fd:print" to";:gosub870
700 print:printhd$:lc=0:return
710 rem**hold the screen**************
720 print:print"****** press space to continue ******"
730 geta$:ifa$<>" "goto730
740 return
750 rem**obtain day and month*********
760 print:input"please enter day number";d
770 ifd<1ord>31thengosub910:goto760
780 print
790 print:input"please enter month number";m
800 ifm<1orm>12thengosub910:goto790
810 ifdm(m)<dthengosub920:goto760
820 rem**convert day and month to days
830 ad=d:forj=1to12:ifj=mthenj=12:goto850
840 ad=ad+dm(j)
850 next:return
860 rem**convert days to day and month
870 m=0
880 m=m+1:iftd>dm(m)thentd=td-dm(m):goto880
890 d=td:printd;m$(m);:return
900 rem**error messages**************
910 print:print"*** please enter the numter again ***":gosub950:return
920 print:print"** please enter these numbers again **":gosub950:return
930 print:print"*** please enter the letter again ***":gosub950:return
940 rem**delay loop******************
950 fork=1to2000:next:return
960 rem**read data into arrays********
970 hd$="========================================"
980 ln$="----------------------------------------"
990 tc=1:te=1:forj=1to12:readdm(j):next
1000 forj=1to12:readm$(j):next
1010 readcl$(tc):ifcl$(tc)="*"thentc=tc-1:goto1030
1020 tc=tc+1:goto1010
1030 reade$(te):ife$(te)="*"goto1070
1040 readc$(te):readdt:gosub1080:gosub830:td(te,1)=ad
1050 ifc$(te)="h"thenreaddt:gosub1080:gosub830:td(te,2)=ad
1060 te=te+1:goto1030
1070 te=te-1:return
1080 d=int(dt/100):m=dt-(d*100):return
1090 data31,28,31,30,31,30,31,31,30,31,30,31
1100 datajanuary,february,march,april,may,june
1110 datajuly,august,september,october,november,december
1120 rem**list of categories**********
1130 databirthday,anniversary,holiday,work,domestic,miscellaneous,*
1140 rem**event,category,date(ddmm)****
1150 dataalan green,b,2301
1160 datasarah black,b,2210
1170 datajohn and jill smith,a,1106
1180 dataliz and bob brown,a,0703
1190 datavienna,h,1007,0908
1200 data rome,h,0403,1803
1210 dataeditorial conference 10.30,w,1504
1220 datamagazine to press,w,2212
1230 datatv licence expires,d,3108
1240 datafinal repayment on the car,d,1910
1250 datagolf with sir james - tee off at 11am,m,1606
1260 datavillage fete - organise and manage the white elephant stall,m,1208
1270 datalunch at golf club,m,1006
1280 datadeadline for memo program,w,1101
1290 data*
```

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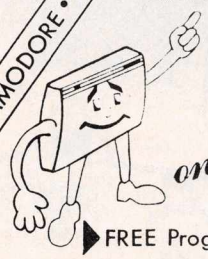

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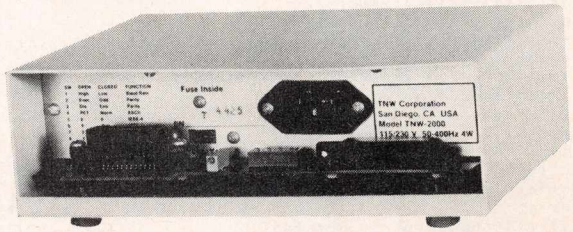

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INSIDE TRADER

Following *the Commodore's* successful prosecution of his lawsuit against PET designer, *Chuck Peddle,* I am intrigued by the specification of the secret new Commodore 128 and 256 revealed in *Hotline.* These bear more than a passing resemblance to Peddle's own Sirius 1, which they undercut. Perhaps readers can enlighten me as to the significance of the designation *'Project Peddlebuster'*?

Thirty years after writing his acclaimed I. Robot, ***Isaac Asimov****, doyen of science fiction writers, has finally got around to tinkering with his own computer. It is a TRS-80 Model II, which for reasons best known to themselves, Tandy dumped on his doorstep one day. Unfortunately, whenever Asimov types English into it, the Trash-80 responds with ?SYNTAX ERROR. Perhaps, he muses, his next project will be a rationalisation of the English language to remove illogical inconsistencies. I start to tell him about BASIC but the great man isn't listening.*

With April first imminent what revolutionary ramps has red-under-the-bed, *Duncan Campbell* in store for us? Last year's 'Government-computers-are-transcribing-your-telephone-calls' myth still rolls merrily on, a spirited defence being mounted as late as last month by *Personal Computer World's* **Guy Kewney**. Unfortunately, Red Dunc omitted to advise his pal G.K. of the practical nature of the joke ....

Apple *executives, Harvard Business School graduates to a man, have been congratulating themselves on the terms extracted from the Irish Government in return for siting their European factory in the Republic. The juiciest concession was a promise that Government Ministries would standardise on Apple. Now the Irish Education Board are on the point of buying a large quantity of Osborne's briefcase computers. By coincidence* ***Osborne*** *are looking for a European factory site.*

The cover of the new **VIC** manual shows one of those impossibly clean cut American families gathered round said computer gazing in awe at the graphics on the screen. As well they might. The power supply is clearly shown to be disconnected.

Micro magazines often have to take turns reviewing a preproduction model of a new computer. Thus it was that an early Sirius 1 was to be seen riding Practical Computing-*wards in a cab charged to* Personal Computer World's *account. P.C. staff were astonished to see their usually bicycle-bound editor,* ***Peter Laurie*** *riding round in the same cab for the next four days.* PCW *should be getting the bill about now.*

You will shortly be reading sundry celebrations of **Tandy's** cleverness in piggybacking a 16-bit 68000 board onto the back of the TRS-80 Model II. This board's close resemblance to one manufactured by the small Californian firm of **Digital Acoustics** is completely coincidental. Serves D.A. right for publishing the circuit details in issue No.4 of their newsletter.

Apple *III has a monitor in ROM. Like the PET. What's newsworthy about that? Not a lot, except that you won't find it mentioned in the literature, and the company play distinctly tight-lipped dumb when asked. To get into the monitor, hold down Reset and press one other key. To make it more interesting I won't tell you which one, since pressing the wrong key can cause spectacular damage. Try it at a show.*

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Although primarily designed for the Sinclair ZX81, many of the cassettes are suitable for running on a Sinclair ZX80 – if fitted with a replacement 8K BASIC ROM.

Some of the more elaborate programs can be run only on a Sinclair ZX Personal Computer augmented by a 16K-byte add-on RAM pack.

This RAM pack and the replacement ROM are described below. And the description of each cassette makes it clear what hardware is required.

8K BASIC ROM

The 8K BASIC ROM used in the ZX81 is available to ZX80 owners as a drop-in replacement chip. With the exception of animated graphics, all the advanced features of the ZX81 are now available on a ZX80 – including the ability to run much of the Sinclair ZX Software.

The ROM chip comes with a new keyboard template, which can be overlaid on the existing keyboard in minutes, and a new operating manual.

16K-BYTE RAM pack

The 16K-byte RAM pack provides 16-times more memory in one complete module. Compatible with the ZX81 *and* the ZX80, it can be used for program storage or as a database.

The RAM pack simply plugs into the existing expansion port on the rear of a Sinclair ZX Personal Computer.

Cassette 1 – Games

For ZX81 (and ZX80 with 8K BASIC ROM)

ORBIT – your space craft's mission is to pick up a very valuable cargo that's in orbit around a star.

SNIPER – you're surrounded by 40 of the enemy. How quickly can you spot and shoot them when they appear?

METEORS – your starship is cruising through space when you meet a meteor storm. How long can you dodge the deadly danger?

LIFE – J. H. Conway's 'Game of Life' has achieved tremendous popularity in the computing world. Study the life, death and evolution patterns of cells.

WOLFPACK – your naval destroyer is on a submarine hunt. The depth charges are armed, but must be fired with precision.

GOLF – what's your handicap? It's a tricky course but you control the strength of your shots.

Cassette 2 – Junior Education: 7-11-year-olds

For ZX81 with 16K RAM pack

CRASH – simple addition – with the added attraction of a car crash if you get it wrong.

MULTIPLY – long multiplication with five levels of difficulty. If the answer's wrong – the solution is explained.

TRAIN – multiplication tests against the computer. The winner's train reaches the station first.

FRACTIONS – fractions explained at three levels of difficulty. A ten-question test completes the program.

ADDSUB – addition and subtraction with three levels of difficulty. Again, wrong answers are followed by an explanation.

DIVISION – with five levels of difficulty. Mistakes are explained graphically, and a running score is displayed.

SPELLING – up to 500 words over five levels of difficulty. You can even change the words yourself.

Cassette 3 – Business and Household

For ZX81 (and ZX80 with 8K BASIC ROM) with 16K RAM pack

TELEPHONE – set up your own computerised telephone directory and address book. Changes, additions and deletions of up to 50 entries are easy.

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Cassette 4 – Games

For ZX81 (and ZX80 with 8K BASIC ROM) and 16K RAM pack

LUNAR LANDING – bring the lunar module down from orbit to a soft landing. You control attitude and orbital direction – but watch the fuel gauge! The screen displays your flight status – digitally and graphically.

TWENTYONE – a dice version of Blackjack.

COMBAT – you're on a suicide space mission. You have only 12 missiles but the aliens have unlimited strength. Can you take 12 of them with you?

SUBSTRIKE – on patrol, your frigate detects a pack of 10 enemy subs. Can you depth-charge them before they torpedo you?

CODEBREAKER – the computer thinks of a 4-digit number which you have to guess in up to 10 tries. The logical approach is best!

MAYDAY – in answer to a distress call, you've narrowed down the search area to 343 cubic kilometers of deep space. Can you find the astronaut before his life-support system fails in 10 hours time?

Cassette 5 – Junior Education: 9-11-year-olds

For ZX81 (and ZX80 with 8K BASIC ROM)

MATHS – tests arithmetic with three levels of difficulty, and gives your score out of 10.

BALANCE – tests understanding of levers/fulcrum theory with a series of graphic examples.

VOLUMES – 'yes' or 'no' answers from the computer to a series of cube volume calculations.

AVERAGES – what's the average height of your class? The average shoe size of your family? The average pocket money of your friends? The computer plots a bar chart, and distinguishes MEAN from MEDIAN.

BASES – convert from decimal (base 10) to other bases of your choice in the range 2 to 9.

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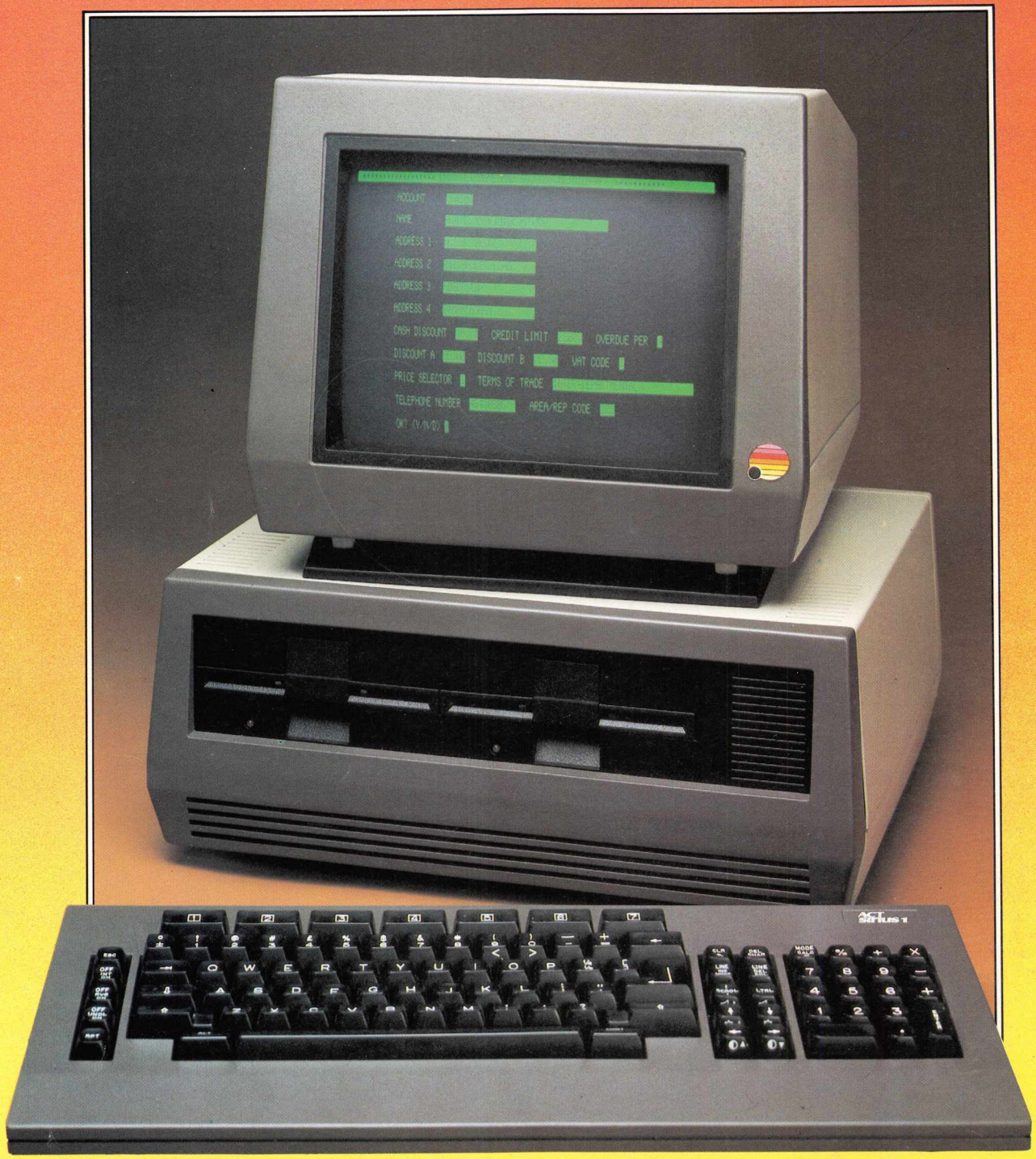

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Languages	**Microsoft BASIC Compiled BASIC COBOL PASCAL FORTRAN**	Microsoft BASIC perhaps one or two others, eg PASCAL	BASIC and perhaps one or two others
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MP03

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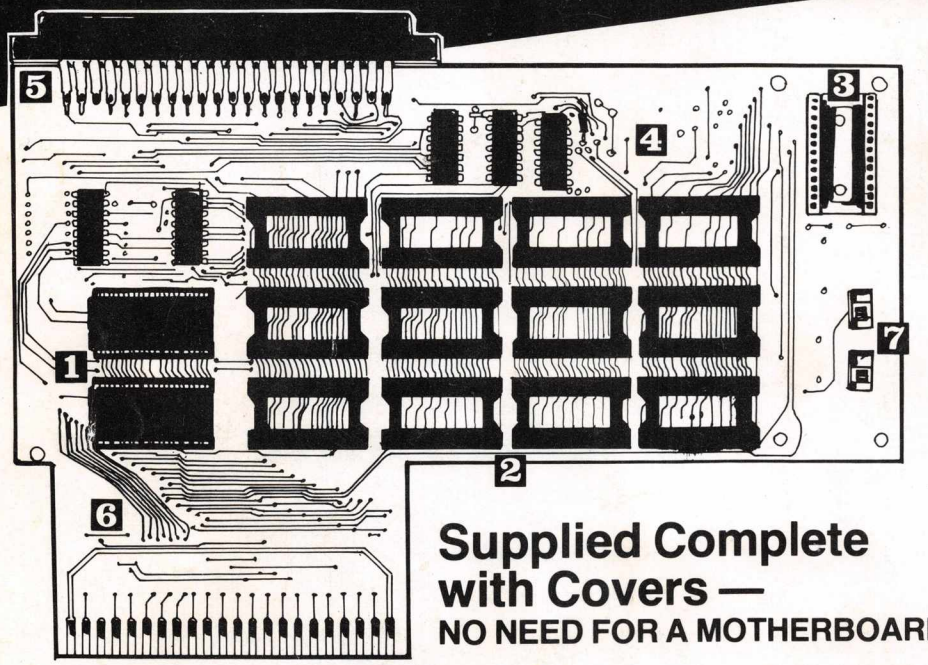

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