Practical Computing

80p

January 1983

Volume 6 Issue 1

Special issue
PORTABLE MICROS
Husky, Epson, HP-75C, Osborne and more

D-I-Y interface for the Spectrum
BBC machine-code disassembler

REVIEWS
16/32-bit Fortune
Apple Scrabble
Forth Ace



NEW MODEL

LOWER COST



Cromemco System One

MicroCentre introduce Cromemco's new System One computer, available with an integral 5 megabyte Winchester hard disk, at a new low price.

The System One supports the full range of Cromemco interface cards, including high resolution colour graphics, and software packages. The choice of operating systems includes CDOS, CP/M and CROMIX—Cromemco's answer to Unix.

Call MicroCentre for Cromemco

MicroCentre Ltd
(Complete Micro Systems)
• Circle No. 101

Britain's independent Cromemco importer

30 Dundas Street
Edinburgh EH3 6JN
Tel: 031-556 7354

>LIST

PRACTICAL COMPUTING JANUARY 1983

>NEWS

17 **COMPEC REPORT**
A brief round-up of some of the new products shown at the industry's premier show at Olympia

21 **NEW PRODUCTS**
The desk-top mainframe has arrived! Plus, other items of hardware and software for those without the necessary £35,000

29 **PRINTOUT EXTRA**
Ian Sinclair believes good design helps to sell computers, it is not just the specification. But then, Ian Sinclair is a designer.

>REVIEWS



66 **FORTUNE 32:16**
Una Sheehan checks out a 16/32-bit micro with Unix and top-quality word processing at a microcomputer price

71 **JUPITER ACE**
A world first — the first machine that speaks Forth as its native language, the Ace has educational potential

77 **MULTITECH MPF-II**
From Taiwan comes a low-cost micro that, from an Applesoft point of view, bears a strong resemblance to the Apple II

78 **WALTERS 2000**
Chris Bidmead tests a British-made dot-matrix printer which rivals daisywheel printers for quality

93 **SNAP — SURVEY ANALYSIS**
Phil Cole takes a look at a CP/M package for handling questionnaires and market-research applications

134 **APPLE GAMES**
Now you can play Scrabble with your Apple, or Choplifter, or go on an Adventure with the Hitch-Hiker's Guide to the Galaxy

173 **SPECTRUM BOOKS**
For a new micro the Sinclair Spectrum has already attracted a lot of authors. Bill Bennett reports on their efforts

>PORTABLES

99 **THE PORTABLE MICRO**
Ian Stobie explains what a portable micro is, and just why you ought to think about buying one

101 **MARKET SURVEY**
What is available — a guide to the nine portable micros now available, their strengths and their weaknesses

106 **APPLICATIONS**
Della Bradshaw tracks down a Husky that's taking stock of the situation in the alcoholic beverages business.

108 **INTERVIEW — ADAM OSBORNE**
Ex-British computer guru and father of the portable business micro talks to Ian Stobie about industry trends

>FEATURES

86 **PROGRAMMING FOR A PURPOSE**
In the second part of this three-part series Arnold Maughan takes a name and address program as an example

112 **FICTION — DIAMONDS ARE FOR....**
Brian Williams returns with a macabre story about an unusual sort of computer-related crime

114 **EDUCATION — SCHOOL ADMIN.**
Let the micro take the strain of keeping track of all that data: T A Forber presents an adaptable Apple program



120 **SPECTRUM INTERFACE**
Lyndsay Robinson shows you how to build an analogue/digital converter for the Sinclair Spectrum

136 **BBC DISASSEMBLER**
John Leach's routine in BBC Basic enables you to read code from memory in comprehensible form. Or you could adapt it for another 6502-based micro

>REGULARS

5 **EDITORIAL**
Goodby to Information Technology Year, and all that

7 **FEEDBACK**
Proving the unprovable, and other correspondence, love letters and advice from readers

131 **RANDOM ACCESS — FORTH THOUGHTS**
Boris Allan wonders if Forth really is a structured language

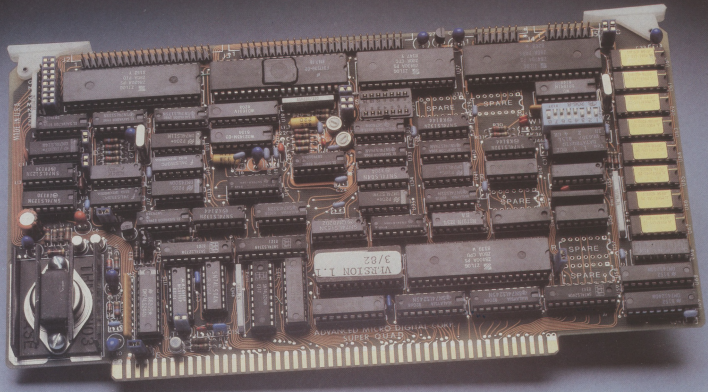
141 **OPEN FILE**
More software and programming tips for Sinclair, Apple, Atari, Tandy, BBC and Commodore micros

177 **PUZZLE — DERBY DAY 1991**
Sort out the punters and riders and frazzle your brain

179 **ANNUAL INDEX, VOLUME 5**
Your essential guide to the last 12 months of *Practical Computing* prepared on a micro by Nigel Martin

185 **PETER LAURIE'S "LAST WORD"**
Hic, hic, hurrah could be an overdose of Christmas spirit, but instead it's real insight into what the micro buyer needs

The World's First



Z-80A™ CPU, Floppy Disk Controller, 64K of Memory, Serial & Parallel I/O Ports . . . all on a SINGLE S-100 BOARD!

Don't buy another one of those 3 Board Sets until you see what one can do!

Advanced Micro Digital has been producing the SUPER QUAD for some time now and it's truly one of a kind. Just plug this board into any S-100 mother board and hook-up your disk drives to it. It flies.

Runs with CP/M, MP/M, and turbo-DOS. You can also plug in additional boards, I/O, hard disk controllers, etc. SUPER QUAD is a BUS master. The cost of this board is one-third to one-half of what you have been paying for the three board set.

Just take a look at these features:

- IEEE S-100 Standard
- Z-80A CPU
- 64K of Bank Select Memory as well as extended addressing
- Double density floppy disk controller. Both 8 or 5¼" Disk Drives
- 2 serial & 2 parallel I/O ports (RS-232 and intelligent hard disk interface)
- 2K or 4K of monitor EPROM
- Runs with CP/M®, MP/M® and turbo-DOS™
- One year warranty
- BIOS disk available

Also introducing SUPER/SLAVE to run multi-processing operating systems such as turbo-DOS™. With 128/64K of memory, serial & parallel I/O, you can plug multiple of the slaves with the master and each user will have its own CPU and memory local.

Now it's time to replace or throw away the old S-100 boards and plug the SUPER QUAD in. Save space, money and power. Retail price is £646.

Dealer enquiries welcome

For more information write or phone:

Sirton Computer Systems
Unit 14, 29 Willow Lane, Mitcham, Surrey, CR4 4NA.
Telephone: 01-640 6931/2/3

Official Distributors for Advanced Micro Digital Corp., U.S.A.

® Registered Trademark of Digital Research Corp. ™ Registered Trade mark of Software 2000 Inc.

Circle No. 102

Practical Computing

EDITORIAL 01-661 3609
Editor
Jack Schofield
Deputy Editor
Bill Bennett
Reporter
Ian Stobie
Art Editor
Steve Miller
Production Editor
John Liebmann
Sub-editor
Sally Nicholls
Editorial Secretary
Julie Milligan
Consultants
Chris Bidmead
Peter Laurie
ADVERTISING 01-661 3612
Advertisement Manager
Ian Carter 01-661 3021
Assistant Advertisement Manager
Kenneth Walford 01-661 3139
Advertisement Executives
Fiona Howell 01-661 3468
Robert Payne 01-661 8425
Advertisement Secretary
Janet Thorpe
Midlands office:
David Harvett 021-356 4838
Northern office:
Geoff Aikin 061-872 8861
PUBLISHING DIRECTOR
Chris Hipwell

Published by IPC Electrical Electronic Press Ltd, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Tel: 01-661 3500. Telex/grams 892084 BIPRES G.

Typeset by Centrepoint Typesetters London EC1 and printed by Eden Fisher (Southend) Ltd, Southend-on-Sea.

Distributed by IPC Business Press (Sales and Distribution) Ltd, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

Subscriptions: U.K. £12 per annum; Overseas £18 per annum; selling price in Eire subject to currency exchange fluctuations and VAT; airmail rates available on application to Subscription Manager, IPC Business Press (S&D) Ltd, Oakfield House, Perrymouth Road, Haywards Heath, Sussex RH16 3DH. Tel: 0444 459188.

©IPC Business Press Ltd 1983.

ISSN 0141-5433

Would-be authors are welcome to send articles to the Editor but *PC* cannot undertake to return them. Payment is at £30 per published page. Submissions should be typed or computer-printed across a 40-character width, and include a tape or disc of the program. Handwritten material is liable to delay and error.

Every effort is made to check articles and listings but *PC* cannot guarantee that programs will run and can accept no responsibility for any errors.

Goodbye to all IT

INFORMATION TECHNOLOGY YEAR has been and gone, which presumably means most people will now forget all about it. In spite of the admirable efforts of the Minister of Information Technology, Kenneth Baker, Britain has not suddenly computerised itself.

In fact, very few of Britain's offices seem to have taken the giant step from the mechanical world of the manual typewriter to the electrical world of the IBM Golf-ball, let alone made the massive step to electronic word processing. Hotels, travel agents, shops and services are still, by and large, run using thousands of small pieces of paper and long telephone numbers which are, tediously, dialled by hand many, many times a day.

Perhaps the most memorable aspect of the whole IT year was the issuing of two special stamps, which were so extravagantly long they required two tongue-strokes. In this respect they could not be considered an improvement on the 1840 originals.

Just why are we so backwards at going forwards? There is no single answer to this question. Ignorance, fear and trade union intransigence are often mentioned as reasons, partly because all three appear together so regularly. The failure of businesses to invest is another factor, and there are few offices which could not be cited, as mentioned above, as evidence of this. But a new report from the NCC*, published by Heidrick and Struggles, finds a new scapegoat in middle management.

The enemy is male, 44 years old, married with 2.2 children, has a degree, earns £18,500 a year and is probably a member of the British Computer Society and perhaps the Rotary Club. The problem: he is slow to respond to change. The alarming conclusion of the report is that the rate of adoption of new technology is slower than senior management and the workers and — of course — the computer industry would like.

The middle manager does not want to introduce computers which would upset his organised routine. He does not want computers breaking down the boundaries between the different departments of the company, spoiling his little empire. He does not want computers because he doesn't really understand them, and it would be unbearable if that new school-leaver or junior-cum-office-dog's-body proved to be an adept. Most of all, the company gets along alright now, thank you, so why bother trying to improve things?

Meanwhile, the company chairman sees his foreign competitors adopting new technology and taking his export business. The more enlightened worker sees that with a loss of competitiveness comes an inevitable loss of jobs. "Computerise!" The cry is heard on all sides, with Kenneth Baker leading the chorus . . .

The middle manager finally bestirs himself. He spends several man-weeks agonising over the choice of micro, before finally doing nothing. "Wait!" he replies.

Don't hold your breath. Having "saved" the company some £5,000, less capital allowance, he climbs into his company car — cost: £10,000 plus petrol — and drives home. If we are lucky, his 2.2 children are monopolising the TV playing Space Invaders on a cheap home micro, thus absorbing a love for computers which is so strong that not even being taught computing at school will be able to destroy it. If we are even luckier, by the time they grow up there will still be some British Industry left for them to save.

In truth the middle manager has a point. Computers are not a panacea. Computerising Britain will not transform the nation overnight, or even over a year. The failure to adopt new technology is neither the disease nor the cure. It is, instead, a symptom of the larger failure to move with the times, and to be adventurous and take risks rather than settling for the easy way out.

Never mind. Now we can turn our attention to 1983 — the Year of Beautiful Britain, Welsh Castle Year, and the Year of Telecommunications between Governments. That should result in some even prettier stamps.

**Information Technology — the management of change in the UK.*

5 Years ago...

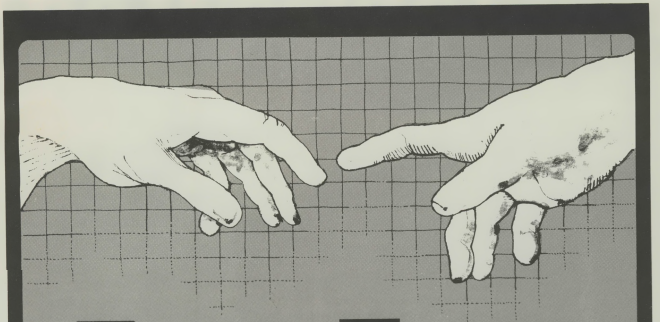
. . . the first Apple, basically a kit of parts for knowledgeable hobbyists, was quickly converted into a market research exercise for a properly-funded, second-generation machine.

With a new product specified by March last year, the company had the cash needed to develop it as a fully packageable product. There was no question of sticking badges on other people's boxes.

By January this year Apple could move into a proper factory, having sold around $3 million worth of the Apple II — formally announced on June 5, 1977. Sales of this machine in the U.S. are expected to reach five times that figure by the end of this year.

The U.K. Apple II is, thankfully, not the same product as sold in the States. A key factor in its appeal is the ability to drive a colour television. American television differs radically from the PAL colour television system used in Britain (and Germany) so a new colour driver circuit had to be designed for sale here. The design project was not exactly rushed, with the result that the Apple II computer is not yet truly six months old here.

Prices: Computer with 4K RAM: £995. 8K: £1,050. 16K: £1,250. 48K: £1,900.
Practical Computing Volume 1 Issue 1



DataFlex™

SOFTWARE FOR CREATORS

Bring your CP/M software applications to life with DataFlex.

From menu to multi-key ISAM, DataFlex has the features and power you need to create complete turn-key software applications in a RELATIONAL DATA BASE ENVIRONMENT.

Compare . . . what else gives you up to 125 data files with 4 indexes each, fast on-line multi-key ISAM file maintenance, a multi-file report generator, on-line multi-file transaction processing, an easy-to-use Query, even a "soft" menu to replace the CP/M command mode. All of this using DataFlex's configuration utilities, and NO PROGRAM CODE!

It is easy to use, You can type in a Screen format "image" of a file with your text editor. Then DataFlex's AUTODEF utility will create the file definition from the screen image . . . in about five seconds.

DataFlex will handle your multi-user requirements too! It runs under the TURBOdos networking operating system with full data protection.

If the 16-bit world is your domain, an 8086 version of DataFlex will be available in early 1983. You can develop now on your Z80 system and transport completed applications to the 8086/8088.

If you need applications now, a Library of DataFlex applications is being developed by other users. For highly specialised requirements, DataFlex's PASCAL Library is available to application developers.

DataFlex can change the way you do business. And at £495, (excl. VAT), with all its facilities we consider it the best value in the business. A demo package, which limits file sizes internally, is available for computer professionals.

Get the full system, or get the demo, but get your hands on DataFlex – software for creators.

Trademarks:
CP/M; Digital Research **DataFlex;** Data Access.
TURBOdos; Software 2000

OEM, SYSTEM HOUSE AND DEALER ENQUIRIES INVITED.

EQUINOX
MULTI-USER SOFTWARE
16 Anning Street, New Inn Yard,
London EC2A 3HB. Tel: 01-739 2387
Telex. 27341

● **Circle No. 103**

Spaghetti pots of Gotos

BORIS ALLAN'S article on the Tower of Hanoi problem — *Practical Computing*, September 1982, — certainly shows that the problem can be solved on small, cheap, computers — but isn't the whole matter of programming languages a question of "the right tools for the job"?

If I wanted to write a payroll package, I'd probably use Cobol; for number crunching, I'd prefer Fortran; for real-time applications I use Coral-66. I do not regard any language as "the best", but each is appropriate for its task.

Good problem solving depends not only on using the appropriate tools but on using them skilfully. The "perpetrators of rubbish" who "frequently avoid Goto" generally produce programs which are easier to write, understand and debug than the spaghetti pots of Gotos which Boris Allan presumably prefers. I notice that he makes no mention of the recursive features of BBC Basic which allow a simple, elegant expression of the Tower problem — or is recursion also "rubbish"?

The key question in choosing any language or computer should be, "Can it be made to do what I want with the minimum effort on my part?" Just because no one product is "the best" overall, this does not mean that they are all equal.

Anne R Heinrichsons,
Wokingham,
Berkshire.

Induction and proofs

IN NOVEMBER'S issue of *Practical Computing*, Boris Allan replies to my letter of the previous month. Since he repeats some of the mistakes of his original article — published in August's issue, the topic was proving programs correct — I must assume that it was written before the correspondence that has taken place between myself and Dr Allan. Since Dr Allan has criticised my letter I would be grateful if you would accord me a chance to reply further.

Firstly induction: "Induction is induction," says Dr Allan. Presumably he is asserting that since "scientific" induction is not a valid method of proof, then neither is mathematical induction. This is, of course, nonsense. Simply because both are called induction, it does not imply any logical connection between the validity of the two methods. In "scientific" induction it is asserted that because something happened yesterday it will happen today. This is obviously rubbish.

In a proof by mathematical induction it is proven that if a statement or theorem is true for some n, then as a logical and necessary consequence it is true for n + 1. Note that n is not an explicit value, but it is general. We can prove the assertion for some particular value. If, for example, it is obviously true if n = 1, this implies it is true for 1 + 1 = 2, which implies it is true for 1 + 2 = 3, and so on for all integers. The logic is faultless.

Would Dr Allen be happy if we changed the name of the method to "mathematical inference"? His statement makes as much sense as saying that cheddar cheese is mouldy because Danish blue vein is; after all, cheese is cheese and to try and distinguish between different types of cheese seems fruitless!

Secondly Dr Allan's criticism of my trivial program is just splitting hairs. He could have run the program on the Jupiter Ace — which uses Forth, and not Basic — and it would have failed. Sinclair Basic and Atom Basic are not Microsoft Basic, and to expect a program that is correct in one version to run faultlessly in another is ridiculous. I reassert that

```
10 A = 1
```

is a correct Microsoft Basic program.

Finally, Dr Allan asks for a proof that the program is correct. I have supplied him with a proof in our correspondence, and if any reader would like a copy I would be happy to supply him or her with it. It is unfortunately too long to include here.

Carl Zetie,
Maidenhead,
Berkshire.

Lucid and succinct

I ENTIRELY AGREED with the letter from Mr Carl Zetie in the October issue which was an admirable, lucid and succinct refutation of Dr Allan's ideas. If Dr Allan — as he says in November — regards it as fruitless to distinguish between the different meanings of induction, Popper himself does not.

In his book *The Logic of Scientific Discovery* he writes of scientific induction: "Now in my view there is no such thing as induction," adding in a footnote, "I am not . . . here considering so-called mathematical induction."

In the Basic program

```
10 A = 1
```

Mr Zetie presumably wanted to concentrate on the essential element, the statement "Set A to 1". It was surely valid, in the interests of brevity, to leave out some syntactic extras. Some Basics require Let, in others it is optional. My complete program including the assertions necessary to the proof would be:

```
ASSERT:   A is undefined
10        (LET) A = 1
ASSERT:   A = 1
20        END
```

Obviously this will not run under any existing Basic because no Basic has, as yet, facilities for proving programs correct, but it does demonstrate the necessary elements.

D A H Brown,
Malvern,
Worcestershire.

Morse omission

HAVING RECEIVED a number of enquiries about our morse program in *Practical Computing*, August 1982, we ought to point out that a rather important piece of information was omitted. The program assumes that the Pet is connected to an Easicomp sound generator and that a machine-code patch provided by Easicomp Ltd, 57 Panama Court, Sprowston, Norwich NR7 8BH is loaded. Statements in the program of the type

```
POKE 950, 0: POKE 951, 54: SYS 845
```

are controlling the sound generator.

However, the program can be modified to drive a transistor oscillator directly from the user ports. A listing of this alternative program can be obtained from the authors.

D Wakelin,
C Dracup,
Newcastle upon Tyne
Polytechnic.

Tax interpretation

I REGRET to note that James Fergusson, Feedback, September 1982, has completely misrepresented the function of my program Income Tax, June 1982. He refers to it as though it was intended to be a fully comprehensive treatise on taxation covering every possible circumstance, and then points out the "errors and inadequacies" compared to that interpretation.

I am aware that taxation law and practice is very complex, with numerous exceptions and variations to general rules, but most of these only apply to a minority of tax payers. As Mr Fergusson correctly surmises, to cater specifically for all of these would have expanded the program beyond the capacity of most Pets and the length of the article beyond the capacity of *Practical Computing*. Such programs can sell commercially for hundreds of pounds.

My program provides a quick, accurate and convenient ready reckoner for straightforward income tax assessments and this function was clearly stated in the final paragraph.

Incidentally I have received

(continued on next page)

Our Feedback columns offer readers the opportunity of bringing their computing experience and problems to the attention of others, as well as to seek our advice or to make suggestions, which we are always happy to receive. Make sure you use Feedback — it is your chance to keep in touch.

(continued from previous page)

many appreciative letters and orders for cassettes from practising accountants, universities and colleges of higher education, and in the three months since publication I have not received any complaints whatsoever.

E G Acraman,
Ruislip,
Middlesex.

Hanoi too basic

THE ARTICLE by Boris Allan in the September issue of *Practical Computing* appeared to be guilty of the failings it attempts to criticise. The solution offered to the Towers of Hanoi problem seems to be at too low a level to be either easily understood or easily translated into languages other than Basic.

In general my criticisms are:

- The solution is too tied to a Von-Neuman architecture.
- The solution assumes that computers will always work in binary. We should not tie ourselves to this number system just to make things easier for electrical engineers. Many numerical analysts would much prefer a base-10 system which eliminated rounding errors in base conversion.
- The structure of the problem is not evident from the programs produced.
- There is no reason why successive characters should have successive codes. We are fortunate that this is a property of the ASCII code but this need not necessarily be true of all character codes.
- The programs as they appear are hard to understand. As a programmer of some years experience I could only vaguely see how the BBC illogical version might work.

We use high-level languages to make things easier for ourselves. We use Basic not because it is the most efficient language in the world but because it is easier to understand than machine code. A higher-level approach to specify a method for solving this particular problem would aid our understanding of it and make it easier to prove that our solution is correct.

The classic solution to the Towers of Hanoi problem uses recursion. It can be found in *An Introduction to Programming* by Richard Conway and David Gries as well as numerous other books on programming practice.

The solution is arrived at by the following logic. Firstly number the towers 1,2 and 3. The problem is now rephrased as "move discs from tower 1 to tower 2 using tower 3 as temporary storage."

The largest disc is clearly a key disc since it can only be placed at the bottom of a tower; therefore we concentrate on placing it first. The first refinement of the solution for six discs is therefore:

1. Move five discs from tower 1 to tower 3 using tower 2 as temporary storage.
2. Move one disc from tower 1, the largest disc, to tower 2.
3. Move five discs from tower 3 to tower 2 using tower 1 as temporary storage.

We must now expand step 1. Clearly here the second-largest disc is important since it may only be placed in three positions. Therefore we concentrate on placing it. The steps are:

1. Move four discs from tower 1 to tower 2 using tower 3 as temporary storage.
2. Move one disc, the second largest, from tower 1 to tower 3.
3. Move four discs from tower 2 to tower 3 using tower 1 as temporary storage.

A pattern emerges and the strategy can be seen to be:

1. Move all but one disc to the spare tower.
2. Move last disc to the correct tower.
3. Move the discs on the spare tower on to the destination tower.

We can now conceive a generalised routine for moving the disc. Assume there are N discs, the source tower is numbered X, the destination tower is number Y and the spare tower is numbered Z.

The routine is then:

1. Move N – 1 discs from tower X to tower Z using tower Y as temporary storage.
2. Move one disc from tower Z to tower Y.
3. Move N – 1 discs from tower Z to tower Y using tower X as temporary storage.

The only special case is where N = 1 and the disc can be moved immediately.

Since X,Y,Z and N may take on any values the routine can call itself to perform steps 1 and 3. The program as listed is a clear representation of the algorithm and contains no low-level features. Of course it is not possible to write the program simply in most versions of Basic but that is a fault in the language design rather than in the problem solution.

The program shown is in a version of Fortran 77 which permits recursion. Pascal would be quite adequate for the implementation of this algorithm. Since the solution has a recursive nature it will obviously execute faster on a machine with stack hardware, but this is not essential. Even in the Fortran solution no unsightly contortions of the program were necessary to produce Goto-less code.

Dr Allan is correct in urging us to forget about individual machines and languages. Unfortunately he has become trapped in a bit-twiddling world of Basic compilers. We should instead seek high-level computer-independent solutions to our problems before developing a low-level answer based on the nature of the computer rather than the nature of the problem. The computer should be a useful tool rather than an obstacle to get round. If we are lucky we may find that one day the facilities for implementing our high-level solutions become available to everyone.

M S Jackson,
Wolverhampton,
West Midlands.

Hanoi too basic.

```
      PROGRAM MAIN
      INTEGER DISCS
C
C     READ NO. OF DISCS
      PRINT*,'ENTER NUMBER OF DISCS'
      READ(1,*)DISCS
C
C     CALL TOWER ROUTINE
      CALL HANOI(1,2,3,DISCS)
      CALL EXIT
      END
C
C
C     MOVE DISCS FROM X TO Y
C     USE Z AS TEMPORARY STORAGE IF REQUIRED
      SUBROUTINE HANOI(X,Y,Z,DISCS)
      INTEGER X,Y,Z,DISCS
      IF(DISCS. EQ. 1)THEN
        PRINT*,'MOVE DISC FROM ',X,' TO ',Y
      ELSE
        CALL HANOI(X,Z,Y,DISCS-1)
        PRINT*,'MOVE DISC FROM ',X,' TO ',Y
        CALL HANOI(Z,Y,X,DISC-1)
      ENDIF
      RETURN
      END


 ENTER NUMBER OF DISCS
 3
  MOVE DISC FROM          1 TO          2
  MOVE DISC FROM          1 TO          3
  MOVE DISC FROM          2 TO          3
  MOVE DISC FROM          1 TO          2
  MOVE DISC FROM          3 TO          1
  MOVE DISC FROM          3 TO          2
  MOVE DISC FROM          1 TO          2
```

Wordpro points

IN DAVID OBORNE'S perceptive article "Wordpro revisited" — October issue, page 129 — in which he uncovers some of the finer benefits of Wordpro, he says several things which are a shade misleading and should be corrected. It is Wego Computers, not Professional Software, who distributes the package in the U.K., so please write to us for information on Wordpro.

Wordpro does not favour just the NEC Spinwriter and the Ricoh. The biggest seller with Wordpro at the moment is probably the Commodore 8300 — the Diablo in CBM clothing — because of its price of £1,395. Qume is another favourite.

David Oborne explains the use of assigned ASCII characters to print subscripts

(continued on page 13)

comart communicator

PROGRESS REPORT



...now the pedigree really shows

How has Comart's controlled, down to earth development strategy kept Communicator a firm favourite in the UK, and the leading candidate to reverse the tide of microcomputer imports?

New Range Additions The Communicator range has broadened to add a new 20 Megabyte 5" Winchester Hard Disk Drive System to the already well established 5 Megabyte and floppy diskette models. Another new system offers 8" floppy disk drives for compatibility of data transfer. With the associated tape and additional Winchester back up systems that adds up to eight basic models – all in the same neat, stackable, casing – all based on S100 bus construction to keep future options in memory, users, peripherals and interface requirements wide open.

New System Additions Communicator operating systems continue to broaden both in options and facilities. An improved CP/M offers enhanced diagnostics, for example, and auto boot from Hard Disk. These basic improvements are reflected in the now tried and tested Communicator multi-user MP/MII™, which also provides for full CP/M™ compatibility.

New Communications Options Communicator now offers CP/Net™ and RBTE communications protocols. Individual Communicator Systems can now operate as intelligent information terminals, integrated with either existing mainframe or mini computer installations, or be part of a shared resource or communications network.



New Range of Terminals Find out more about Comart's new smart VDU. It's a new advanced ergonomically designed unit. It has a 105 keyset detached keyboard, soft green phosphor tilt screen, and a low profile foot. Its a perfect complement to the Communicator in both styling and performance.

Some things don't change Communicator still has Comart's established dealer network and nationwide after sales service back up, supporting thousands of Communicators already at work throughout the UK.

And in the Future? Behind all these innovations are advanced programmes of research and development. Soon Comart will be bringing you 16 bit, multi processor and distributed processing systems. This is your guarantee that Communicator will continue to keep pace as microcomputer technology progresses.

To find out more about Communicator today, call us now on 0480 215005.

Main Dealers

Birmingham The Byteshop 84/96 Hurst Street **Tel** 021-622 7149 **Dublin** Lendac Data Systems 8 Dawson Street **Tel** 0001 372052 **Glasgow** The Byteshop Magnet House 61 Waterloo Street **Tel** 041-221 7409 **Leeds** Holdene Bray House Leicester Place **Tel** 0532 459459 **London** The Byteshop 324 Euston Road NW1 **Tel** 01-387 0505 Digitus Lading House 10/14 Bedford Street Covent Garden WC2 **Tel** 01-379 6968 Jarogate 197/213 Lyham Road Brixton SW2 **Tel** 01-671 6321 **Manchester** The Byteshop 11 Gateway House Piccadilly Station Approach **Tel** 061-236 4737 **Nottingham** The Byteshop 92a Upper Parliament Street **Tel** 0602 42076 **Southampton** Xitan Systems 23 Cumberland Place **Tel** 0703 38740

A member of the Comart Group of Companies

comart

SPECIALISTS IN MICROCOMPUTERS

Comart Limited, Little End Road, Eaton Socon, St Neots, Cambs PE19 3JG Tel: 0480 215005 Telex: 32514 Comart G

● Circle No. 104

Dealers

Aberdeen MCM Offshore **Tel** 0224 20963 **Bedford** Ramdas Bradley **Tel** 93 68581 **Cambridge** Cambridge Computer Store **Tel** 0223 65334 **Edinburgh** Holdene Microsystems **Tel** 031 557 4060 **Glenrothes** Computer Services (Scotland) **Tel** 0592 773710 **Blackpool** Western Computers **Tel** 0253 404676 **Manchester** NSC Computers **Tel** 061 832 2269 **Norwich** Anglia Computer Centre **Tel** 0603 29632 **Worthing** Ace Computing Services **Tel** 0903 35411 **Middlesbrough** Adtech **Tel** 0642 222621 **Barking** Adtech **Tel** 01-591 6511 **Belfast** Cardac Services Co **Tel** 0232 625566 **Wilmslow** Holdene **Tel** 0625 529498 **Colchester** Eurotec Consultants **Tel** 0206 72538 **Huntingdon** Westwood Electronics **Tel** 0480 413030 **Ipswich** Sunrise **Tel** 0206 **Middlesex/Berks** Newbury Data Recording **Tel** 0784 61141 **Sheffield** Hallam Computer Systems **Tel** 0742 663125 **Watford** Lux Computer Services **Tel** 0923 29513 **Aylesbury** J K Wakeford Assoc **Tel** 0296 27473

CP/M, MP/MII and CP/Net are all trademarks of Digital Research Inc.

Sinclair ZX Spectu

16K or 48K RAM... full-size moving-key keyboard... colour and sound... high-resolution graphics...

From only £125!



First, there was the world-beating Sinclair ZX80. The first personal computer for under £100.

Then, the ZX81. With up to 16K RAM available, and the ZX Printer. Giving more power and more flexibility. Together, they've sold over 500,000 so far, to make Sinclair world leaders in personal computing. And the ZX81 remains the ideal low-cost introduction to computing.

Now there's the ZX Spectrum! With up to 48K of RAM. A full-size moving-key keyboard. Vivid colour and sound. High-resolution graphics. And a low price that's unrivalled.

Professional power–personal computer price!

The ZX Spectrum incorporates all the proven features of the ZX81. But its new 16K BASIC ROM dramatically increases your computing power.

You have access to a range of 8 colours for foreground, background and border, together with a sound generator and high-resolution graphics.

You have the facility to support separate data files.

You have a choice of storage capacities (governed by the amount of RAM). 16K of RAM (which you can uprate later to 48K of RAM) or a massive 48K of RAM.

Yet the price of the Spectrum 16K is an amazing £125! Even the popular 48K version costs only £175!

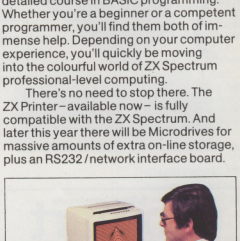
You may decide to begin with the 16K version. If so, you can still return it later for an upgrade. The cost? Around £60.

Ready to use today, easy to expand tomorrow

Your ZX Spectrum comes with a mains adaptor and all the necessary leads to connect to most cassette recorders and TVs (colour or black and white).

Employing Sinclair BASIC (now used in over 500,000 computers worldwide) the ZX Spectrum comes complete with two manuals which together represent a detailed course in BASIC programming. Whether you're a beginner or a competent programmer, you'll find them both of immense help. Depending on your computer experience, you'll quickly be moving into the colourful world of ZX Spectrum professional-level computing.

There's no need to stop there. The ZX Printer – available now – is fully compatible with the ZX Spectrum. And later this year there will be Microdrives for massive amounts of extra on-line storage, plus an RS232 / network interface board.



Key features of the Sinclair ZX Spectrum

- Full colour – 8 colours each for foreground, background and border, plus flashing and brightness-intensity control.
- Sound – BEEP command with variable pitch and duration.
- Massive RAM – 16K or 48K.
- Full-size moving-key keyboard – all keys at normal typewriter pitch, with repeat facility on each key.
- High-resolution – 256 dots horizontally x 192 vertically, each individually addressable for true high-resolution graphics.
- ASCII character set – with upper- and lower-case characters.
- Teletext-compatible – user software can generate 40 characters per line or other settings.
- High speed LOAD & SAVE – 16K in 100 seconds via cassette, with VERIFY & MERGE for programs and separate data files.
- Sinclair 16K extended BASIC – incorporating unique 'one-touch' keyword entry, syntax check, and report codes.

tum



The ZX Printer – available now

Designed exclusively for use with the Sinclair ZX range of computers, the printer offers ZX Spectrum owners the full ASCII character set – including lower-case characters and high-resolution graphics.

A special feature is COPY which prints out exactly what is on the whole TV screen without the need for further instructions. Printing speed is 50 characters per second, with 32 characters per line and 9 lines per vertical inch.

The ZX Printer connects to the rear of your ZX Spectrum. A roll of paper (65ft long and 4in wide) is supplied, along with full instructions. Further supplies of paper are available in packs of five rolls.



The ZX Microdrive – coming soon

The new Microdrives, designed especially for the ZX Spectrum, are set to change the face of personal computing.

Each Microdrive is capable of holding up to 100K bytes using a single interchangeable microfloppy.

The transfer rate is 16K bytes per second, with average access time of 3.5 seconds. And you'll be able to connect up to 8 ZX Microdrives to your ZX Spectrum.

All the BASIC commands required for the Microdrives are included on the Spectrum.

A remarkable breakthrough at a remarkable price. The Microdrives are available later this year, for around £50.



How to order your ZX Spectrum

BY PHONE – Access, Barclaycard or Trustcard holders can call 01-200 0200 for personal attention 24 hours a day, every day. BY FREEPOST – use the no-stamp needed coupon below. You can pay by cheque, postal order, Barclaycard, Access or Trustcard.

EITHER WAY – please allow up to 28 days for delivery. And there's a 14-day money-back option, of course. We want you to be satisfied beyond doubt – and we have no doubt that you will be.

To: Sinclair Research, FREEPOST, Camberley, Surrey, GUI5 3BR. **Order**

Qty	Item	Code	Item Price £	Total £
	Sinclair ZX Spectrum – 16K RAM version	100	125.00	
	Sinclair ZX Spectrum – 48K RAM version	101	175.00	
	Sinclair ZX Printer	27	59.95	
	Printer paper (pack of 5 rolls)	16	11.95	
	Postage and packing: orders under £100	28	2.95	
	orders over £100	29	4.95	
			Total £	

Please tick if you require a VAT receipt ☐

*I enclose a cheque/postal order payable to Sinclair Research Ltd for £ _____

*Please charge to my Access/Barclaycard/Trustcard account no.

*Please delete/complete as applicable

Signature

PLEASE PRINT

Name: Mr/Mrs/Miss

Address

PRC901

FREEPOST – no stamp needed. **Prices apply to UK only.** **Export prices on application.**

ZX Spectrum software on cassettes – available now

The first 21 software cassettes are now available directly from Sinclair. Produced by ICL and Psion, subjects include games, education, and business/household management. Galactic Invasion... Flight Simulation... Chess... History... Inventions... VU-CALC... VU-3D ... 47 programs in all. There's something for everyone, and they all make full use of the Spectrum's colour, sound and graphics capabilities. You'll receive a detailed catalogue with your Spectrum.

RS232 / network interface board

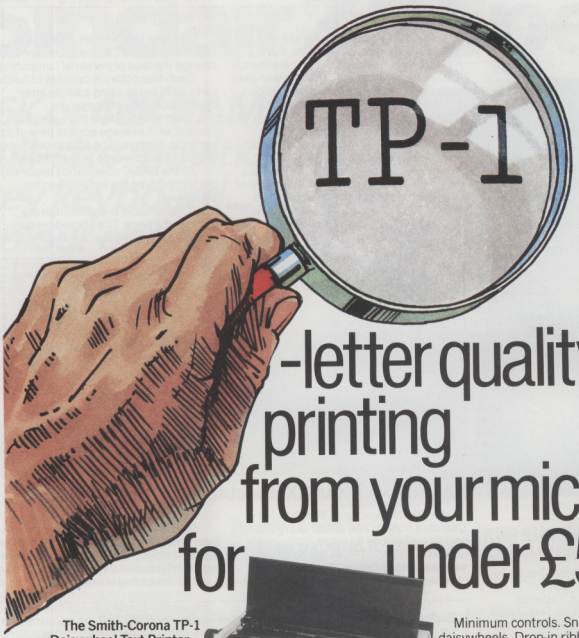
This interface, available later this year, will enable you to connect your ZX Spectrum to a whole host of printers, terminals and other computers.

The potential is enormous. And the astonishingly low price of only £20 is possible only because the operating systems are already designed into the ROM.

sinclair

Sinclair Research Ltd, Stanhope Road, Camberley, Surrey GU15 3PS. Tel: Camberley (0276) 685311.

● Circle No. 105



-letter quality printing from your micro for under £500

The Smith-Corona TP-1 Daisywheel Text Printer.
Fully formed executive quality printout. Letters of real character. For the price of a matrix printer.

The TP-1 costs just £485, plus VAT. Interfaces with all popular microcomputers (Serial, Parallel and IEEE).
Can be used with word processors or small business systems.

Minimum controls. Snap-on daisywheels. Drop-in ribbon cassettes. The TP-1 is as easy to use as it is readily affordable.

Now letters, documents, forms, reports, price lists and data sheets — all can be printed with the image you deserve.

For instant information, complete and mail the coupon.

Butel-Comco Limited
Garrick Industrial Centre,
Garrick Road,
London NW9 6AQ.
Telephone: 01-202 0262/2277
Telex: 47523

BUTEL
Technology for business

To: Butel-Comco Ltd., Garrick Industrial Centre, Garrick Road, London NW9 6AQ.
Yes, send details of the TP-1.
Name _____
Company/Occupation _____
Address _____
_____ Tel _____
Computer details:
Make _____ Model _____ Interface _____
Software application _____

A Butel Technology Company · Consultancy · Software · Turnkey Systems · Microcomputers · Communications and Terminal Equipment

● Circle No. 106

(continued from page 8)

and superscripts on the Ricoh. Of course with most printers there is a standard embedded command in Wordpro: Ctrl-4 for superscripts and Ctrl-6 for subscripts.

We would be very pleased if readers could give us feedback on ways of "bending" Wordpro to their advantage. We have recently found a way of double-underlining a row of figures — something that accountants insist on for totals. It is rather long to describe here, but we would be happy to send a copy of the description to any of your readers.

Jill Hewett,
Wego Computers Ltd,
22a High Street,
Caterham,
Surrey CR3 5UA.

Apple formatter

I HAVE JUST FINISHED typing in the Apple text editor-formatter program in September's Apple Pie. While this is an excellent program, I have two problems with it:

- The program has been saved on disc. If it is called up using BRun, then the first time Ctrl-L is used, whether text has been entered or not, then the program is called up from disc and run again.
- If the last character of the input text is Ctrl-L, the program locks during coding.

If anyone has a solution I would be grateful.

Philip Colmer,
Fordingbridge,
Hampshire.

BBC Bytes back

THERE IS NO NEED to go to the lengths Mr Hill does — November issue — to achieve automatic line feed on your printer, since the micro can do it for you.

*FX6 sets the Printer Ignore character — it is ignored by the printer routine and is not set. This character defaults to the line-feed character. To send line feeds enter

```
*FX6, 0
```

For fuller details see page 423 of the user guide.

T Duffield,
Stansted,
Essex.

Sound seduction

HAVING BEEN SEDUCED by a young lady in one magazine claiming low G in the bass clef for 0 in BBC sound compared with the low A claimed by *Practical Computing* I find that my own machine blurts out a very nearly accurate B — 0.5Hz out of pitch, checked against a frequency meter.

As a musician, I find this discrepancy an irritation. Is there any way of altering this frequency, or is the division frequency derived from the main clock? I suppose it means that I can number-crunch faster than my rivals.

Douglas Tate,
Ampthill,
Bedfordshire.

Spectrum software

LOOKING THROUGH your adverts it is clear that no one has yet got his or her act together to offer much decent material for the Spectrum. Can I therefore offer potential producers some guidance:

- Warmed-up ZX-81 software will sell to 16K Spectrum owners whose machine is their first purchase.
- Most of the rest of we Spectrum owners are ZX-81 owners who have upgraded, and we are likely to be suspicious of offerings with vague descriptions. The reason for this is that some of the stuff we bought for our ZX-81s was pretty awful, and we don't intend to get caught a second time.
- The advent of the Microdrive and the promised RS-232 interface — which will enable us to output to "proper" printers — will change the nature of the game.

Here's a list of items I'll be looking for:

Comal, Pilot, and Forth.
A graph, histogram and pie-chart plotting program.
A decent VisiCalc-type system.
An electronic card index with a good set of searching, sorting, listing and counting facilities.
A renumber program to use on my own programs in Sinclair Basic.
A text editor.
A program to reformat output to an 80-column printer.

D Simpson,
Rochdale,
Greater Manchester.

Libel laws

HOW REFRESHING to see a totally unbiased article in your October edition. I refer, of course, to P K Chilvers' article on the BBC Microcomputer and the Sinclair Spectrum. It is

(continued on page 15)

If you are about to make an important decision in computers

... make a note in your diary to read either the *Financial Times* on Tuesday 11th January.
Or *Computing* on Thursday 13th January.

Ten of the largest computer-orientated companies in the country have been involved in the design of a computer that overcomes the key limiting factors in the current generation's architecture.

The range of machines that has emerged from this concerted effort will be available to the market at large from 18th January.

They are expected to retain their leading edge position for the next five to ten years.

MICROFRAME FROM THE TYCOM CORPORATION



"THE FIRST OF THE 4TH GENERATION"

● Circle No. 107

PROFESSIONAL SOFTWARE

Wiley Professional Software

"Because you didn't buy a computer to practice your typing"

We are pleased to be able to announce the first software packages produced by John Wiley & Sons Inc. They are designed to accompany Computer Titles from the self-teaching guide series.

BOOK/DISC COMBINATIONS

● Practical manuals that show you how to program your micro for business, learning, and pleasure.
● Convenience disks that contain all the programs and subroutines in the books they accompany—error free and ready to run.
PLUS the Wiley expertise that has helped more than a million people learn how to program, use, and enjoy microcomputers.

☐ **APPLE™ BASIC: DATA FILE PROGRAMMING SET**
LeRoy Finkel & Jerald R. Brown

How to program and maintain data files for billings, catalogs and lists, numerical and statistical data, and much more. Includes one 5¼" disk for Apple II™. (Requires one 16 sector disk drive, 32K of memory.)
0471 86836 X **£13.50**

☐ **THE TRS-80™ MEANS BUSINESS SET**
Ted G. Lewis

Covers file merging, data base, word processing, payroll, financial analysis, and scores of other business applications. Includes one 8" disk for TRS-80™ Model II. (Requires two disk drives, 64K of memory.)
0471 86798 5 **£13.50**

☐ **GOLDEN DELICIOUS GAMES FOR THE APPLE™ COMPUTER SET**
Howard M. Franklin, Joanne Koltnow, & LeRoy Finkel

Step-by-step instructions for designing game programs that turn your Apple II™ into a home entertainment center — whether you're a novice, intermediate or advanced programmer. Includes two 5¼" disks for Apple II™. (Requires one 16 sector disk drive, 32K of memory.)
0471 86836 1 **£23.70**

☐ **FAST BASIC: BEYOND TRS-80™ BASIC SETS**
George A. Gratzer with Thomas G. Gratzer

Learn a streamlined form of BASIC that accelerates computations by 3 or 4 times . . . and some functions by a factor of 1,000.

Available in disk or cassette for TRS-80™ Model I or Model II. (requires 32K of memory.)

☐ 0471 87484 1 Model I Disk Set (one 5¼" disk) **£13.50**
☐ 0471 86838 8 Model III Disk Set (one 5¼" disk) **£13.50**
☐ 0471 87421 3 Cassette Set for Model I or Model III **£13.50**

TRS-80™ is a trademark of Tandy Corp. Apple™ is a trademark of Apple Computer, Inc.

Look for these at your favourite bookshop or computer store. Or, check the sets that interest you and write to us at the address below.

John Wiley & Sons Limited
Baffins Lane · Chichester · Sussex PO19 1UD · England

● **Circle No. 108**

(continued from page 13)

such a shame that other magazines do not print such articles, as this would dispel many of the rumours abounding about the virtuosity of one computer compared with another.

However, I did get the impression that although the author had attempted to give an unbiased opinion of the two micros, some form of censorship had been applied to the article in order for it not to offend. This practice, although unprovable, is wrong, as it leads to false information being relayed and hence ultimately in making your magazine's views worthless.

It is obvious to those of us who have used both a Spectrum and the BBC Micro that there is no comparison at all. The BBC machine leaves the Spectrum standing in all aspects of operation. The Spectrum's advantage of price is far outweighed by the disadvantages — keyboard, Basic, speed, display, expansion, etc. I would not hesitate to say the BBC Micro is the most advanced computer in Europe, and possibly the world.

Simon Clark
Towcester,
Northants.

● We do not censor articles, but our contributors generally try to stay on the right side of the U.K.'s illiberal libel laws. Your assertion about the BBC Micro might upset the makers of the Cray 1, not to mention IBM, but it is certainly one of the best currently available home computers costing less than £400, our lawyers agree.

Spectrum deliveries

I AM WRITING in regard to your article "Spectrum's Delays", which appeared on page 48 of the November issue. You quoted the then current expected delivery date as January 1983, but I should point out that we have now completely cleared our backlog on Spectrum and all orders are now being fulfilled within 28 days of our receipt of them.

Bill Nichols,
Sinclair Research Ltd,
London SW1.

● We will take Sinclair's word for this — unless, of course, you know different.

Illegible listings

A FEW DAYS AGO I received my copy of the October issue of *Practical Computing*, and having glanced through it briefly I am prompted to complain at the legibility of some of the computer listings. A particularly bad example is that for the Apple II Graphics on page 174 but there are others almost as bad — as indeed there have been in other issues.

Surely you must be aware that the chance to try out new programs is one of the main reasons why your readers buy the magazine.

I am sure you will say that there are technical problems in obtaining a consistent print size and quality, but these problems are yours and should not be passed on to your readers who have paid money for a readable magazine.

This point aside, thank you for an excellent publication.

Hugh McDonald,
Wallsend,
Tyne and Wear.

● We are making every effort to improve the quality of our program listings as should be evident from this month's issue. Contributors can help by always supplying a cassette or disc as well as a program listing.

Wiley's books

IN THE October and November issues of *Practical Computing* you were good enough to review some of our titles. I would like to point out, however, that *Microcomputer Buyer's Guide 1981* is published by Hayden but is distributed in the U.K. by John Wiley and Sons Ltd. *Pet Graphics* is also published by Hayden and distributed by us for sale in Europe only. It is available in the U.K. and Ireland from Nick Hampshire Publications, PO Box 13, Lysander Road, Yeovil, Somerset.

Bernice Preddy,
John Wiley & Sons Ltd,
Chichester.

Apology

"The BBC Micro as a colour graphics terminal" published in the November issue was written by John Ferguson and John Gordon, not as originally credited.

Electronic Brokers

DEC SALE

a selection from our huge stocks

All items reconditioned unless otherwise stated



DIGITAL WS78 SERIES WORD PROCESSOR

Specification
VT78 word processing video terminal
RX01 diskette storage subsystem
PDP-8 control processor
Diablo 1345 letter quality printer producing 540 words per minute with wheeled storage cabinet.
Bi-directional tractor feed fitted as standard.

Features
- Interactive stand-alone text editing
- Simple to use—prompts the operator automatically
- Letter quality printer with choice of print wheels
- Simultaneous editing and printing
- Powerful list processing package
- Flexible communications capability

System performance
Digital's WS78 word processing system is a powerful stand-alone, video display word processor. The WP8-B word processing software provides the WS78 user with a sophisticated yet easy to use text editing capability. Using the dialogue between operator and machine known as the "Menu Based" system allows the operator to choose from an extensive, clearly listed range of options and the automatic prompting features help the operator to learn how to use the system with only minimal training.

£2,950

SYSTEMS

PDP 11/23 SYSTEMS
11/23 CPU, 128KB MOS, Dual RL02 and Control DLV11J and DUV11 Interfaces. Cabinet, VT100 Console NEW **£11,500**

PDP 11/24 SYSTEM
11/24 CPU, 256KB MOS, Dual RL02 and Control. Cabinet, VT100 Console NEW **£16,000**

PDP 11/03 SYSTEMS
11/03 CPU, 64KB MOS, Console Interface, Dual RX01 Floppy Disk Drive. Low cabinet on castors ONLY **£1,525**

DISK DRIVES

RX11BD RX01 + Unibus Ctl	£895
RXV11BD RX01 + LSI Ctl	£895
RX8E RX01 + PDP8 Ctl	£895
RK11D 2.4MB + Unibus Ctl	£1450
RK8E RK05 + PDP8 Ctl	£1450
RK05 14MB Add-on	£1450
RK611 RK05 + Ctl	£2850
RK07 28MB Add-on	£3500
RK711 RK07 + Ctl	£2850

PRINTERS/TERMINALS

LA36 DECwriter II 20mA	£895
LA36 DECwriter II RS232	£925
LA34 DECwriter IV	£485
LA180-PD Parallel DECprinter (NEW)	£495
LA180-ED RS232 DECprinter (NEW)	£870
VT50 Decscope 20mA	£199
VT50 DECscope RS232	£885
VT55 Graphics DECscope (NEW)	£495

INTERFACES

DL11W Asynchronous I/F	£395
DLV11J Asynchronous I/F	£525
DJ11D Asynchronous I/F	£775
KL8E Asynchronous I/F	£775
KUL8A Asynchronous (BC 8A)	£875
M7258 Printer I/F (RSP11)	£395
M8027 Printer I/F (LPS11)	£1175
M8342 Printer I/F (BE 8A)	£825

PDP8A
PDP8A-305 Processor 10¼" rack 32kW MOS (NEW) **£1,750**

DAISY WHEEL PRINTERS

NEW LOW PRICE



Scoop purchase of factory refurbished Anderson Jacobson AJ832 daisy wheel printers complete with full keyboard, integral stand, and RS232 interface. Utilising the famous QUME Printer Mechanism.

NOW ONLY £750

Hazeltine 1420

Special purchase of Hazeltine VDUs
— manufacturer's surplus —
ALL BRAND NEW BOXED

- All 128 ASCII Codes
- 94 Displayable Characters including Lower Case
- High resolution using 5 × 8 Dot Matrix
- Typewriter-Style Keyboard Layout
- 15-Key Numeric Pad including [+], [ ] and Enter
- User-defined Video Presentation— HiLo Intensity, Blink, or Non-Display
- Cursor Addressing and Sensing
- EIA Interface
- Eight Transmission Rates up to 9600 Baud
- Twelve Operator Function Keys
- Non-Glare Screen
- Self Test.

ONLY £350



Also available from time to time

HAZELTINE 1410	£295
HAZELTINE 1510	£550
HAZELTINE 1520	£625

New Winter '82/83 Catalogue now out. Send for your FREE copy now.

ADD 15% VAT TO ALL PRICES Carriage and Packing extra

Electronic Brokers Ltd., 61/65 Kings Cross Road, London WC1X 9LN. Tel: 01-278 3461. Telex 298694

Electronic Brokers

● Circle No. 109

Brainless prices!

FREE Membership to Micro Computer C when you buy SUPERBRAIN Entitles you to other special offers



Now

SUPERBRAIN™ INTERTE DATA SYSTEM

at unbelievably low prices fro the Micro Computer Clu

JUNIOR 320K DISK CAPACITY £125
QD 720K DISK CAPACITY £155
SD 1.5MB DISK CAPACITY £180

MICROLINE 83A PRINTER £ 45
WITH M/C

And price includes CP/M and Microsoft M Bas

Only by selling direct mail order can we offer these price

From the Micro Computer Club, popular software lines:

MICROSOFT	Basic £175	**MICRO PRO**	Wordstar Vers.3.0 £210	Organic Software Milstone ...	£1
	Basic Compiler £202		Mailmerge ... £ 70	Ashton Tate dBase II	£3
	Fortran £225		Datastar £155	SORCIM SUPERCALC	£1
	Cobol £330		Calcstar £105	**NOTE:** SUPERBRAIN & 8in. IBM FORMATS ONL
	Microplan ... £150				

3 MONTH Return to Works Warranty

MAINTENANCE

- On site maintenance available from day one.
- Nationwide contracts through Software Sciences — a member of THORN EMI group.
- Software Sciences will inspect, deliver and maintain your SUPERBRAIN.
- The 24 hour call-out basis.

JUNIOR	£375 pa
QD	£415 pa
SD	£440 pa
MICROLINE 83A PRINTER	£150 pa

To: The Micro Computer Club PO Box 66 Croydon CR9 4QB Tel: 088 32 4820
Please accept my order and enrol me as a member of the Micro Computer Club.

All prices are based on exchange rate at time of going to press and may be subject to change. All orders must be accompanied by a cheque for the sum due. This will not be banked until four days before despatch.
Carriage within UK extra at £25 Greater London, £35 outside London.

ITEM	QNTY	UNIT PRICE £ p	TOTAL £ p

Name ..... TOTAL

Address ..... CARRIAGE

..... VAT at current rate

Post Code ..... CHEQUE TOTAL
All machines sold to UK specification with full manufacturers warranty

Membership of the Micro Computer Club entitles members to other special offers.

Compec '82 report



Around 400 firms exhibited at Compec

NEW 16-BIT micros, portables, and local area networks were the main themes of Compec '82. There was little that was startling, but a lot of evidence of continuing development in these areas.

As well as the by now familiar Sirius/Victor 9000 and IBM PC there were several recent or brand-new 16-bit micros at the show.

Six interesting machines all use the powerful Motorola 68000 16/32-bit processor: the Fortune — reviewed on page 66 of this issue — the Sage II, Alpha Micro AM-1000, Wicat 150WS, Corvus Concept and the British-built IMP-68. MicroAPL showed the Scimitar, which is a version of the Sage II running APL under the custom Mirage operating system.

Range of micros

Among the many micros using the Intel 8088 chip were the Rair Business Computer, the Hitachi 16, Zenith Z-100, Televideo 1602 and the new Micro Five Series 1000.

An interesting — and good — trend is for machines to include both an eight-bit and a 16-bit processor. Both the Rair and the Zenith machines have an 8085 to go with the 8088, for example. Interam showed the North Star Advantage with both Z-80B and 8035, though an 8088 16-bit upgrade is due shortly. EuroMicro showed the new EuroMicro M8/16 with dual 8085 and 8088 processors, and also the Equinox range which now offers an 8088 upgrade. Equinox also showed a 68000-based micro in prototype form.

Buy British

Two excellent British companies taking advantage of the upgrade path offered by the S-100 bus system are Comart and Almarc. Comart's Communicator range now features an Intel 8086, of which the 8088 is a cut-down version and the Cromenco that Comart imports now offers a 68000 option. Almarc has used an 8086 to upgrade the Series 8 to a Series 16; existing Series 8 users can also take the upgrade.

Finally, Ferranti has entered the 16-bit market with the new PPC — Professional Personal Computer — which is also based on the 8086 and runs CP/M-86.

In spite of the current rage for 16 bits, eight-bit micros continue to appear. That is where the software still is, after all. Excitement can still be generated by making the hardware smaller, neater and cheaper, and three new American imports come into one or more of these categories.

The Morrow Designs Decision 1 was shown in the U.K. for the first time. This is a quite cheap, very expandable machine which runs multiple CP/M or multiple Unix level 6 packages simultaneously.

The oddly named Fox is not actually designed as a portable, but becomes so when packed in a custom case. Digital Microsystems calls it the DMS-3/F.

The third is the Cromenco C-10 personal computer which consists of a keyboard, VDU and single disc drive. Nothing special about that perhaps — except the price, which at $1,785 is cheaper than the Osborne. As with the Osborne, essential software is included in the price, so this could well be the cheapest business system on the market.

Just about every major manufacturer is now implementing some form of network system to link micros together, allowing them to share hard discs and printers. Keen Computers, for example, offers the Corvus hard discs and the Omninet to link up a network of Apples or other micros — including the Sirius, IBM PC, and even the Atari 800.

Digital Microsystems offers the HiNet local area network which is CP/M compatible. Data Logic Ltd launched the 90/10 Network Management System at the show, which includes 60Mbyte of disc storage. Research Machines Ltd's Chain network for linking 380-Z and 480-Z micros is now in production. Zynar has the Cluster/One network for Apples, and is now offering the Elf as a low-cost LAN for the same machines.

Digico's 7800 series uses a 16-bit processor to control up to 32 clusters of micro terminals, where each cluster can include three work stations based on a 5Mbyte or 10Mbyte hard disc — for example the 3800 series announced in September.

The well-known Ethernet LAN is used by a number of manufacturers. Altos showed Ethernet working on its full range of eight-bit and 16-bit micros. MicroAPL had Ethernet linking its Spectrum and Scorpion micros. Finally, Clearway showed four new versions of its standard unit, which was reviewed on page 61 of our September 1982 issue.

With around 400 firms exhibiting at Compec it is impossible to mention all the new products shown, but several caught the eye. Among these was the JP101, an ink-jet printer from Olivetti. It is to be sold at around £400, which will give dot-matrix printers a run for their money.

Newbury Data, the largest exhibitior at Compec in terms of stand space, launched four new dot-matrix printers with optional add-on keyboards, a series of VDUs and an 8in. Winchester offering 80Mbyte storage.

New at the show

ICE showed its 50Mbyte Rodime-made hard disc for Apple, Sirius, IBM PC, etc, with tape-streamer back-up. Owners of the Profile hard disc for the Apple III will be delighted to hear that the tape-streamer will back up the contents in under three minutes.

Kode Ltd was offering to add voice-recognition modules to existing terminals for less than £2,000, and Aptec had an Arabised version of the IBM PC with a bilingual Arabic/English keyboard, software and printer. Comsol had its multi-tasking Forth, knows as polyForth, running on the Sirius 1, and Atari had two new arcade games, Defender and Galaxian, on ROM cartridges. Even a show devoted to the highest forms of microcomputer life should find room for a bit of inter-galactic death. That was Compec.

Let Commodore expand your horizons.

VIC 20 is the finest home computer that money can buy.

And the better you get to know it, the more confident, adventurous and ambitious you'll become.

You'll want to take advantage of the vast range of VIC software: a superb and constantly-growing selection of programs, embracing business systems, entertainment, education and many applications in the home.

Every program in the series has been designed by experts, and chosen for its quality and value for money.

VIC business software covers a wide range of applications, including spread-sheet analysis, stock control, information handling and word-processing.

A mind-blowing range of games including Scott Adams' world-famous 'Adventure' series.

Advanced space games, including the sophisticated 'Omega Race'.

Learn subjects as diverse as English Language, programming, and biology.

And 'home' software ranges from IQ tests to Robert Carrier menus.

In addition, there is a range of VIC software, like programmers' aids and graphics packages–



to add to your understanding and enjoyment of computers and computing.

There's even a special 'VicSoft' Club for VIC 20 enthusiasts, with many advantages including special offers to club members.



VIC software will expand your horizons. And your mind.

PRICES RANGE FROM £4.99 to £24.95 INC. VAT.

commodore

VIC 20

● Circle No. 111

For more information, a catalogue of VIC software and details of your local retailers or dealers please phone or complete the coupon and send to:
The Commodore Information Centre,
675 Ajax Avenue, Slough, Berkshire SL1 4BG.
Telephone: Slough (0753) 79292.

Name
(MR./MRS./MISS)
Address

Postcode

VCPCO 01/83

NEW!

Fast CP/M
Business Application Software from Padmede



at £249 per module

The Padmede Business Control System is available now on the following machines:-

Sharp PC-3201, MZ-80B ● Apple II ● NEC PC-8000 ● DEC VT180 ● Osborne I
ICL Personal Computer ● Rair Black Box ● Wangwriter
Hewlett-Packard 125 ● OKI if-800 ● Toshiba T200 ● IBM Displaywriter
Xerox 820 ● IBEX 7102/7103 ● Cromemco ● Sirius I (MS-DOS Version)

Send for details of the Dealer Demonstration Pack

Padmede
COMPUTER SERVICES
351 Fleet Road, Fleet, Hampshire
Telephone: Fleet (02514) 21892/3
Telex: FLETEL 858893

Please send me: ☐ End user documentation ☐ Dealer Pack ☐ Dealer Demonstration pack for Machine .....
Name ..... Position .....
Company .....
Address .....
Tel. No. .....

● Circle No. 112

HP announces first 'desk-top mainframe'

HEWLETT-PACKARD has announced further developments of its NMOS-III integrated-circuit technology, which allows circuit densities 70 times greater than the NMOS-II. It has allowed them to build a package of five "superchips" which combine in a 32-bit machine to bring mainframe power to the single-user desk-top computer.

The new range is the HP-9000 Series. The smallest configuration — an integrated work station with one CPU, 912K of RAM, floppy disc and monochrome display — costs about £20,000. With a 10Mbyte hard disc, built-in printer, high-res colour display and software the cost goes up to over £45,000.

Other versions of the HP-9000 are available rack-mounted, and with multiple CPUs for those unfortunates who have to share their machine with other members of the human race.

It may be expensive, but perhaps one day all micros will be made this way!

Two new microcomputers from Hewlett-Packard are the HP-120 Office Computer and the HP-200 16-bit machine. Both are offered with 3.5in. micro-floppy discs which are based on Sony developments with HP electronics and packaging. Each floppy disc offers 270K of storage.



The HP-120 is like the HP-125, but smaller. The HP-200 is a 16-bit micro using the Motorola MC-68000.

Contact Hewlett-Packard Ltd, Nine Mile Ride, Wokingham, Berkshire RG11 3LL. Telephone: (03446) 3100.



The World launch of Eagle's new 16-bit micro took place at Compec. The Eagle 1600 is a stylish-looking micro built round the Intel 8086 CPU, and runs MS-DOS or CP/M-86. The basic model has 128K of RAM, built-in hard disc with 10Mbyte of formatted storage, and a 5.25in. floppy. It is claimed to be fully compatible with both hardware and software for the IBM Personal Computer, and offers eight expansion slots compared to the IBM PC's five. Contact Mediatech Business Systems, Woodside Place, Alperton, Wembley, Middlesex HA0 2HA. Telephone: 01-903 4372.

Apple memory

BUBBLE MEMORIES could be back in fashion soon. Xcalibur has announced a 128K Bubble Memory Module for the Apple II. It is called, imaginatively, XBUB1 and costs under £500. Contact Xcalibur, Spencer House, 3 Spencer Parade, Northampton NN1 5AB. Telephone: (0604) 21051/4.

HAL computers has announced the Aquarius subsystem, also for the Apple II. It offers a choice of 5, 7.5 or 11Mbyte of formatted storage on a mini-Winchester with 20 Mbyte, 0.25in. tape for back-up. The tape does not receive an unverified dump when backing up, but is verified by read-after-write. Contact HAL Computers, Invincible Road, Farnborough, Hampshire. Telephone (0252) 517171.

A tape back-up is available for the Apple III Profile 5Mbyte drive from DNCS. It is called the Shadow III and takes about 25 minutes to back up the full drive with verify. Contact DN Computer Services, West Croft Industrial Estate, Manchester Old Road, Rhodes, Middleton, Greater Manchester. Telephone: 061-643 0016.

Touchy input

YOUR VDU could have a sense of feel if you fitted an unpatterned glass faceplate over it. The faceplate from Interaction Systems senses impedance changes, so if you touch the screen it returns the x,y co-ordinates of the point in eight-bit numerics, 0 to 255. It would allow you to, for example, dial phone numbers by touching a picture of a phone dial on the screen, or write complex programs that do not require keyboard input.

Interaction is offering manufacturing licenses, and plans to supply components to OEMs. The price comes below $200 for quantities of 1,000 or more.

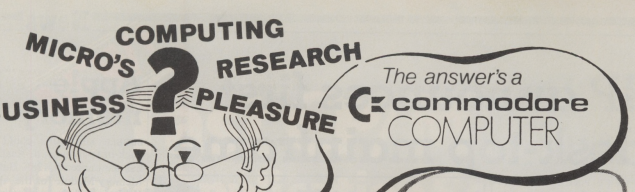
Contact Interaction Systems Inc., 24 Monroe Street, Newtonville, Massachusetts, 02160. Telephone: (617) 964 5530.

Football crazy

FOOTBALL POOLS prediction programs require data to work on, and the more the better, but keying it all in takes a lot of time and effort. Alternatively it can be purchased from Selec Software. The database is the scores and dates of all the English Football League results from 1977 to 1982.

Selec can cater for most home computers from the ZX-81 up. A tape of two years' data costs £7.50, and a disc of all five years costs £15. The data comes with some starter analysis software in Basic and UCSD Pascal to help beginners get started.

Contact Selec Software, 37 Councillor Lane, Cheadle, Cheshire. Telephone: 061-428 7425.



L&J COMPUTERS

192 HONEYPOT LANE, QUEENSBURY, STANMORE, MIDDX HA7 1EE. 01-204 7525

THE "PET" SPECIALISTS

We specialise in PACKAGE DEALS — from beginners to big users you may lose out if you don't contact us before you buy !

IF YOUR CALL IS URGENT, RING OUR HOT-LINE 01-206 0440

HARDWARE

CBM MICRO-COMPUTERS	16K	4016
	32K	4032
	32K	8032
	96K	8096
	SUPER-PET	9000
DISK DRIVES (5.25")	2M/B	8250
	1M/B	8050
	340K	4040
	170K	2031
HARD DISKS CBM	5 M/B	9060
	7.5M/B	9090
** MATOR	23 M/B	SHARK
** MATOR	30 M/B	SHARK
** MATOR	BACK-UP	SHARKIVE

(** APPROX 8 WEEK DELIVERY)

PRINTERS (MATRIX)	CBM	4022
	CBM	8023
	CENTRONIC	150
	CENTRONIC	737
(DAISY WHEEL)	CBM	8300
	NEC	7730
	QUME	SPRINT

NOW IN STOCK: SMITH CORONA DAISY WHEEL PRINTER AT £ 485 + VAT
WITH INTERFACE (£100) - £ 525 + VAT ONLY!!

The price of our systems start at about £1600+

NEW! NEW!! SWITCH CONTROLLABLE WRITE PROTECT + AUDIBLE ERROR WARNING ON C.B.M. DISK DRIVES. ONLY £ 15 + VAT

RAM/ROM FOR YOUR CBM AT ONLY £ 39 + VAT. REMAINS PROGRAMMED FOR UP TO 7 DAYS EVEN WITHOUT USING YOUR MACHINE!

For those with 3032s who want 4032s and those with 4032s who sigh for 3032s, all is not lost! HAVE BOTH, at the flick of a switch — CHIPSWITCH for £57 + ROMs for £50 (with de-glitching facility built-in).

TOOL KITS (BASIC 2 & 4), SUPERCHIPS, ...AND ALL SORTS OF OTHER CHIPS... UPGRADE YOUR PET EVEN MORE!!

WE GUARANTEE THE BEST SERVICE AND WHAT'S MORE

WE DON'T QUIBBLE WHEN YOU HAVE A WARRANTY CLAIM!!

SOFTWARE

SILICON OFFICE : WORDCRAFT : WORDPRO D.M.S.V. : ADMINISTRATOR : DATALEX BASIC & SUPERPAY : ACCOUNTS : VISICALC ALL IN STOCK

CASH BOOK
Enter daily-weekly amounts — printout and totals, weekly/monthly analysis, totals and balances.
3032, 4032 & 8032 versions — from £90 to £150
STOCK TAKING for the licensing trade — £240
Superb new program for 8032 — £420
OUTSIDE SERVICES (For Mini-Cabs, etc.) — £220
New 8032 Version at 3032 price

EDGE CONNECTORS AND COVERS
RS232 CONNECTORS AND COVERS
CENTRONIC CONNECTORS AND COVERS
DUST COVERS FOR MOST PETS & VICS
ALL SORTS OF RIBBONS
PAPER (PLAIN & LINED)

DIRECT MAIL ORDER SYSTEM
Please send me/us the following items:

Cheque/P.O. enclosed (allow for VAT & post)
Please charge my ACCESS/VISA/BARCLAYCARD No.

Name

Address

Postcode

Phone No.

If you require more information, please tick
[ ] Please send details of
[ ] Please send Software details
[ ] Please send Hardware details

PERSONAL SHOPPERS WELCOME
Phone & Mail Orders accepted.

ALL GOODS SENT SAME DAY WHEREVER POSSIBLE
LARGE S.A.E. FOR LISTS ETC.

● Circle No. 113

Rival top-end database managers

DBASE II is the top-selling full-feature database package for eight-bit CP/M systems, with possibly 20,000 copies sold worldwide. Now its creator Ashton-Tate has produced a 16-bit version which will run on the IBM PC, other CP/M-86 machines and the ACT Sirius. More details from Encotel Systems, 7 Imperial Way, Croydon Airport Industrial Estate, Croydon, Surrey CR0 4RR, telephone 01-686 9687; or for the Sirius contact Sirius dealers or ACT Microsoft, ACT House, 111 Hagley Road, Birmingham B16 8LB, telephone 021-454 8585.

dBase II is a very powerful relational-database package, and its flexibility makes it much favoured by sophisticated users as a system-building tool, much like a very high-level programming language. For example, Magnum Computers has just released a foreign-exchange management package written entirely in dBase II commands. It handles spot and forward deals in any foreign currency, producing various reports which analyse exchange risks and keeping a complete audit trail.

One advantage Magnum Computers derives from this approach compared to writing the application package in Basic is that it can more readily be modified to suit individual clients' requirements. The users pay £550 for the package, plus £430 for dBase II if they do not already have it. More details from Magnum Computers Ltd, 156 Northfield Avenue, Ealing, London W13 9SB, telephone 01-567 0154.

Dataflex is a new database package aiming to compete with dBase II in both the eight-bit CP/M-machine market and the 16-bit CP/M-86 and MS-DOS arena. It is written in Pascal and can also run on most multi-user operating systems like MP/M-86 and Turbodos.

Dataflex is a multi-file full-feature relational database. It can handle 125 files with up to 255 fields and four indexes per record. Six files, and sometimes more, can be active at any time.

An optional library of Pascal utilities is available for the system builder who wishes to incorporate Dataflex into an application package but wants to go down beneath the usual interface to Pascal language level.

Dataflex costs £450 in its CP/M version and £595 for multi-user systems. More details from Equinox, 16 Anning Street, New Inn Yard, London EC2A 3HB. Telephone: 01-739 2387.

...improved middle range

FIRST-TIME USERS who care more about what they want to use a computer for than what has got to be done to get it to happen tend to find the full-feature database package such as dBase II a little overwhelming — unless somebody else has set the whole system up for them. Into this opening come packages such as Compsoft's DMS.

DMS's great strength is its simplicity in use and the excellent training and support available from Compsoft. DMS has sold over 4,000 packages in the U.K., and it must be the leader in its class.

There tends to be a trade-off where software is concerned between power on the one hand and ease of use on the other. DMS is still very powerful in terms of data-checking, sorting, searching and reporting features, but some compromises are made to keep it relatively simple. In particular, operations are performed on one file at a time.

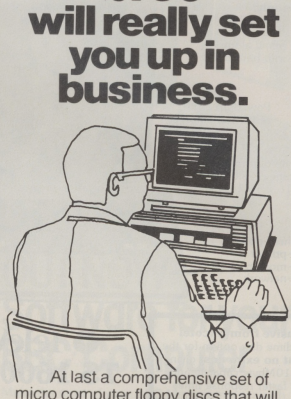
Now Compsoft has introduced a new version of DMS, called DMS Delta. It adds the ability to handle more complex data while still keeping to the tried and tested DMS menu-driven format. DMS Delta runs on eight-bit CP/M machines or 16-bit machines like the IBM PC and ACT Sirius under MS-DOS. It costs £495.

Users are now able to attach sub-files or related data to the main file. For instance, an order sub-file can be attached to a stock file, or borrower details appended to a file of book

(continued on page 25)

exact

£750 will really set you up in business.



At last a comprehensive set of micro computer floppy discs that will really set you up in business book-keeping and keep you on top . . . at an affordable price.

We've called it the Exact Business System. Compatible with most modern micro computers, everything's there at your fingertips. Stock and invoicing – sales, purchasing and nominal ledgers – even payroll.

Ask your Sirius Nationwide dealer, Electronic Office Services dealer or local computer centre about the Exact Business System or write/phone us direct.

Exact Business Systems,
The Bickerton Computer Centre,
Park House, Abbey Foregate, Shrewsbury SY2 6BL.
Tel: (0743) 68167.

Also at:
56 Wigmore St., London W1H 9DG. Tel: 01-925 2303.
Enquiries from stockists welcomed.

ACT SIRIUS 1

● Circle No. 114

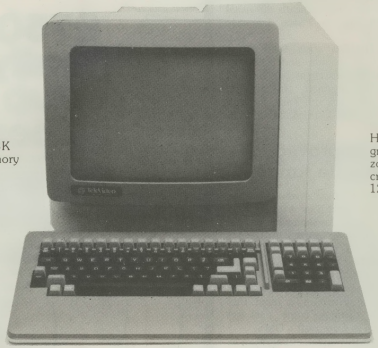
You can keep your 8-bits–with the new 16-bit Televideo®*

TS 1600 family:
TS 1600 Workstation
TS 1602 Stand alone
TS 1602H Stand alone with hard disk

Prices start at £1629* for a TS 1600 Workstation
*At $2 to the £ Sterling

Powerful 128K resident memory

High resolution graphics with zoom, pan and crosshair cursor. 1280 x 804 (optional)



141 Mbyte of formatted disk storage possible using a 16 x TS 1602H network

Three ports
—printer
—modem
—network

Multi-user, multi tasking system will support 16-bit and 8-bit software simultaneously

Exclusive from Encotel
A Rodime disk option for the 806 **at no extra cost** giving a full 10Mbyte capacity and much faster response times

TeleVideo TS 1600 Series

Nationwide service through Software Sciences — part of THORN EMI

* Now, a whole new 16-bit Televideo range that can simply plug into your existing multi-user 8-bit system.

Encotel are one of Britain's largest microcomputer distributors with full engineering technical support facilities and workshops.

SYSTEMS

ENCOTEL

Britain's specialist microcomputer distributors

ENCOTEL SYSTEMS LIMITED 7 IMPERIAL WAY CROYDON AIRPORT INDUSTRIAL ESTATE CROYDON SURREY CR0 4RR
Tel 01-686 9687/8 01-680 6040 (six lines) Telex 8951921 ENCO G

Televideo® is the registered trademark of Televideo Systems Inc.

MIDLANDS AND NORTH ENGLAND
DUDLEY Independent Systems Ltd 0384 236934
DONCASTER Briarstar Computer Centre 0302 67135
LEICESTER Selex Ltd 0533 402722
NOTTINGHAM Cambridge Data Systems Ltd 0602 811801
STOCKPORT Microscope 061 427 2340
STOCKPORT MellorComputerConsultancyLtd061 449 8101
ST NEOTS West Com Ltd 0480 217217
WILMSLOW Magnalfe Ltd 0625 526713
EASTERN ENGLAND
BURY ST. EDMUNDS Rebvale Ltd 095 381316

LONDON
NORTH LONDON Boyd Microsystems Ltd 01 950 0303
SOUTH HARROW Wordset Systems Ltd 01 864 7389
KINGSTON UPON THAMES Ideal Computer Systems 01 946 5568
LONDON N6 Cambridge Data Systems Ltd 01 340 6561
LONDON E6 System Builders Ltd 01 471 4884
LONDON WC1 Bondbest Ltd 01 580 4273/7249
LONDON WC2 Systematica Ltd 01 836 9379
SOUTH EAST ENGLAND
BRIGHTON The Electronic Office 0273 722248/9
HAYWARDS HEATH Ampersand Ltd 0444 456509
HORSHAM Sussex Microsystems Ltd 0403 68071
READING Chandler Computer Services Ltd 0734 475853
SEVENOAKS Labrae Ltd 0732 460528
WEST COUNTRY
MELKSHAM Advent Data Products Ltd 0225 706289
WALES
GWYNEDD C.P.L. Ltd 075 881 2053
IRELAND
CASTLEBAR Delta Microsystems Ltd Castlebar 22632
NAVAN STS Ltd Navan 28472

● Circle No. 115

(continued from page 23)
information. Up to eight sub-files can be attached to a file.

In effect DMS has been upgraded to a multi-file package, but compared to a true relational database like dBase II or Dataflex there is less flexibility: you have to decide what data you want to associate together at the time you define your files rather than at run time. But for many common applications the simpler DMS approach may be exactly what is required.

More details from Compsoft Ltd, Hallams Court, Shamley Green, Guildford, Surrey GU4 80Z. telephone (0483) 898545.

Rescue is an all-new database package for eight-bit CP/M systems. Although 20 files can be held per disc, Rescue can only operate on one file at a time, so it is a single-file package; it is thus comparable to the original DMS but not to DMS Delta or the more complicated relational packages like dBase II and Dataflex. Nonetheless, it has a number of interesting features. Data compression techniuqes are used extensively. As well as cramming more data per disc, Rescue has a dictionary feature which allows you to specify a permitted set of up to 256 values for a particular field, other values being rejected upon entry.

Rescue allows records up to 1K in length, containing up to 100 fields and up to 10 keys. Used in conjunction with WordStar the package can produce personalised letters or reports.

Rescue costs £295. More details from MBS (U.K.) Ltd, 5 Charterhouse Buildings, Goswell Road, London EC1M 7AN. Telephone: 01 253-3998.

...and the bare essentials

MANY PEOPLE find choosing between database packages so complex that they give up. And they may be right — if it takes that long to find out what they all do it is worth considering seriously how long it will take to learn how to use the chosen product. Hence a new wave of products which are unashamedly primitive but have the virtue of being easy to pick up and use.

Addressbook is a completely menu-controlled mailing-list package for use with CP/M word-processing systems like WordStar. The user initially enters information about each addressee into a standard form displayed on the screen.

Addressbook costs £90. It is available now for the Superbrain range with versions for other machines to follow. Contact Decision Technology, 7 St Johns Road, East Molesley, Surrey KT8 9JH. Telephone: 01-979 5533.

List Handler for the Apple is marginally more ambitious, handling mailing labels, lists and letters. It can store, sort and selectively retrieve, and costs £85. Details from Pete and Pam Computers, New Hall Hey Road, Rossendale, Lancashire BB4 6JG. Telephone: (0706) 227011.

The Acclaim is a British-made Apple work-alike — it runs all Apple software and accepts all Apple peripherals — but it has enhancements of its own. For a start it has upper and lower case, pressing one key will switch formats between 40 and 80 columns, and the keyboard offers programmable auto-repeat. Hardware advances on the II include a detached keyboard and built-in 6 or 12Mbyte hard disc with tape back-up. Prices run from £3,650. Contact Country Computers, Pipers Road, Park Farm Industrial Estate, Redditch B98 OHU. Telephone: 0527-29826.





OUT NOW— Software for your BBC Computer

Make the most of your BBC Microcomputer with this exciting new range of BBC software packs.

Featuring colour, sound, movement and superb graphics, they cover a wide range of applications – from painting, drawing and home finance to sophisticated video games. Two of the packs include programs demonstrated in *The Computer Programme* on BBC tv.

Each of these high-quality software packages contains a pre-recorded program cassette and a comprehensive handbook.

Home Finance • Early Learning
Fun Games • Games of Strategy
Painting • Drawing • Music
The Computer Programme Programs Vol. 1
The Computer Programme Programs Vol. 2

Price **£10.00** (inc. VAT) each

ON SALE WHERE YOU SEE THIS SIGN

BBC SOFT

THE *REAL* SOFTWARE FOR YOUR BBC COMPUTER

Published by British Broadcasting Corporation

● Circle No. 116


ORIC-1
ESC
CTRL
SHIFT
RETURN
ORIC-1™
TIMELESS TECHNOLOGY FROM ORIC PRODUCTS INTERNATIONAL

The Computer Challenge

16 colours professional keyboard full graphics real sound

FREE FORTH with every 48K model.

- Superb styling
- Choice of 16K, or massive 48K RAM
- Ergonomic keyboard with 57 moving keys
- 28 rows x 40 characters high resolution
- Teletext/viewdata compatable graphics
- 6 octaves of real sound plus Hi-Fi output
- Centronics printer interface and cassette port
- Comprehensive user manual

THE REAL COMPUTER SYSTEM FROM £99.95 incl VAT

OPTIONAL MODEM OFFERS COMPUTER PHONE LINK FOR:
● ELECTRONIC MAIL ● TELESOFTWARE ● PRESTEL

COMING SOON, TO COMPLETE YOUR SYSTEM: ORIC MICRO-DRIVE DISCS & SPEED PRINTER

FOR HOME: The ORIC-1 is the professional alternative for home computing. Superbly styled, the 57 key layout is based upon computers costing many times more than the ORIC, and will help the whole family to learn and understand computing, right from day one. The ORIC incorporates an improved version of Basic for ease of programming and use. For the enthusiasts the computer has laser zaps, explosions, etc. pre-programmed for games use, with Hi-Fi output for incredible effect. The communications Modem will allow 'Telesoftware', message sending, and Prestel use.

FOR BUSINESS: The ORIC-1 is the answer to many day to day problems. Software is becoming available for payroll, accounts, stock-control, and many more systems to help your day to day business organising and control. In addition, the ORIC COMMUNICATIONS MODEM will allow you to access up to 200,000 pages of Prestel information, to send and receive 'electronic mail', to book hotels, and flights (and pay for them) and to look at the latest stock-market and share indexes. In short the ORIC-1 is a must for all businesses large or small.

HOW TO ORDER YOUR ORIC-1: By phone: Just ring our telesales number Ascot (0990) 27641. By post: You can pay by cheque, postal order ACCESS – BARCLAYCARD – AMEX – DINERS.

ORIC-1
The Real Computer System
ORIC PRODUCTS INTERNATIONAL LTD
Coworth Park Mansion, Coworth Park, London Road, Sunningdale, Ascot, Berks SL5 7SE

● Circle No. 117

Please delete/complete as applicable.
I enclose a cheque/P.O. payable to ORIC PRODUCTS INTERNATIONAL LIMITED for £

Prices Include VAT

ORIC-1 16K RAM	£ 99.95
ORIC-1 48K RAM	£169.95
ORIC Communications Modem	£ 79.95
Postage and Packing	£ 5.95
TOTAL	£

(Money back if not satisfied)

Please charge my Access, Barclaycard, Amex, Diners Club account no.

Name

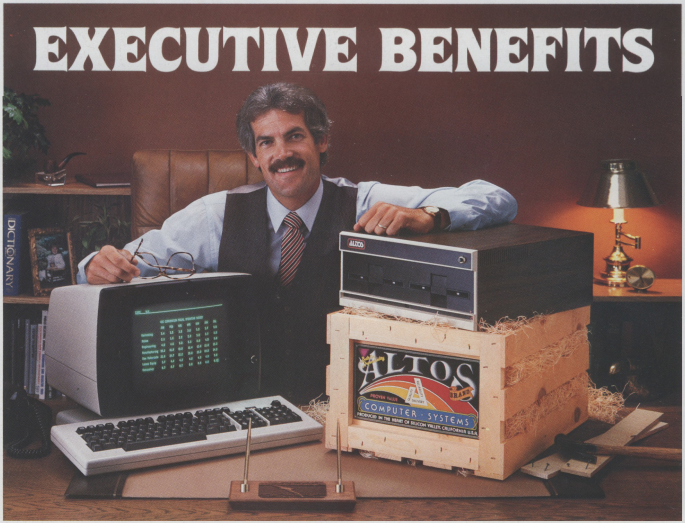
Address

If you require a brochure please tick ☐

CVG

© Copyright ORIC PRODUCTS INTERNATIONAL 1982

EXECUTIVE BENEFITS



Altos places complete multi-user management solutions on your desk for as little as £2,200 per user.*

Now you can benefit from increased management productivity with the new ALTOS® EXECUTIVE desktop computer system. The ALTOS EXECUTIVE is more than a computer. It's a multi-user solution designed for management use. Yet it can cost less than £2,200 per user – a small investment that pays big dividends in efficiency.

The ALTOS EXECUTIVE is a FINANCIAL PLANNER that rapidly helps managers consider multiple alternatives, create budgets, and perform "what-if" studies with numbers. It's a great planning tool.

The ALTOS EXECUTIVE is a word processor that makes it easier to work with words, file and retrieve ideas, plan schedules, and create or modify proposals and reports. It even checks your spelling and generates form letters.

The ALTOS EXECUTIVE includes an Altos computer that can store over 600 pages of documents, two easy-to-use terminals, and two applications for business managers – financial planning and word processing.

To make it easier to use, we include the ALTOS COMPUTER TUTOR – a self-paced, step-by-step, on-screen tutorial that helps you learn how to use the ALTOS EXECUTIVE WORD PROCESSOR, within minutes. Plus, we also have other applications for financial systems and management solutions.

See the ALTOS EXECUTIVE benefits in action today. Please ring operator for FREEPHONE 3003 or ring direct on Ascot (0990) 23377 for the name of your local Altos sales and service dealer.

Manhattan House,
Suite E, High Street
Crowthorne, Berkshire
Telex: 849426 LONINF.

ALTOS
COMPUTER SYSTEMS

Packed with fresh ideas for executives

Ring operator
FREEPHONE 3003

● Circle No. 118

* The £2,200 per-user price is based upon a two-user system costing approximately £4,400 consisting of an Altos Series S-15 processor with MP/M™ operating system, two terminals, the ALTOS EXECUTIVE WORD PROCESSOR with the built-in ALTOS COMPUTER TUTOR and the EXECUTIVE FINANCIAL PLANNER applications. Price includes installation and three-month warranty, but does not include printer.

© 1982 Altos Computer Systems

The designer's tale

Ian Sinclair — the name is right but are his designs, asks Bill Bennett.

GOOD LOOKS sell computers. System specifications are very important, but nobody wants to have a hideous monstrosity sitting on their desk, no matter how useful it might be. This is one of the most widely unrecognised truths of the microcomputer business. Designer Ian Sinclair believes that a good design is a fundamental ingredient of a successful machine.

The success of the Italian office-equipment giant Olivetti is a testament to the importance of good design. Ian Sinclair believes that the time is right to apply the same philosophy to computer products aimed at the home user. He has already designed the Chess Champion Mark V, which incorporates a number of innovatory features, and is currently working for Acorn Computers designing a new range of exciting machines.

With any project Sinclair's method of operation is simple. First he looks at existing "conventional" designs, then he throws them out and starts from scratch. With microcomputers there is a limitation, the keyboard, but then good design is all about incorporating a number of essential features into the product.

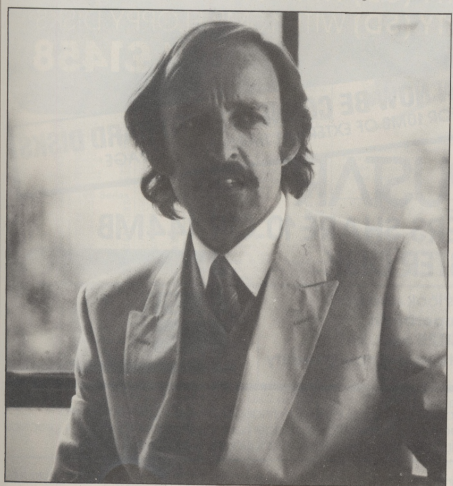
Sci-fi micros

Acorn is being pretty cagey about these new micros, but they will be aimed at the home market and will feature highly futuristic designs. "Futuristic design is essential for computer products," argues Sinclair. "People want to feel that they are living in the science-fiction future now, and in fact they are."

The mentioned of science fiction is certainly interesting. Sinclair believes that the technology is developing so fast that the turnaround time from something being science fiction to it becoming science fact is now less than 10 years, and decreasing. To this end he gets a lot of inspiration from what is, at present, merely fantasy. Science-fiction films are often showing technology that is just around the corner.

Sinclair's design for the Polybrain, a computer-based TV games machine manufactured in Hong Kong, is certainly futuristic. It has a wedge shape which suggests the lines of a spaceship. It does not require much imagination to look at the games console as a control console for a spaceship.

Sci-Sys, manufacturer of highly sophisticated chess computers, commissioned Ian Sinclair to design the range. Sinclair has to design just about everything that the user sees: the complete outside, and with it the interface between the cold, digital logic of a microprocessor and the analogue world of the chess player. It is a task which requires a lot of thought about ergonomics.



"A good design," says Ian Sinclair, "is fundamental to a successful machine."

Combination of ideas

"I have to work hand-in-hand with the engineers," says Sinclair. "Sometimes what is desirable from an aesthetic point of view is not achievable in practice, the limiting factor being either technological or simple economics." The design for the Chess Champion Mark V can be seen as a real achievement, both from the aesthetic point of view and the technical.

"There is a family look to the Sci-Sys range," claims Sinclair, and all the machines do have certain common design themes. The Mark V was technically difficult, the hardest job being to get the wiring from the board across a hinge. There are two essential features to the design: chess players like to use a traditional board, with traditional pieces, but the unit also has to look modern. The final design combines both requirements, and the sensor board has been hailed as something very special.

Sinclair's other computer design was for the Torch, a British-made, desk-top micro with a heavy communications bias. His submission was only partly used in the final design, mainly because of cost. Development work in this field can be expensive, with mock-ups costing thousands of pounds to build, but the real costs are in people's time. Ian Sinclair insists on payment up front.

Other projects worked on by Sinclair include tennis rackets, hi-fi equipment, watches with removable chips and a pocket-size bridge computer to complement the Sci-Sys chess machines. He designed the first digital clock, which used the old-fashioned Nixie tubes. Recent developments inlcude a turbo version of the Austin-Morris Metro, a new sport craze that combines skate-boarding and sail-boarding, and a range of puzzles and games; he has also been working on using computers in cars. Maybe he could sell that idea to his brother, Clive.

SUPERBRAIN II

–THE BEST THING SINCE SUPERBRAIN I!



OFFERS: – *Basic Interpreter.*
– *Full Reverse Video and True Descenders.*
– *Superbly Improved Circuitry.*

ALL AT REDUCED COST!

Choose From:

THE JUNIOR (JR) WITH 350K FLOPPY DISKS
THE QUAD DENSITY (QD) WITH 750K FLOPPY DISKS
THE SUPER DENSITY (SD) WITH 1.5MB FLOPPY DISKS

FROM £1458 EXCL. VAT
MAINTENANCE CONTRACTS AND SOFTWARE AVAILABLE

SUPERBRAIN CAN NOW BE CONNECTED TO HARD DISKS
FROM £2228 FOR 10MB OF EXTERNAL HARD DISK STORAGE

+COMPUSTAR

– LETS 255 USERS SHARE 10 OR 144MB OF WINCHESTER DISK

Compustar II Terminals look and act exactly the same as **Superbrain** and with prices from **£1125** excl. VAT low-cost multi user systems are now a **reality**



KCB MICROS LIMITED

word processing + accountancy + financial modelling + calculation
record keeping + sales office management + accounts + payroll + graphics
engineering + communications + languages + solicitors + CAD

14 Windsor Road Slough SL1 2EJ Tel: Slough (0753) 38581/38319. Telex 23152 KMICRO
and in Scotland: Micro Change Ltd. Telfer House, 74/78 Miller Street, Glasgow Tel: 041 554 1462

● **Circle No. 274**

WATFORD ELECTRONICS

33b Cardiff Road, Watford, Herts, England
Tel Watford (0923) 40588. Telex: 8956095

ALL DEVICES FULL SPEC. AND FULLY GUARANTEED. TERMS OF BUSINESS: CASH/CHEQUE/P.O.S. (OR ACCESS) WITH ORDER. GOVERNMENT AND EDUCATIONAL INSTITUTIONS OFFICIAL ORDERS ACCEPTED. TRADE AND EXPORT INQUIRIES WELCOME. (P&P add 50p on all cash orders). Unless stated otherwise.

VAT ALL PRICES ARE EXCLUSIVE OF VAT. PLEASE ADD 15% TO THE TOTAL COST INCLUDING P&P. SHOP HOURS: 9.00am-6.00pm MONDAY TO SATURDAY. AMPLE FREE CAR PARKING SPACE AVAILABLE. FOR QUANTITY PRICES PHONE WATFORD (0923) 40588

Computer IC's

1702A	350
1802CP	850
2112-1	250
2114L-300n	50
2114L-200n	55
2147-3	425
2532-450n	350
2564	612
2708	225
2716-5v	350
2732-450n	395
2764	595
3242	590
4027	95
4116/150	85
4116/200	80
4118/250	325
4164-200	450
4334-3	450
ICM0251116	325
4816A-100nS	225
4864 364k	450
5101	220
6116/150nS	390
6116L-120nS	550
61171-00n	490
6502	395
6502CPU	325
6503	600
6504-250	550
6521	100
6522-VIA	395
6530-RIOT	£11
6532-RAM	£11
6545-CRTC	899
6551-ACIA	650
6592-PC	600
6800	225
6802	350
6803	850
6808	160
6808	670
6809	670
6810	160
6821	100
6840	450
6845	685
6847	650
6850	160
6852	250
6854	599
6875	350
6877	750
6922/3	420
8080A	450
8088	£18
8085A	350
8155/6	80
8155/6	80
8155/6	80
8212	110
8214	425
8216/A-300	225
8216	100
8224	110
8226	220
8228	220
8237	650
8250	950
8251	290
8253	450
8255	250
8255A	350
8257	400
8259	395
8271	3.95
8272	395
8731	350
8755	1990
8797N	80
8797N	80
9602	160
AM2L53-12C	350
AM28L532A	350
AY3890	£438
AY-3-1015	350
AY3-1270	675
AY3-8910	450
AY3-8912	450
AY3-8913	650
AY5-1013	300
AY5-1350	388
AY5-2376	650
AY5-3600	750
CDP1802	1250
COM5116	1250
DM8131	270
DP8304BN	450
DS3691N	320
DS8LS120N	275
FD1761	£15
FD1771	1250
FD1791	£24.95
FD1793	£23
FD1795	£32
FD1797	£28
HD29501	75
HM6167-8	785
IM6402	650
INS8060N	1090
INS8154N	650
SFF96364	650
MC1488	95
MC1489	95
MC14412	775
MC14411	675
MC1455	90
MC1458	55
MC1488	95
MC1489	95
MC14412	775
MC14411	675
MC1455	90
MC1458	55

FLEX 80 EUROCARDS

CZ-1	Z80A/B fully buffered CPU card with bytewide memory slots and three I/O ports	£59
ST-1:	Two channel RS232C I/O, three channel counter/timer, cassette interface	£49
BM-1:	8 slot bytewide memory fitted with 6116LP-3s	£74
BM-2:	24K expandable ram-only card.	£86
VD-1:	VDU 24 × 80 memory mapped with light pen input. Many modes, 256 characters	£72
DC-1:	Disk controller single/double density. 1793 chip set	£82
MB-1/2:	8/12 slot motherboards	£58/£73
PS-1/2/3:	5V/12V/24V Eurocard linear PSUs with toroidal transformers and secondary outputs for RS232 etc.	£44/£45/£47
RK-1:	Hinged-front Eurocase with cut and printed panel	£49
BMD-1:	48K × 16Ext. double euro S. ram	£363
MR-1:	Mains relay card	£56

S100 IEEE 696 (8 BIT)

BMS-1:	24 slot bytewide memory fitted with 6116LP-3s masked for Tuscan etc	£320
BMS-2:	64K static ram. Page mode, phantom, battery back-up options	£340
VDS-1:	24 × 80 I/O mapped VDU, emulates Hazeltine 1500	£160
DCS-1:	Single/double density disk controller	£192

BBC Computer 8 page memory card £28

Please add 15% VAT and £1.00 p&p per board (G.B. Mainland). Payment by cheque or bankers order.
Send SAE or telephone anytime for detailed lists.

BASYS

48 Sundridge Drive Walderslade Chatham
Kent ME5 8HT Tel: Medway (0634) 660157

● Circle No. 121

NODEVIEW LTD.
NEW DECWRITER II LA36 DN PRINTERS ONLY £425 + V.A.T.

Including one full years D.E.C. maintenance worth £132 giving an effective price of £293 for an industry standard, heavy duty printer, complete with a 20 m.a. interface and a full qwerty keyboard. As there are a limited number of these printers available at this price we suggest you lose no time in contacting us with your order.

DATASOUTH DS120 UPGRADE FOR LA35 — LA36 PRINTERS ONLY £495 + V.A.T.

For those people already using their DECWRITER II LA35 or LA36 we offer an upgrade module which gives 165 c.p.s. bi-directional printing, double width characters and both 20 m.a. and E.I.A. RS232C interfaces. The above price includes 3 months warranty and D.E.C. installation, the price for self-installation is only £420.

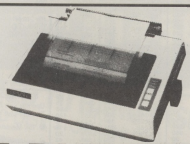
We can also supply the Toshiba EW-100 dedicated word processor from £3300 excluding printer, the Toshiba T200 microcomputer from £1950 excluding printer and the full 16 bit logica range as well as the televideo range of micro computes and V.D.U.s. A comprehensive selection of software is available for all micros. Free delivery on all cash with orders for the DS120 received before January 31st, 1983. All other orders delivery at cost. 15% V.A.T. to be added to all orders.

Send your orders or write or Telephone for further details to:

NODEVIEW LIMITED,
Unit 16 Pucklechurch Industrial Estate,
Pucklechurch, Bristol, Avon.
Tel: 027582 (Abson) 2054.

● Circle No. 122

Type III
EPSON plus



HALF-PRICE PRINT BUFFER

ONCE ONLY OFFER MUST END 31st JANUARY

MICROBUFFER accepts data as fast as your computer can send it, then takes control of the printer, and your computer is freed to resume processing at once. Additional output may be sent to MICROBUFFER at any time and it will be printed in turn. MICROBUFFER fits inside the Epson — has no effect on your computer or software except speed! Model MBS (for RS232C Serial interface) has 8K of RAM buffer. Model MBK (for Centronics-compatible parallel) has a full 16K RAM buffer.

JUST LOOK AT THESE PRICES!

Epson MX80 F/T	£389	Epson MX100F/T	£499
MICROBUFFER	£125	MICROBUFFER	£125
NORMAL PRICE	£514	Normal Price	£624
SPECIAL OFFER	**£450**	**SPECIAL OFFER**	**£550**
YOU SAVE	£64	YOU SAVE	£74

Interface/cable, carriage VAT extra,
CASH WITH ORDER

If you purchased your Epson (type II or III) elsewhere, without MICROBUFFER, relax. Send a remittance for £143.75 (£125 + VAT) and we'll despatch your MICROBUFFER post free (state model). Absolutely NO installation problems — no wiring to worry about. Plugs straight in to existing slot.

REMEMBER: PRICES BACK TO NORMAL 1st FEBRUARY

Tel: 0602-276445
24 Horsendale Avenue,
Nuthall, NOTTINGHAM.

A›Line Computer Systems

● Circle No. 120

Welcome to the ICE Age

ICE



5¼in. Winchester Sub Systems with a tape streamer back up

From 3 to 42 Megabyte configurations

Compatible with

Apple II • Apple III • Superbrain • Sirius/Victor • I.B.M.P.C. • S100 • Z80 based Systems

Tapestreamer backup now available for Profile. Apple III hard disc.

Retail from £1350

For further information or a demonstration contact:– ICE 16/18 Littleton Road, Ashford, Middlesex TW15 1UQ. Telephone Ashford (07842) 47271/47171 Telex 8952042 (DP CUST G)

● Circle No. 123

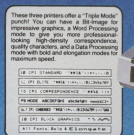
Tandy® TRS-80™ Means...



A.

£1099 Inc. V.A.T.

These three printers offer a "Triple Mode" punch! You can have a file-master for impressive graphics, a Word Processing mode to give you more professional looking high-density correspondence quality characters, and a Data Processing mode with bold and elongation modes for maximum speed.





C.

£699 Inc. V.A.T.



B.

£499 Inc. V.A.T.

A. New! All-Business Printer. DMP-500. Prints original, plus three copies. Adjustable tractor adjusts from 4" to 15". Line feed in 1/6, 1/8, 1/72, 1/216 increments. Paper advance in fine-line increments for aligning preprinted forms. Parallel interface. **26-1252**

B. New! Full Performance 9½" Printer. DMP-200. A versatile, compact dot-matrix impact printer! Prints 80 characters at 16.7 on an 8" line. Features selectable parallel and serial interfaces (600/1200 baud). Line feed in 1/6, 1/8, 1/72 increments. On/off line, restart and paper feed controls. Power-on indicator. **26-1254**

C. New! Superb 15-Inch Wide Printer. DMP-400. Cover design aids in noise reduction. Line feed in 1/6, 1/8, 1/72, 1/216 increments. Tractor allows use of 4" to 15" fanfold paper. Friction platten for single-sheet paper. Selectable parallel and serial interfaces (600/1200 baud). **26-1251**

...A Full Range of Printers



A.

£249 Inc. V.A.T.

HERE IS A SELECTION



D.

- **DMP Means Dot Matrix Printer**
- **DWP Means Daisy Wheel Printer**

A. New! Low-Cost Printer With Dot Addressable Graphics. DMP-100. Prints high-density graphic information or standard 10 cpi alphanumerics. 480-byte full-line dot-buffer, selectable parallel and serial interfaces (600/1200 Baud) and adjustable tractor, 4½ to 9½". Uses fanfold paper. With ribbon cassette. **26-1253**

B. New! Low Cost Daisywheel Printer. Select 10 or 12 characters per inch or proportional spacing. Features ½ line feed, underline, boldface and programmable backspace. You also get 1/120" space and 1/48" line feed. With Courier 10 print wheel and carbon ribbon. **26-1250**



B.

£999 Inc. V.A.T.

C. Our Finest Word Processing Printer. Allows 10 or 12 cpi or proportional spacing, 43 characters per second (500 plus words per minute), forward and reverse paper feed and ½ line feed, underline, boldface, backspace, interchangeable print wheels. Adjustable for up to five carbons. 15" platten. Includes ribbon. **26-1158**

£1299 Inc. V.A.T.



C.

D. New! CGP-115 Colour Graphics Printer. Creates beautiful graphics in red, blue, green and black, plus prints alphanumerics. Built-in commands simplify drawing and plotting. Text mode prints 40 or 80 characters per line at 12 characters/sec. Software controls additional character sizes and rotation. **26-1192**

Tandy COMPUTER CENTRES

YOUR NEAREST COMPUTER CENTRE

Birmingham:	021-455 6175 / 021-643-5369 / 1 Hurst Street	Glasgow:	041-221-4132 / 0278 / 041-333-1534
Bradford:	0274-726431/2	Liverpool:	051-708-0131
Bristol:	0272-214712/ 0272-291021	London:	01-630-1327 / 01-636-7911 / 01-200-8625 / 01-636-8893 / 01-202-5191
Croydon:	01-680-1852		
Dundee:	0382-25076		
Edinburgh:	031-225-8321 / 031-449-9545		01-248-5731/4 / 01-236-1326/7/8
Manchester:	061-832-3242/ 8314 / 061-833-0250 / 061-236-2102 / 061-236-2122		
Nottingham:	0602-412144		
Sheffield:	0742-755948		
St. Helens:	0744-20774		
Southampton:	0703-36462		
Tunbridge Wells:	0892-46128		

YOUR NEAREST COMPUTER DEALER

Abergele:	0745-826200	Dublin:	0001-726699
Ashford:	07847-53074	Guildford:	0483-504801
Bangor:	0247-66854	Hadleigh:	0702-558522
Blandford Forum:	0258-53731	London W.1.:	01-388-5721
Brixham:	08045-4567	St. Helier:	0534-74000
Cambridge:	0223-63334	Windsor:	07535-58077
Cork:	Cork 21954		



Send For Your FREE 1982/3 TRS-80 RSC-8 Computer Catalogue

Computer Marketing, Tandy Corporation (Branch U.K.), Tameway Tower, Bridge Street, Walsall, West Midlands. WS1 1LA

Name _____

Address _____

_____ Postcode _____ PC3

● Circle No. 124

You've really got our back up

The Intertec SUPERBRAIN microcomputer from Icarus

For a stand alone system, the SUPERBRAIN comes with a tremendous amount of support – from Icarus. Each machine is thoroughly tested before it leaves our premises and the nationwide network of Icarus dealers offers a full maintenance service and training programme at local level.

As for the machine itself, SUPERBRAIN is a smart, fully self-contained desk-top unit using the popular CP/M operating system. Twin Z80 microprocessors and an RS 232 communications port mean that you can never outgrow it – the SUPERBRAIN will expand to keep pace with your business.

320K, 680K and 1.5MB disc drives are offered as standard with hard discs available too – integral or separate.

Full technical details, software lists and the address of your nearest dealer on request.

The Icarus dealer network includes:

LONDON

CAMBRIDGE DATA SYSTEMS LTD., 35-37 Queensland Road, Holloway, LONDON N7 7DP. Tel: 01-607 0101

DATA PROFILE, Lawrence Road, Green Lane, HOUNSLOW, Middx. Tel: 01-572 6381

J & F GROVER LTD., 10 Barley Mow Passage, LONDON W4 4PH. Tel: 01-994 6477

SISCO LTD., 4 Moorfields, LONDON EC2Y 9AA. Tel: 01-920 0315

TERMACRE LTD., 126 Woodwarde Road, LONDON SE22 8TU. Tel: 01-693 3037

HOME COUNTIES

COMPUTING CONSULTANCY, Lyngen, Oldhill Wood, Studham, DUNSTABLE, Beds. Tel: 0582 872463

CONQUEST COMPUTER SALES, 92 London Road, BENFLEET, Essex. Tel: 03745 59861

CULLOVILLE LTD., Thornfield, Woodhill Road, SANDON, Chelmsford, Essex. Tel: 024 541 3919

FOREST ROW COMPUTERS, 53 Freshfield Bank, FOREST ROW, East Sussex. Tel: 034 282 4397

MASS MICROS, Wellson House, Brownfields, WELWYN GARDEN CITY, Herts. Tel: 07073 31436

RANMOR COMPUTING LTD., Nelson House, 2 Nelson Mews, SOUTHEND-ON-SEA, Essex. Tel: 0702 339062

ROGIS SYSTEMS LTD., Keepers Lodge, Frittenden, Nr. CRANBROOK, Kent. Tel: 058 080 310

SAPPHIRE SYSTEMS, 19-27 Kents Hill Road, BENFLEET, Essex. Tel: 03745 59756

THAMES VALLEY COMPUTERS, 10 Maple Close, MAIDENHEAD, Berks. Tel: 0628 23532

WILDER & CO., 123 Goldsworth Road, Woking, Surrey. Tel: Woking 21552

SOUTH & SOUTH WEST

BARD COMPUTER SERVICES LTD., 24 Old Street, Clevedon, Nr. BRISTOL, Avon. Tel: 0272 878157

COMMONSENSE COMPUTING, PO Box 7, BIDEFORD, Devon. Tel: 02372 4795

OMEGA ELECTRICAL LTD., Flaxley Mill, Flaxley Road, MITCHELDEAN, Glos. Tel: 045 276 532

EAST

CAMBRIDGE MICRO COMPUTERS, Cambridge Science Park, Milton Road, CAMBRIDGE. Tel: 0223 314666

BORDER COMPUTING & PROGRAMMING LTD., Dog Kennel Lane, BUCKNELL, Shropshire. Tel: 054 74 368

DRAGON SYSTEMS LTD., 37 Walter Road, SWANSEA, W. Glam. Tel: 0792 474498

DUPLEX COMMUNICATIONS, 2 Leire Lane, Dunton Bassett, LUTTERWORTH, Leicestershire. Tel: 0455 209131

FAST COMPUTING LTD., 52 High Street, HENLEY-IN-ARDEN, West Midlands. Tel: 05642 2714

MICROCARE COMPUTING LTD., 18 Hawarden Road, NEWPORT, Gwent. Tel: 0633 278040

NORTH

AP LTD., Maple House, Mortlake Crescent, CHESTER CH3 5UR. Tel: 0244 46024

JENNINGS COMPUTER SERVICES, 55-57 Fagley Road, BRADFORD, West Yorkshire. Tel: 0274 637867

MICROSERVE (HUMBERSIDE) LTD., 39 Oswald Road, Scunthorpe, SOUTH HUMBERSIDE DN15 7PM. Tel: 0724 849696

NASTAR COMPUTER SERVICES LTD., Ashton Lodge, Abercrombie Street, CHESTERFIELD S41 7JE. Tel: 0246 207048

SIGNAL, Tower Hc . . . Fishergate, YORK. Tel: 0904 [illegible]078

SORTFIELD LTD., E Floor, Milburn House, Dean Street, NEWCASTLE-UPON-TYNE. Tel: 0632 329593

SPOT COMPUTER SYSTEMS LTD., New Street, Kelham Street Indus. Estate, DONCASTER. Tel: 0302 25159

SCOTLAND

ESCO COMPUTING LTD., 40a Gower Street, GLASGOW. Tel: 041 427 5497

TURNKEY COMPUTER TECHNOLOGY LTD., 23 Calderglen Road, St. Leonards, EAST KILBRIDE. Tel: 03552 39466

OVERSEAS

GICC, PO Box 519, Manama, Bahrain.

KUWAIT COMPUTER CENTRE, PO Box 1196, Salmia, KUWAIT.

MICRO MANAGEMENT INFO SYSTEMS, 132 King Street, GIBRALTAR.

M G ENTERPRISES, 32 Rue Victor Hugo, 92800 PUTEAUX, France. Tel: 01033 15060655



SUPERBRAIN

DAYTA, Kingsbury Square, Wilton, SALISBURY, Wilts. Tel: 0722 74 3896

EMTEK COMPUTERS LTD., 40 South Furzeham Road, BRIXHAM, Devon. Tel: 080 45 3566

NICOMTECH LTD., The Old Mill, Anthony Passage, SALTASH, Cornwall. Tel: 07555 2719

STUKELY COMPUTER SERVICES, Barnhill, STAMFORD, Lincs. Tel: 0780 64947

MIDLANDS & WALES

BASIC BUSINESS SYSTEMS LTD., 39/41 Trent Boulevard, WEST BRIDGEFORD, Nottingham. Tel: 0602 819713

JAEMMA LTD., Unit 24, Lee Bank House, Holloway Head, BIRMINGHAM. Tel: 021 643 1609

LAWMAR BUSINESS SYSTEMS, 1 Paterson Drive, Woodhouse Eaves, LOUGHBOROUGH, Leics. Tel: 0509 890901

MICROAGE LTD., 53 Acton Road, LONG EATON, Nottinghamshire. Tel: 06076 64764

ICARUS
Computer Systems Ltd.

Icarus Computer Systems Ltd., Deane House, 27 Greenwood Place, London NW5 1NN. Tel: 01-485 5574. Telex: 264209.

● Circle No. 125

WHICH MICROCOMPUTER?
WHICH PRINTER?
WHICH SOFTWARE?
WHICH SERVICES?
WHICH COMPUTER?
WHICH WORD PROCESSOR?

Be sure you make the right decision

The computer or word processor you install in your business is going to be with you for a long time. So when you're buying a system, the last thing you can afford is a mistake.

The Which Computer? Show is for business people who believe in leaving nothing to chance.

Firstly, the show offers you the widest choice of equipment you'll find under one roof. Over 200 exhibitors will be there.

But then it helps you narrow down that choice until you've found the one system that matches your needs exactly.

At the Which Computer? Show you'll find computer experts who talk your language.

A SPECIAL OFFER FOR VISITORS Major discount on Which Computer? magazine. SEE COUPON

THE WHICH COMPUTER? SHOW

National Exhibition Centre Birmingham

18-21 January 1983

The National Computing Centre will be presenting special video briefings and you get a free NCC Questioner when you send for your tickets to help pinpoint what you're looking for before you leave.

Compare, discuss and get practical experience of the new technology. Then you can make your decision with confidence.

The show takes place at the National Exhibition Centre in Birmingham, easily reached by car or train. Car-parking is free. The dates are 18th-21st January 1983. Open from 10.00 am.

Simply clip out the coupon and send it to us at **Which Computer? Show, 232 Acton Lane, London W4 5DL. Phone: 01-747 3131 during office hours.**

FREE TICKETS WORTH AT LEAST £3 + INFORMATION PACK

Which Computer? Show, 232 Acton Lane, London W4 5DL

Please send _____ complimentary tickets for me and my colleagues. Also send your free information pack containing the NCC Questioner.

Name _____

Position _____

Company _____

Address _____

_____

Telephone _____

☐ I would like to receive Which Computer? magazine at the 45% discount rate of £9.90 (normal annual subscription £18 – send no money at this stage).

☐ I am interested in exhibiting at the Which Computer? Show.

PC/1/1

Nobody under the age of 18 will be admitted

● Circle No. 126

HONEYFOLD
BOOKLIST

Over 1000 Titles

We have concluded agreements with some major book suppliers around the world that allow us to offer immediately the biggest computer book list in Europe. We have a shortform price list of all our titles that we will send you and we also have a 200-page, cross referenced, catalogue with editorial on hundreds of titles that will give you a bookshop of your own. This catalogue costs £1.00. We know our prices are better than elsewhere and we can still offer a monthly service of new books to those on our mailing list.

In early 1983 we will start a book club and hope to offer you even better purchasing power. Let us hear from you. We are equally willing to talk to computer shops where our range and customer use of our catalogue will allow them to offer a much greater service to their customers.

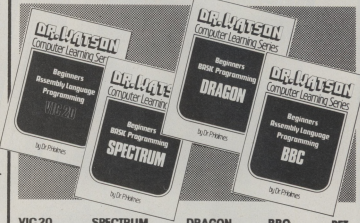
LIST OF PUBLISHERS

ADDISON WESLEY
BRADY
CAMELOT
COMPUSOFT
CORD
COMPUTER SCIENCE PRESS
DESIGN
DILITHIUM PRESS
HARRIS
HAYDEN
LIG COMPUTER SERVICES
JOHN WYLIE & SON
LEXINGTON
LITTLE
McGRAW HILL
MIT PRESS
MATRIX PRESS
OSBOURNE
PETROCELLI
PRENTICE HALL
RESTON
ROBOTICS PRESS
SAMS
SENTURY
SPECTRUM
SYBEX
TAB PUBLICATIONS
VAN NOSTRAND REINHOLD CO



NOW AVAILABLE

DR. WATSON
Computer Learning Series



VIC 20 SPECTRUM DRAGON BBC PET

The Dr. Watson Computer Learning Series

A new series of books on computer languages, carefully graded to suit different abilities and written specifically for the new micros. The whole series is presented in a consistent style and each book comes with a cassette containing all the major programs developed in the book.

Learning BASIC is FUN. Learning assembly language is FUN – ask Dr. Watson!

Learn BASIC with your Spectrum, Dragon or BBC by writing your own games, your own music program and – yes – an Adventure game designed by you! Just in case though, if you can't wait to learn, the good Doctor provides a cassette. So you can run and enjoy the games and then settle down to see how they work – and add YOUR improvements.

Learn ASSEMBLY-LANGUAGE with your PET, VIC 20, Spectrum or BBC, using your own assembler – supplied in a cassette with the book and used throughout in all the demonstration routines. Just in case, too, there's a tutor to show you how the noughts and ones of binary and the E's and F's of Hex work. A book to make sure you learn assembly-language EASILY. Crammed full of sample programs and exercises.

BOOK AND SOFTWARE

£14.95 INC VAT & POST

VIC 20
TOTL PROFESSIONAL SOFTWARE

TOTL TEXT

SIMPLY THE BEST: Page numbering • Right and left margins • Skip to top of page • Centered title lines • Character and line spacing • Graphics characters • Full curser control in editing • Add, change, delete characters • Specify printer device number • Print mailing labels • Paragraph control • VIC 1515 expanded characters • Single, double, triple spacing • Tab position control • Upper and/or lower case • Full screen editing • Scroll up and down through text • Insert, delete blocks of text • Multiple copies of document

Up to 4 heading lines per page • Footing line at bottom of page • Up to six 80 column lines may be entered and printed within the body of a document • Footnotes • Keyboard inputs

£16.95

TOTL LABEL

A completely practical program for computerising address books or business mail lists. You define width, number of lines and number of characters. The program alphabetizes and you can assign account or customer numbers for further search control. You can print the whole list or selected labels. Make full use of your computer.

£14.95

TOTL TIME

Easy to use, menu driven • Add, change, delete • Browse, (display on screen) • Inquiry display, (date range, Person, Project) • Save and load files on tape or disc • Use of full colour in screen display

Time report • 56 different bar chart report formats • Organise by Person, Project, activity • Sequence beginning or ending date or activity number • Four years, one year, six months, seven weeks, six 9 hour days, two 24 hours

£16.95

RESEARCH ASSISTANT

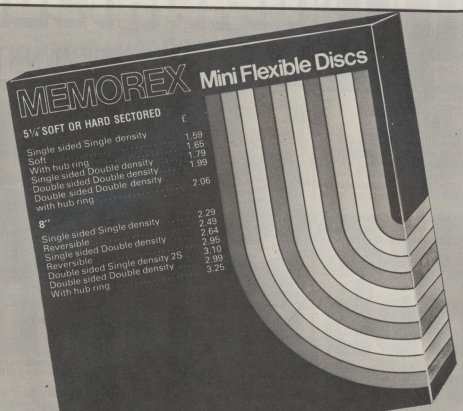
It takes a competent programmer to write the program to create and control the necessary data files that will let you recall specific data at will. Here are three programs that will allow you to compile information from books, periodicals, accounts, dates in fact any data you wish to keep, to organise it and, most important of all, to create cross reference lists by feyword to help you locate the right reference when you need it.

£16.95

HONEYFOLD

Honeyfold Software Limited
Standfast House, Bath Place,
High Street, Barnet, London.

● Circle No. 127



DYSAN DISKETTES

Full range of discs available — Phone for best prices.

dysan



DISK STORAGE BOXES from **£14.95**

full range of 5¼" and 8" models available

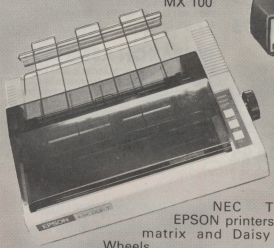
In stock
Dust Covers for Micro's & Printers & VDUs from **£6.95**
Floppy Saver Kits from **£7.95**
Indexing Systems from **£2.00**

(DEALER ENQUIRIES WELCOME)

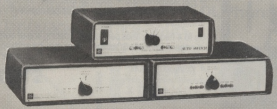
Microware

Telephone **01 272 6398**
01 272 6237

Microware (London) Ltd. 637a Holloway Road London N19 5SS



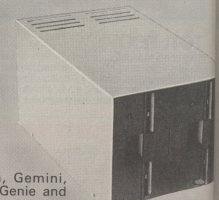
MX 80T
MX 8FT
MX 100



DISK DRIVES 250K-1MB

PRINTER SWITCHES (from £79)
RS232 — Cont
Para Multiple
Printer Switches.

Full range of CDC drives from 250K to 1MB Sub systems/Bare drives Winchester available



NEC TEC and EPSON printers Dot matrix and Daisy Wheels.

PHONE FOR UNPRINTABLE PRICES

BBC, Nascom, Gemini, Tandy, Video Genie and many more. Call for dealer price list. Suppliers to the trade.

● Circle No. 128

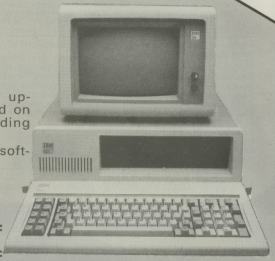
THE FIRST FAMILY COMPUTER NOW AVAILABLE

DRAGON 32



Z80 Card.
Full range of software available.
Phone for latest price.

Winchester upgrade kits. Add on boards including Z80 card.
Full range of software available.



ACT SIRIUS 1

The IBM Personal Computer (£2,395)
320K memory 700K floppy. All configurations available.

398
237
9 5SS.

Microware

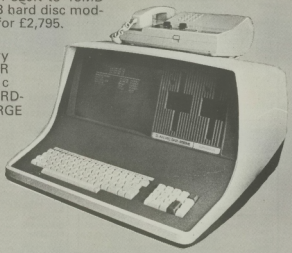
Telephone 01 272 6398
01 272 6237

Microware (London) Ltd. 637a Holloway Road London N19 5SS.

Full range available from 320K to 15MB 6MB hard disc models for £2,795.



FREE. With every machine MONITOR 10 DISCS m basic c basic CPM WORDSTAR MAIL MERGE SUPER CALC



OSBORNE 1

SUPERBRAIN II £1,495
Call for cash and carry prices

● Circle No. 129

G. W. COMPUTERS LTD LONDON'S WEST END NATIONWIDE OVERNITE SERVICE MORE PRODUCT RANGES LOWER SYSTEM PRICES BETTER SERVICE

*****THE NEW DBMS III (SERIES III OF THE WORLD'S FIRST 'TASK-ROBOT-PROGRAMS'*****

*****FEATURES*****

Mbasic & word-star compatible.....
1400 character record sizes.....
mathematical scratchpad.....
record relational indexes.....
transiateable to any language.....
User-defineable report/printing.....
field protection/classification.....
sorts 'alpha or numeric' any window.....
either-or, same as, greater, smaller.....

32000 records per filename.....
20 main/200 sub fields per record.....
field and record related formulae.....
'Jump-to' any of 32000 records per file.....
random/binary/key/multiple field search.....
'if-then' questioning.....
file protection/password entry.....
speed of 500 records per 20 seconds.....
range match, not match, integer match.....

12 online file architectures.....
240 fields using cross-referencing.....
cross-record calculations.....
'Jump-to' any record in 12 files.....
User-defineable files/field words/sizes.....
endless 'either-or' matching.....
formulate/recall on selection criteria.....
12 interrogation question types.....
short filing output/audit trails.....

ONE OF THOUSANDS OF DIFFERENT TASKS ON WHICH THIS PROGRAM MIGHT BE EMPLOYED

DMS'S MACROS WORK FROM THE MOMENT YOU INSERT THE 'TASK DISK' IN THE COMPUTER DRIVE

Simply design your file, give its fields your words, setup your report mask, and then enter your records. Switch to 'automatic drive' and formulate any task you wish the program to fulfill, the task is stored as a macro. Take a copy of the program on another 'task disk' and from then on, the task disk will function without a single key-stroke. Think of a number of such 'task disks' such as "stock-re-order reports"; "stock-valuation reports"; "sale-mail-shots"; "production-process-analysis"; "patient history analysis"; "research-analysis"; "budgetting" "purchase/sales-analysis"; "personell-file-analysis"; "vehicle-location control"; "librarian analysis"; "plus more?"

Previous issues showed examples of 'employees-short-list', 'garage stock re-order', 'sales analysis' here is an example of a garage librarian's index and some reports it might generate.

The record may look like this:
1-record number (23)
2-author (Shakespear)
3-date of pubn (1981)
4-title (Hamlet)
5-selling price (38.00)
6-minimum stock (5)
7-maximum stock (12)
8-current stock (3
9-publisher (Oxford University Press)
10-binding (Imperial leather)

One report might be: select ?? all records where the current stock is lower than the minimum stock. When found, subtract current from maximum, and produce a printed list of the manufacturer's name; title; and re-order quantity.

Another report might be: select ?? all records in the file where the author is either Shakespeare or Milton or Byron. Output the records to another 'short-disk-file'. Sort them by author into alphabetic order. Take this file and print a list of all works in order Byron/Milton/Shakespeare that are only published in leather bindngs.

DBMS II (WITHOUT MACROS) AND DBMS III ARE FULLY IMPLEMENTED UNDER CPM-86 (trm) and MS-DOS (trm) ie: (SIRIUS/VICTOR/IBM)
DBMS II IS 395.00 (or 250.00 by mail order ex. training). DBMS III is 575.00 (or 295.00 by mail order ex. training)

TELEPHONES: 01-636 8210 : 01-631 4818 : TLX: 892031 TWCG (BOSTON 94-0890)

MICRO-COMPUTERS

G.W.L.	-G80 64K interface port/s/board	795.00
	-G80 V D.U.	150.00
	-G80 Dualdrives enclosed	550.00
INTERTEC	-Superbrain 64K RAM/2DK disks	1695.00
	-Superbrain 64K RAM/7DK disks	2195.00
	-Superbrain 64K RAM/13M disks	2595.00
	-Superbrain 64K RAM/XM disks	call
	-Computer 64K RAM/2DK disks	1495.00
	-Computer 64K RAM/2DK disks	1895.00
	-Computer 64K RAM/7DK disks	2495.00
	-Computer 64K RAM/1.5M disks	2895.00
NORTHSTAR	-Advantage 64K RAM/5.2M disks	£2695.00
	-Advantage 64K RAM/5.3M disks	£2995.00
	-Horizon 64K RAM/7DK disks	1850.00
	-Horizon 64K RAM/5.3M disks	3395.00
	-Horizon 64K RAM/10M disks	4595.00
	-816 256K/7DK disks	1195.00
ACT	-8/66 64K RAM/7DK disks	1995.00
VICTOR	-8/66 64K RAM/5.2M disks	3250.00
OSBORNE	-8/66 64K RAM/10M disks	4595.00
IBM	-PC 64K RAM/40K disks	£2695.00
	-PC/1 320K/640K disks	£2895.00
PET	-8032 32K RAM	795.00
	-8050 1 Meg disks	795.00
	-64 CBM personal computer	call
APPLE	-II 64K RAM	675.00
	-III 128K/140K disks	2095.00
ALTOS	-AC5800/2 64K RAM/1M disks	1995.00
	-AC5800-10 256K/10.5Meg disks	5495.00
NEC	-PC8001/10 64K RAM/2DK disks	1695.00
	-APC 128K RAM/2M disks	call
CORVUS	-Concept 16 bit pc	call
SANYO	-G80 64K RAM/2DK disks	1350.00
	-G81 64K RAM networker	1250.00
ABC	-24 64K RAM/7DK disks	2195.00
	-26 64K RAM/2.2M disks	3250.00

All computer prices include mbasic as standard.
All prices marked £ are 8/16 bit machines.

SYSTEM DEALS

Choose any computer and any printer
add 10% for full 12 month warranty (12.5% mntnce)
add 150.00 for blank diskettes
add 175.00 for cables, delivery and installation
training optional extra 100.00

and get completely ****FREE****

cpm handbook	50 basic exercises	2000 sheets paper
DBMS II	magic wand w/proc	magic calc
mbasic 80	diagnostics	mon/dsbort
recover	autoload	instant basic
cbasic	disk/games	library case

****total value 1480.00*****

Buy a system including a hard disk and get FREE the G8086 software package value 690.00 also

PRINTERS

OKI	-Microline 80	295.00
	-Microline 82A	395.00
	-Microline 83	695.00
	-Microline 84	895.00
EPSON	-MX80/FT-3	375.00
	-MX100/FT-3	495.00
ANADEX	-DP 9000	895.00
	-DP 9501	1045.00
	-DP 9501 (A)	1145.00
QUME	-9/45 R/O	1695.00
	-9/55 R/O	1795.00
	-9/35 R/O	1495.00
NEC	-3510 R/O	1395.00
	-7710 R/O	1795.00
	-5520 KSR	2250.00
DRE	-8820	1295.00
	-8830	1695.00
TEXAS	-810	1295.00
	-825	1395.00
DIABLO	-630	1695.00
RICOH	-RP1600	1495.00
OLYMPIA	-ESW 103 14 CPS	975.00
	-ESW ??? 55 CPS	1025.00

PERIPHERALS & ACCESSORIES

CORVUS	-6 Meg hard disk	1950.00
	-11 Meg hard disk	2950.00
	-20 Meg hard disk	3950.00
	-Multiplexor 7 station	695.00
	-Mirror backup card	695.00
INTERTEC	-Compustar 10 Meg hard disk	2950.00
	-CDC 96 Meg hard disk	7950.00
N'STAR	-16 Bit u/grade	325.00
	-18 Meg hard disk	2995.00
RODIME	-6 Meg hard disk	1495.00
	-12 Meg hard disk	1950.00
MORROW	-26 Meg hard disk	3295.00
GENIE	-5MG fixed/5MG removeable disk	3295.00
CDC	-s/sided floppy drives	150.00
	-d/sided floppy drives	225.00
	-d/sided dtrack drives	375.00
MEMOREX	-soft/hard s/sided diskettes (10)	30.00
SCOTCH	-104/2D double sided (10)	50.00
S.S.E.	-Softbox PET to CPM (trm)	495.00
	-Sirius 8/16 bit 5MHz card	365.00
QUADRAM	-64K print spooler/copier	250.00
BIZCOMP	-RS232/auto-modem 1200 baud	450.00
AST	-Port expanders (4 tmnls to 1 prtr)	395.00
GIX	-Port expander (w/clches)	95.00

NOTE CORVUS DRIVES WITH MULTIPLEXOR MAY NETWORK SIRIUS..SUPERBRAIN..CONCEPT..PET.. VICTOR..IBM..

SOFTWARE

G.W.L.	-BUS V8.00 (accounts)	575.00
	-DBMS II (database)	395.00
	-DBMS II (by mail order only)	250.00
	-DBMS III (database)	575.00
	-DBMS III (by mail order only)	295.00
	-DSORT & MSORT (Mbasic files)	75.00
	-Sales ledger	95.00
	-Purchase ledger	95.00
	-Nominal ledger	95.00
	-Stock-control	95.00
	-Address-mailer	95.00
	-Asset/Transport (500 recs/14secs)	95.00
	-Autoload & recover	25.00
MICROSOFT	-Mbasic 80	150.00
	-Fortran 80	200.00
	-Cobol 80	330.00
	-Basic Compiler	190.00
	-MU ilsp/mu star	95.00
MICROPRO	-Word-star	250.00
	-Mail-merge	55.00
	-Spellstar	100.00
	-Datastar	170.00
	-Super-sort	120.00
	-W-star/M-merge/Sp-Star	350.00
BYROM	-BStarn (communications)	75.00
	-BStms (tele-comms')	85.00
DIGITAL	-Despool	30.00
	-CBasic	75.00
	-Pascal MT	225.00
F. GELLER	-Quickscreen	95.00
LEXISOFT	-Spellbinder	195.00
LIFEBOAT	-T/Maker	155.00
M'FOCUS	-CIS Cobol	420.00
	-Forms II	100.00
SORCIM	-Super Calc	185.00
	-Pascal M	250.00
STANDARD	-Quic-N-Easy	195.00
PEACHTREE	-Magic-Wand	190.00
	-Magic Calc	175.00
S'Soft	-Diagnostics	50.00
N'West	-Statpak	250.00
OASIS	-The Word	35.00
ITHACA	-Pascal Z	100.00
MICROSTUFF	-Cross-talk (Tele-comms')	195.00
WOOLFE	-Move-it (Micro to Micro)	45.00

Software formats on all micros in our hardware list.
All prices marked £ are available 8/16 bit formats.

TERMS & ETC

G. W. Computers Ltd (Grama (Winter) Ltd)
55 Bedford Court Mansions
Bedford Avenue
London W.C.1. England.
Tel: 01-636 8210: 01-631 4818: tlx 892031 twc g
Boston office tlx 94-0890
24 hour answerphone-leave address for 'infopacks'
We do not operate a reader's reply card service.
Terms: C.W.O. or C.O.D. Prices include V.A.T. No dealers. The above lists are not exhaustive.
Please call in only by prior appointment.

● Circle No. 130

G80/86 SOFTWARE

Fully implemented on MS-DOS, CPM 2.2 and CPM 86 (tm)

Works on IBM, Sirius and Victor 9000 and all micro-computers in our price list

Sale ledger (95 pounds)
Purchase ledger (95 pounds)
Nominal ledger (95 pounds)
Aged analysis (25 pounds)
Stock control-valuation/re-order (95 pounds)
The invoicer (95 pounds)**
The address mailer (95 pounds)
The spread-calc (95.00)
The sales/purchase order-book (95.00)**
The Diary (95 pounds)**
Qasort/Qnsort (500 records/15 seconds) (95 pounds)

Each module is a set of 'task disks' designed for minimal learning curve. This software derives from modules of 'DBMS III' and runs reports without your secretary having to touch a single key.

Consider the advantages in these features
The user manual is contained in FIVE pages.
All reports are generated by robot functions
Reliability tested (benchtest PCW June)
Works in a network multi-user environment
Fast easy data entry
Files are re-organised and sorted automatically
Produced by the same people that originated 'BUSiness' 'DBMS II', 'DB-CALC', 'AUTOLOAD AND RECOVER' 'ETC'
and sold successfully over the past five years
Also see our advertisement next page, the software above comes free with a system purchase
(excluding items marked ** and DBMS III)

The G80/86 networks

Based upon one hard disk and multiplexor module the G80/86 networks feature full network sharing of data resources by adding different stations that may be as various as Sirius/Victor 9000/IBM/Superbrain/Pet/N'Star/Sanyo
The low-cost startup of a network could be simply.
1 hard-disk of 5 mgbytes 2100.00
1 multiplexor 695.00
1-2 stations from 795.00

We also have a special 'spooler module' as well as software controllable port expanders and modems for output to telephones, printers, and screens so that a number of terminals may share the resources of one printer, as well as be able to send files over the telephone at any time (day/night) to both store on the hard disk and print out as well.

Imagine a terminal at a remote site, being able to send/receive its files to/from the main network's hard disk/printer overnight to be examined and processed the next day.
The commands are literal English. Like:
(send file 'ledger' to port 'B' (the modem) at 11.30)
only from **G. W. Computers** (the leaders in database)
call us on 01-636 8210 or 01-631 4818
and leave your address for our standard 'infopacks'
Purchasers of a network (h'disk, micro, printer)
Get the system deal and above software list . . . FREE

Imagine eventually being able . . .

With an IBM PC, Modem, dot matrix and daisy printer to start your day with our robot task disks working under CONCURRENT CPM 86 (tm).

Enter virtual console 0 and telephone your head-office to call all yesterday's ledger files and store them locally on your hard disk.
Now switch to virtual console 1 and while console 0 runs concurrently for about an hour, get a 1000 mail-shot running to the daisy printer.
Now switch to virtual console 2 and while consoles 0/1 run concurrently, get the 'robot task' of producing a stock-re-order report out to the fast dot matrix. Now switch to virtual console 3 and while consoles 0/1/2 run concurrently, do some programming, or file-re-organising, or any other task you might require. Four virtual computers all running concurrently on one computer, batch processing to various devices or else queue-spooling their output through print buffers of up to 500k storage and spreading the load through time on fewer printers.

Mailing Floppy Disks?

Use Swan Disk Mailers — and get Safety in the Mail

Now used by over 1,000 computer companies, Swan Disk Mailers provide outstanding postal security at economical prices.

Combining great strength with simplicity of use, Swan Disk Mailers are manufactured from rigid white corrugated, holding up to four disks.

There are two sizes available: 8·75"×8·75" & 6"×6"



ring
01-607 9938
for Free samples and prices

● **Circle No. 132**

CRYSTAL RESEARCH LTD

XTAL BASIC 3

A Z80 based Interpreter. Disc and Cassette versions including CP/M are available now or in the near future.

FEATURES

1 Has over **110** Commands and Functions and is user extendable.
2 **Xtal BASIC 3** incorporates its own editor that is independent of VDU or terminal being used but appears to have the facilities of the most sophisticated direct screen editing, in brief the editor contains the following:
Lines of 127 characters (can be extended up to 254)
Full on screen editing, up, down, left, right.
Auto insertion of lines.
HOME CURSOR, CLEAR SCREEN, DELETE LEFT, DELETE RIGHT, INSERT CHARACTER, ERASE WHOLE LINE, ERASE TO END OF SCREEN, PRINT SCREEN CONTENTS TO PRINTER, and ABANDON LINE. A LINE EDIT MODE IS INCLUDED AS STANDARD.
3 Variables can be of any length. First five characters used to distinguish one variable from another. Multi-dim arrays, string arrays and integer arrays.
4 Full Tape and Disc file handling.
5 32 standard error messages and traps. Ability to trap **BREAK KEYS.** Error table is extendable.
6 Possible to run programs larger than memory capacity.
7 Special features allow transfers of programs from machine to machine.
8 **Xtal BASIC 3** is designed to be compatible with most available BASICS and a program is supplied for many BASIC to BASIC conversions.
9 The manual, consisting of over **100 pages,** includes full description of the BASIC, sample programs, useful Machine Code Subroutines in Xtal BASIC 3, examples of extra commands and functions.
10 **SIZE 12K to 14K** depending on the System.
11 Available on **Cassette** and/or **Disc.** Please contact Crystal Research Ltd., for availability on your particular machine.
12 On Cassette **£40.00** + **VAT** On Disc **£60.00** + **VAT**
OEM and Manufacturers are invited to contact Crystal Research Ltd., for licence details.

Open 0930-1200 1300-1730 except Saturday & Sunday
40 Magdalene Road, Torquay,
Devon, England. Tel: 0803 27890
Access and Barclaycard

XTAL BASIC

● **Circle No. 131**

THE MOST DIFFICULT THING ABOUT GETTING A COMPUTER IS GETTING THE RIGHT ONE.

PRICES EXCL. VAT

COMMODORE VIC 20

Top selling home computer with enough facilities to interest the hobbyist or serious programmer.

130.00 ex. VAT



COMMODORE VIC

VIC 20 Home Computer	130.00
VIC 20 Starter Pack	215.48
VIC C2N Cassette Unit	39.09
VIC Printer	200.00
VIC Single Floppy Disk Drive	260.00
VIC 3K RAM Cartridge	26.04
VIC 8K RAM Cartridge	39.09
VIC 16K RAM Cartridge	65.17
VIC Programmers Aid Cartridge	30.39
VIC Superexpander High Res. Cartridge	30.39
VIC Machine Code Monitor Cartridge	30.39
VIC Joystick	6.52
VIC Paddles (Pr)	11.74
VIC Games Cartridges from	17.35
VIC Games Tapes from	2.95
Commodore 64 Home Computer	299.00

DRAGON 32

Dragon 32 Family Computer	170.00
Dragon Joysticks (Pr)	19.95
Dragon Printer GP100A	199.00
Dragon Cartridges from	17.35
Dragon Cassettes from	6.91

SINCLAIR

ZX81 Computer	43.43
ZX Printer	52.13
16K RAM Pack	26.04
Learning Lab	17.35
All Sinclair Software available from	3.43

CROMEMCO C-10 PERSONAL COMPUTER

A full feature personal business computer system including software – for the price of a VDU. Also the entry point into the renowned Cromemco range. 4195.00 ex.VAT



CROMEMCO

C-10 SP Personal Computer Superpak inc. Z80A Processor, 64K Memory, Single 5¼" 390K Byte Floppy Disk, 24 × 80 Screen, CKBA Keyboard. CP/M Compatible Operating System, plus Word Processing, Financial Planning & 32K BASIC Software 1195.00
Additional 5¼" Floppy Disk Drive 450.00
120 Word / Min Daisy Wheel Printer 675.00



EPSON HX-20 PORTABLE COMPUTER

Diminutive fully featured business computer that is small and light enough to slip into a briefcase. Specification includes integrated LCD screen, printer and microcassette; 16K RAM expandable to 32K and its own rechargable power supply. Ideal for people on the move – data can be subsequently 'down loaded' on to a larger machine when you return to base. 402.00 ex. VAT

OSBORNE

Osborne Portable Computer inc. Standard Software – Wordstar, Mailmerge, Supercalc, MBASIC, CBASIC, CP/M – Plus Free Monitor 1250.00
Osborne Double Density Version inc. USDC-P System 1375.00
Osborne Starter Kit inc. Daisy Wheel Typewriter 'Printer' 1699.00

PRINTERS – IMPACT

Anadex DP9500A 132 Cols., 150CPS Matrix Printer with Graphics. 10, 12, 5, 13.3, 16.4 Char/In, Low Noise 1150.00
Anadex DP9501A 132 Cols, 150CPS Matrix Printer 10, 12, 15, 16.4 Char/In, Low Noise 1150.00
Anadex DP9620A 200CPS Printer, Low Noise, 10, 12, 15, 16.4 Char/In 100 CPS in Double Pass Enhanced Mode 1250.00
Anadex DP6000 Dual Mode Printer 132 Cols. 150/180CPS Correspondence Quality, 300/330CPS Draft and Graphics Mode. Diablo 630 Protocol Emulation 1950.00
Epson MX80T / 3 Tractor only 80CPS 349.00
Epson MX80T / 3 Friction and Tractor 389.00
Epson MX100FT/ 3 Friction and Tractor 100CPS 499.00
Seikosha GP100A 30CPS, 80 COL 199.00
Interfaces and cables for all popular micros available – contact your nearest shop.

PRINTERS – DAISY WHEEL

Diablo 630R0 ..... 1575.00
Crown Ranier – Brother 19CPS 795.00
Brother B300 ..... 458.00

NORTH STAR ADVANTAGE

Two versatile desk top options to choose from featuring high quality business graphics with either 720Kb floppy or 5Mb hard disk storage.

From 2095.00 ex. VAT



NORTH STAR ADVANTAGE

Advantage Desk-Top System inc. Keyboard, Graphics, Screen (Green), 64K Byte RAM, Z80A Processor, Serial Interface, Dual 350K Byte Diskette Drives and Busigraph Software 2095.00
Advantage Desk-Top System, as above except single 350K Diskette Drive + 5M Byte 5" Winchester Hard Disk 2995.00
Advantage upgrade to Intel 8088 Processor with 64KB Memory @ 320.00

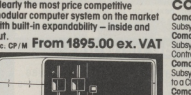
NORTH STAR HORIZON

Horizon S100 Bus. Micro Computer inc. Z80A Processor, 64K Byte Memory, Dual 350K Byte Diskette Drives and DOS/BASIC 1995.00

COMART COMMUNICATOR

Clearly the most price competitive modular computer system on the market with built-in expandability – inside and out.

Inc. CP/M From 1895.00 ex. VAT



COMART COMMUNICATOR Z80A MODULAR SYSTEMS

Comart CP100 'Communicator' Micro Computer. Z80A Processor, 64K Byte Memory, Dual 5¼" Floppy Diskette Drives each storing 390K Bytes of Data. Dual Serial and Parallel Ports. 10 Slot S100 Bus. CP/M Version 2 included 1895.00
Comart CP200 as CP100 except Dual 790K Byte Diskette Drives 2195.00
Comart CP500 as CP100 except one 790K Byte Diskette Drive and one 5" Winchester Drive having 4.8M Bytes of Formatted Data. 2995.00
Comart CP520 as CP100 except one 790K Byte Diskette Drive and one 5" Winchester Drive having 19M Bytes of Formatted Data . 3995.00

COMART COMMUNICATOR 8086 MODULAR SYSTEMS

Comart CP100 Communicator Micro Computer. 6MHz 8086 Processor, 128K Byte Memory with Parity. Dual 5¼" Floppy Disk Drives each storing 390K Bytes. Dual Serial and Parallel Printer Ports. 10 Slot S100 Bus inc. CP/M86 & MS-DOS 2295.00
Comart CP1102 CP100 with 256K Byte Memory 2445.00
Comart CP1200 as CP1100 except Dual 790K Byte Diskette Drives 2595.00
Comart CP1202 CP1200 with 256K Byte Memory 2745.00
Comart CP1500 as CP1100 except Single 790K Byte Diskette Drive and Single 5" Winchester Hard Disk Drive having 4.8M Bytes of Formatted Data 3395.00
Comart CP1502 CP1500 with 256K Byte Memory 3545.00
Comart CP1520 As CP1500 except 5" Winchester Disk having 19M Bytes of Formatted Data 4395.00
Comart CP1522 CP1520 with 256K Byte Memory 4545.00

UPGRADE KITS

Wide range of 8 to 16 Bit and floppy to hard disk upgrade kits available for Communicator Systems

COMART MULTI USER CONFIGURATIONS

Comart CP5001 / M CP500 Communicator System with 256K Byte Memory and 6 Serial Interfaces. Includes CP/M and MP/M11 ..... 3995.00
Comart CP520 / M CP520 Communicator System with 256K Byte Memory and 6 Serial Interfaces. Includes CP/M and MP/M11 ..... 4995.00
Comart CP1525M CP1520 Communicator with a total of 512K Byte Memory and 10 Serial Interfaces. Includes CP/M86 and MP/M86 ..... 5995.00

COMART SUBSYSTEMS

Comart CB200 Cartridge Tape Back-Up Subsystem for Hard Disk 2495.00
Comart HD200 8" Hard Disk (18M Byte) Subsystem (including HD10 Controller) 3895.00
Comart HD520 5" × 20M Byte Hard Disk Subsystem (requires HDCONT or can be added to a CP520 or CP1520) 1995.00
Comart HD522 Dual 20M Byte Winchester Hard Disk Subsystem (requires HDCONT) 3495.00
Comart HDCONT Winchester Disk Controller for 2, 20M Byte Drives 595.00
Comart FD800 8" Floppy Single Disk Drive Subsystem. Single Sided, Single Density IBM 3740 Compatible (requires C-IFDC) 995.00
Comart FD802 8" Floppy Dual Disk Drive Subsystem 1495.00
Comart MP/MSUB Hardware & Software to Upgrade Communicator to MP/M. Includes MP/M, two 48K Byte CRAM 48 Memory and ASIO Serial Interface Card 1150.00

S100 BOARDS

Comart CRAM64 64K Byte Dynamic RAM with Bank Select 200.00
Comart CRAM48 48K Byte Dynamic RAM with Bank Select 180.00
Comart CRAM256 256K Byte Dynamic RAM with Parity, 8 and 16 Bit Data. IEEE696 Compatible. Also supports 8 Bit Bank Switching 550.00
Comart CRAM128 128K Dynamic RAM with Parity, 8 and 16 Bit Data, IEEE696 Compatible. Also supports 8 Bit Bank Switching 400.00
Comart CP-CPUBB CUBB Processor Card, with Dual Serial and Parallel Ports. Monitor in 8K EPROM and 4K RAM 300.00
Comart C-IFDC Intelligent Diskette Drive Controller with Z80A Processor 295.00
Comart C-CPU Z80A system Processor Board incl. 2 Serial / 1 Parallel Port 200.00
Comart 4SIO 4 Channel Synch / Asynch Interface Board 250.00
Dual Systems CLK24 Battery Supported Real Time Calendar Disk 295.00
Dual Systems CMEM32 32K CMOS Battery Supported Memory 1195.00
Dual Systems CMEM16 16K CMOS Battery Supported Memory 895.00

CROMEMCO 68000/Z80A SUPER MICRO SYSTEMS

Cromemco CS1D2E System 1 including Dual 390K 5" Floppy Disks, DPU, MCU, 256MSU and 16 FDC Cards in 8 Slot S100 Card, Table Top Enclosure 3620.00
Cromemco CS1D5E as CS1D2E but with 512 MSU 4280.00
Cromemco CS1HD2E System 1 including Single 390K 5" Floppy Disk, 5.5M Byte 5" Winchester Disk, DPU, MCU, 256MSU, 16FDC, WD12 ..... 5595.00
Cromemco CS1HD5E as CS1HD2E but with 512MSU 6255.00

PRICES EXCL. VAT

Cromemco CS3/D5E System 3 including Dual 1.2M Byte Floppy Disk Drives, 21 Slot Card Cage, DPU, MCU, 512MSU, 16FDC £585.00
Cromemco CS3/HD5E as CS3/D5E but with 5" 5.5MB Winchester Disk and WD1 ....£230.00

CROMEMCO Z80 COMPUTER SYSTEMS

Cromemco CS-1H System One including Z80A Processor, 64K Memory, 390K Byte 5" Floppy, 5.5M Byte 5" Winchester Disk and VDU/ Printer Interfaces.....4595.00
Cromemco CS-1 8 Slot S100 Bus. Computer System One, with Z80A Processor, Dual 5" Diskette Drives, 64K Memory, VDU/Printer I/F.....2630.00
Cromemco CS-2 21 Slot S100 Bus. Computer System Two, Z80A Processor, Dual 5" Diskette Drives, 64K Memory, VDU/Printer Interfaces (19" Rack Mount).....£4595.00
Cromemco CS-3 21 Slot S100 Bus. Computer System Three: Z80A, 64K Memory, Dual High Speed 8" Diskette Drives (1.2M Byte each), VDU/ Printer Interfaces (19" Rack Mount).....4495.00
Cromemco Z-2H 12 Slot S100 Bus. Hard Disk Computer System with Z80A Processor, Dual 5" Diskette Drives, 10M Byte Winchester Drive. 64K RAM & VDU / Printer Interfaces.....6585.00
Cromemco Z-2H / GS Cromemco Graphics System based on Z-2H, together with additional Dual Ported 96K Byte Video Memory, High Resolution Graphics I / F and Bit Pad Interfaces CDDS and SGS Software Included 8560.00

CROMEMCO GRAPHICS OPTION

Cromemco SD1 High Resolution (754 x 482) Colour Graphics Interface Board.....595.00
Cromemco 48KTP 48K Byte Dual Port Graphics Memory 755.00

VDU'S & MONITORS

Comart WY100 Visual Display Terminal, Green Display, 24 x 80 and Status Lines. Detached 105 Key Keyboard with Numeric Pad, Function, Cursor and Editing Controls. Swivel and Tilt Display 675.00
Volkercraig 4404 .....595.00
Volkercraig 4404WS 695.00
Cromemco RGB14LP. High Resolution Colour Monitor.....1395.00
12" Green Screen Monitor 99.00

BUG—BYTE SOFTWARE

All Types Available For Acorn, VIC, BBC, ZX81. Spectrum. Call for availability.

BOOKS

Very wide range of computer books stocked at all shops.

DISKETTES

Wabash 5¼" Single Sided, Single Density.....1.70ea
Wabash 5¼" Single Sided, Double Density.....2.13ea
Dysan 5¼" Double Sided, Double Density.....3.90ea
Dysan 8" Double Sided, Double Density 4.40ea
Full range of 5¼" & 8" Diskettes in stock

CP/M SOFTWARE

ACCESS MNGR Digital Research Programming Tool.....186.00
ANIMATOR Microfocus Programming Tool.....225.00
BASCOM Microsoft Basic Compiler.....227.46

SYSTEM SPOTLIGHT

OSBORNE MICRO SYSTEM



Truly portable personal small computer system housed in a 'snap together' case complete with the following comprehensive business programs. CP / M Operating System with Utilities, WORDSTAR with MAILMERGE, SUPERCALC, CBASIC and MBASIC. Other features include 64K RAM and 12" MONITOR with a PRINTER plus 10 floppy disks and 100 sheets of paper so you can start work straight away!

1650[00] ex. VAT

Optional Double -density version now available

BASIC-80 Microsoft Basic Interpreter 205.27
BAZIC Micromethes Basic Language 120.00
BTAM BYROM Software Communications Package between CP/M based machines. Both machines require BSTAM 115.00
BSTMS BYROM Software Communications Package. A commercially orientated, TTY Emulation Facility for CP/M Systems 115.00
BT-80 Digital Research Programming Tool 126.00
CALCSTAR Micropro Financial Planning / Budgeting, Electronic Spread Sheet Package 169.00
CARDBOX Caxton Fast Store and Search System 155.00
CB80 Digital Research Basic Compiler.....314.00
CBASIC Digital Research Basic Language 94.00
CBASIC / B6 Digital Research Basic Language for 16 Bit Micro's (CP/M 86) 204.00
CIS COBOL Microfocus COBOL Language425.00
COBOL TRAIN Microfocus Training Package for DIS COBOL 350.00
COBOL-80 Microsoft COBOL Compiler....421.63
CP / M-DS Digital Research Operating System 94.00
CP/M for SBC Digital Research Operating System 126.00
CP/M-86 Digital Research Operating System for 16 Bit Micro's.....157.00
CP/M-86 DISPWR Digital Research Operating System 204.00
CP/M-86 + CB86 DW Digital Research Operating System + Language 350.00
CP/NET Digital Research Networking Operating System 126.00
CPHLT Jaragote Operating System Simulator 55.00
DATASTAR Microprо Database Package .200.00
DBASE II Ashton-Tate Relational Database + ZIP / ZIP is a Screen and Printout Form Writer for DBASE II 435.00
DESPOOL DR Utility 31.00
DISPLAY MNGR Digital Research Programming Tool 251.00
EDIT-80 Microsoft Editor 72.12
EXTEND Jaragote Utility 55.00
FILESHARE Microfocus Utility 250.00
FILESTAR Microsec's Disk Reformatter CP / M to IBM, DEC, Motorola and Intel Formats 195.00
FMS-80 DJR Assoc. Database / FM 650.00
FMS-81 DJR Assoc. Database / FM.....350.00
FMS-82 DJR Assoc. Database / FM.....350.00
FORMS 2 Microfocus Table Maker. Useful with CIS COBOL 110.00
FORTRAN-80 Microsoft FORTRAN Compiler 288.48
GBS Bytesoft General Business System ..810.00
ISL Bytesoft Accounting Package 1110.00
ITC CP / M Intelligent Terminals Corporation CP / M Operating System for Cromemco ..215.00
KSAM80 MKS Database 350.00
LINK-80 Digital Research Programming Tool 63.00
MAC Digital Research Programming Tool 57.00
MACRO-80 Microsoft Macro Assembler 116.50
MAILMERGE Microprо Wordprocessing Enhancement to link with WORDSTAR 86.00
MBAS Sagphire Business System 400.00
MICROSTAT Ecosoft Statistics Package .195.00
MILESTONE Organic Software Critical Path Package 225.00
MP / M II Digital Research Multi-User Operating System 283.00
MP / M 86 Digital Research Multi-User Operating System for 16 Bit Systems.....409.00
MSORT Microsoft Sort Utility 83.21
PASCAL/ MT + &SPP Digital Research Pascal Language with Speed Programming Tool 314.00
PASCAL/ MT + Digital Research Pascal Language 220.00
PASCAL / MT + 86 Digital Research Pascal Language for 16 Bit Systems 377.00
PEACHTREE Basic Accounting System per module 325.00
PEACHTREE Business Management System per module 600.00
PERSONAL PEARL Peart Data Base / FM .185.00
PLANNERCALC Combiware Financial Planning Package 39.00
RM / 80 Digital Research Language 314.00
REFORM / DEC Microtech Disk Reformatter CP / M to and from Dec.....120.00
REFORM / IBM Microtech Disk Reformatter CP / M to and from IBM 120.00
RMAC, LINK Digital research Programming Tool 126.00
SID Digital Research Programming Tool .. 50.00
SID-86 Digital Research Programming Tool 94.00
SIM22 Wheatcroft Hards Operating Systems Simulator CP / M Simulator for CROMIX Version II 55.00
SPELLSTAR Microprо Proofreading Utility to link with WORDSTAR 143.00
SUPERCALC Sorcim Financial Planning / Budgeting Electronic Spread Sheet Package 190.00
SUPERSORT Microprо Sort Utility 143.00
SUPERVYZ Epic Application Control 86.00
T / MAKER II Lifeboat Associates Financial Planning / Budgeting Electronic Spread Sheet Package 195.00
W / S TRAINING Microprо Training Guide for WORDSTAR 17.00
WORDSTAR Microprо Wordprocessing Package 283.00
WORDMASTER-86 Micro Pro W / P Package.....86.00
WP WORKSHOP MAC Ltd Training Guide for WORDSTAR or MAILMERGE 75.00
X1802 Avocet Cross Assembler 130.00
X3870 Avocet Cross Assembler 130.00
X8502 Avocet Cross Assembler 130.00
X6800 Avocet Cross Assembler 130.00
X6048 Avocet Cross Assembler 130.00
X BASIC/micro Language 185.00
X COPY Xitan Utility 50.00
X CP / M Xitan / DR Operating System 118.00
XLIB Digital Research Programming Tool 94.00
ZSID Digital Research Programming Tool .63.00

Prices include configuration on machines supplied by ourselves. We are totally committed to after sales service and future support

CROMEMCO SOFTWARE FOR 68000/Z80A SERIES

Cromemco CRO-D Cromix (Multi-User / Multi Tasking) Unix Based Operating System 395.00
Cromemco FOR-D Fortran 77 .....395.00
Cromemco PAS-D ISO Pascal 395.00
Cromemco ASM-D 68000 Macro Assembler 395.00
Cromemco STB-D 32K Structured BASIC @ 395.00
Cromemco CCC-D C-Compiler @ 395.00
Cromemco CDB-D Cobol Compiler @ ..395.00
Note: All 68000 Languages (Suffix D) require Cromix (CDR-D). All Software is available on 5" or 8" Floppy Disks – Please Specify.
@ = Availability early '83

CROMEMCO OPERATING SYSTEMS

Cromemco CROMIX Multi User / Multi Tasking Unix Based Operating System (Z80A Systems) 395.00
Cromemco KSAM KSAM File Management for CROMIX (Z80A) 195.00

CROMEMCO LANGUAGES (Z80A)

Cromemco FDB 16K BASIC Interpreter 130.00
Cromemco FDF Fortran IV Compiler 195.00
Cromemco FDC Cobol Compiler 395.00
Cromemco STB 32K Structured BASIC (includes KSAM) 130.00
Cromemco FDR RATFOR- Rational Fortran IV Compiler & Pre-Processor 260.00
Cromemco FDA Z80 Macro Assembler ..195.00
Cromemco CDC C Compiler (Requires Cromix) 395.00
Cromemco RPG RPGII Report Generator..395.00
Cromemco LSP LISP I Lst Processor 260.00
Cromemco CDL Overlay Link Editor 260.00
Cromemco IDS I.O.P. Development Software.....395.00
Cromemco CDS Diagnostic Systems Software.....130.00
All software is available on 5" or 8" Diskettes – please specify.

ALL PRICES EXCLUSIVE OF VAT

* **Barclaycard Visa & Access cards taken in payment;**
* **Shop opening hours 9 – 5.30, check individual shops for details of Saturday opening times.**
* **Phone Mail Orders accepted. Please contact nearest shop for P.P. & Delivery Rates. Regret no C.O.D.**

* Some items may be subject to a dollar surcharge if the dollar exchange rate changes more than 5 cents. Prices will be adjusted in line with the rate prevailing at the time of purchase.
* Prices subject to change without notice
* E. & O.E. and are valid for the cover date life of this magazine.
* Whilst we carry a vast range of stock, we regret we cannot accept every advertised item will be available in each shop.
* All goods are new and include factory warranties.
* No refunds on opened software.
* Orders from Government Depts. & Colleges etc. welcome.
* Leasing & HP facilities available – apply for written details.
* Detailed prices available on request





There are so many micro computers on the market that choosing the right one is far from easy.

And it isn't made any easier when you find them cheek by jowl with cameras, hi-fi and a host of other electrical equipment. What you need is someone that is single minded. And that means us.

Byteshops are totally dedicated to microcomputers. So not surprisingly, we can offer you a wider range because we sell nothing else.

Our prices are keener too. So are our staff. Each one is an expert who can make sure you get the computer that's exactly right for you – whether it's a £40 home micro or a £20,000 business system.

What's more we'll freely advise you on expanding or upgrading your system as your knowledge grows or your requirements change. While our Microserve Centres offer service and maintenance on site and at our shops.

After all, we are the UK's longest established microcomputer specialists. Come and see us soon.

THE BYTESHOP

Your Specialist Computer Centre

LONDON
The Byteshop
324 Euston Road NW1
Tel: 01-387 0505

BIRMINGHAM
The Byteshop
94-96 Hurst Street
Tel: 021-622 7149

GLASGOW
The Byteshop, Magnet House
61 Waterloo Street
Tel: 041-221 7409

MANCHESTER
The Byteshop
11 Gateway House, Piccadilly,
Station Approach Tel: 061-236 4737

NOTTINGHAM
The Byteshop
92A Upper Parliament Street
Tel: 0602 40576

SOUTHAMPTON
Also at XITAN Systems
23 Cumberland Place
Tel: 0703 334711

Members of the Comart Group of Companies

● Circle No. 133

LONDON COMPUTER CENTRE



ACT Sirius 1

1.2 Mb Disk Storage £2395
2.4 Mb Disk Storage £2895

Now available
Z 80 CP/M Add-on board to run all CP/M 8 bit or 16 bit software

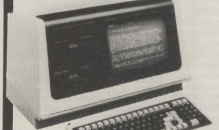
NEW

Sirius Hard Disk 10 Mb Available Now!

Wordstar Magic Wand Spellbinder
Spellstar D Base II T/Maker Calcstar
Milestone Datastar Microstar
Fortran Cobol Pascal or any CP/M software

TELE-VIDEO SINGLE-USER TO MULTI-USER

NOW UPGRADED NO EXTRA CHARGE



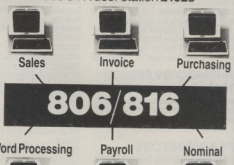
802E 100K EXTRA DISK STORAGE **£2170**

Superbrain compatibility
Faster disk access
Green Screen. True descenders
22 Function Keys

802DE 2 Mb Disk Storage	**£2295**
802HDE 14 Mb Hard Disk 1 Mb Floppy	**£3990**
806 6 User 10 Mb Hard Disk	**£4095**
816 16 User 23 Mb Hard Disk	**£7385**
800 64K User Station	**£1025**

Prices above based on exchange rate $2 = £

800 64 K user station **£1025**



CP/M Software

Wordstar	**£195**
Spellstar	**£130**
Grammatik	**£65**
Foot Note	**£75**
CPM/IBM	**£99**
CPM/DEC	**£99**
T Maker II	**£150**
D Base II	**£395**
Autocode	**£120**
Milestone	**£195**
Task	**£195**

NEW

EPSON HX20 the Portable Computer **£402**



Epson Type 3 MX 80/FT MX 100



NEW

New Superbrain 2 from £1595
Dedicated Wordstar Keypad



AUTO SHEET FEEDER £580
New! 12" Wide Automatic Sheet Feeder fits all below



NEW

5Mb Hard Disk Model 111 £995

Model I	Model II	Model III
48K System	with TRS DOS	16K **£599**
2 Disk Drives	and CPM at	48K **£649**
Green Screen	no extra charge	48K with 2 disk
Complete **£995**	from **£1995**	drives **£1395**



DAISY WHEEL PRINTERS LETTER QUALITY PRINTING

- **FLOWRITER RP 1600. 60 CPS** The most intelligent Daisy. Proportional spacing with Right Justification on WORDSTAR, WORDPRO, APPLE WRITER, SCRIPSIT etc. **£1500.**
- **TEC 40. 40 CPS** JAPANESE DIABLO 630 uses Diablo Daisy Wheel & Ribbons **£1135.**

HARD DISKS

for Superbrain, TRS 80 Model II, Apple

Model 6 6 Mb Formatted **£1595**
Model 12 11.5 Mb Formatted **£1895**
✻ Specially designed Hybrid heavy duty power supply
✻ Data Error Recovery



All prices are Exclusive of VAT and Delivery. Dealer Enquiries invited on all Products.
Large range of CPM Software available. Please phone for Prices.
Demonstrations on all models.

● Circle No. 134

43 GRAFTON WAY, LONDON W1P 5LA (Opposite Maples)
OPENING HOURS: 11-7 MON-FRI 12-4 SAT Tel: 388 6991/2
24 hour answer phone: 01-388 5721

The XEROX 820 series needs ---



-professional software for business

ISBS-F – the totally integrated business software system for microcomputers. Designed to perform day to day accounting and administrative functions in most business environments.

A few examples of the key business benefits from using ISBS-F are:

- optimum stock holding to keep costs to a minimum
- speedy invoice productions with stock release and posting to the sales ledger
- statements produced quickly at month end
- vat analysis at the touch of a button
- improved credit control
- monitor performance easily using budgets and financial reports.

With over 3000 program modules already being used in many different types of industries and professions, ISBS-F offers reliability, backed up by support, and at reasonable cost.

ISBS-F is available as individual modules or bundles so that configurations can fit the exact business environment. Each module is supplied on floppy disk with comprehensive documentation.

ISBS-F can be used on either the 5¼" or 8" versions of the Xerox 820 microcomputer. The system runs under CP/M* with a minimum of 48k memory, dual floppy disks and 132 column printer.

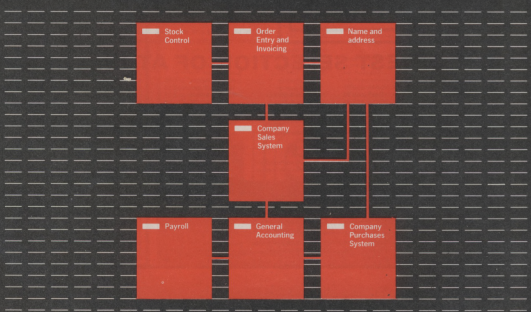
In addition to ISBS-F, to provide for the larger business user, we have the ISBS-W suite. ISBS-W is an advanced integrated business system for users of hard disk microcomputers, operating in a single or multi-user environment.

For further details or a demonstration of any of our software products, call your nearest Xerox Store or Dealer.

Graffcom Business Applications
102 Portland Road London W11 4LX 01 727 5561

Rank Xerox (UK) Ltd
Bridge House Oxford Road Uxbridge
Middlesex UB8 1HS 0895 51133

GRAFFCOM



*CP/M registered trademark of Digital Research

● Circle No. 135

INTERESTFREE

On Atari, VIC 20, Commodore 64 and D

If your order contains over £120 worth of computer hardware apply now for interest free credit by telephoning: Mail-order: (0702) 552911. London Shop: 01-748 0926. Birmingham Shop: 021-356 7292. Southend Shop: 0702 554000 or write to P.O. Box 3, Rayleigh, Essex SS6 8LR.

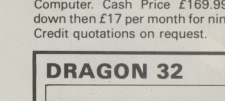
You pay 10% down, then 10% per month for a further nine months (to nearest penny). Example: VIC20 Colour Computer. Cash Price £169.99. Credit terms: £16.99 down then £17 per month for nine months: Total £169.99. Credit quotations on request.

THE NEW COMMODORE 64

The incredible new computer from Commodore come with 64K RAM fitted! Plus 16 colours, hi-res graphics 320 x 200 pixels, 40 columns by 25 lines, Z80 micr processor can be added — that means you can run CP/M software, 8 independently movable Sprites with collisio detection, and a sound generator with 3 voices, 4 wave forms, envelope and filter to rival some dedicated musi synthesisers. And all this at the most incredible price ever

(AF56L) Only £339.0

DRAGON 32



The amazing new British computer with a full-travel standard keyboard, a 16-bit microprocessor, 32K RAM fitted (expandable to 64K and later to 256K!!), 9 colours, hi-res graphics and Microsoft extended colour BASIC (the very best BASIC to learn with). It can be used with virtually any ordinary cassette recorder, it has a printer interface (Centronics-type), joysticks are available and it's incredible value for money. **(AF57M) Only £199.50**

THE AMAZING ATARI COMPUTERS

4 Consoles Available:

Atari 400 with 16K RAM (AF36P) £249.95

Atari 400 with 48K RAM (AF37S) £319.00

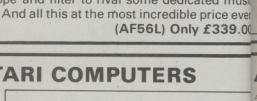
Atari 800 with 16K RAM (AF02C) £499.00

Atari 800 with 48K RAM (AF55K) £590.00

★All above with BASIC & handbooks

Other hardware:	
Cassette Recorder	(AF28F) £50.00
Disk Drive	(AF06G) £299.95
Thermal Printer	(AF04E) £265.00
Epson MX80T Mk III	(AF38R) £399.95
Epson MX80F/T Mk III	(AF40T) £447.35
Printer Interface for 400	(AF41U) £59.95
Printer Interface for 800	(AF42V) £59.95
Interface Module	(AF29G) £135.00
Versawriter	(AF43W) £199.95
16K RAM Module	(AF08J) £59.00
48K RAM Module for 400	(AF44X) £125.35
48K Upgrade for 400	(AF45Y) £75.00
Floppy Disk	(YX87U) £2.50
Le Stick	(AC45Y) £24.95
Joystick Controllers (Pair)	(AC37S) £13.95
Paddle Controllers (Pair)	(AC30H) £13.95

For full details ask for our hardware leaflet (XH54J) SAE appreciated





JOIN THE U.K. ATARI COMPUTER OWNERS' CLUB

An independent users' group. Four issues of the club magazine for only £3.00! Address your subscription to Ron. issue 1 of the club magazine featured a tutorial on character set redefinition and contained a collection of demonstration a games programs and lots more. Issue 2 featured a tutorial on player/missile graphics, an article about graphics on computers selection of members' contributions to the program library and much more.

THE FINEST SELECTION OF ATARI SOFTWARE

Teach-Yourself Programs

Conversational French	-5C-16K-YG44X £39.95
Conversational German	-5C-16K-YG45Y £39.95
Conversational Spanish	-5C-16K-YG46A £39.95
Conversational Italian	-5C-16K-YG47B £39.95
Touch Typing	-2C-16K-YG49D £15.95
States & Capitals	-1C-16K-YG50E £9.95
Euro. Countries & Capitals	-1C-16K-YG57N £9.95
Kids 1 (3 Programs)	-1C-16K-BG00A £9.95
Kids 1 (3 Programs)	-1D-24K-BG01B £9.95
Kids 2 (3 Programs)	-1C-16K-BG02C £9.95
Kids 2 (3 Programs)	-1D-24K-BG03D £9.95

Learn Programming

Invitation To Programming 1	-1C-8K-YG43W £15.95
Invitation To Programming 2	-2C-8K-BG67X £22.95
Invitation To Programming 3	-2C-8K-BG68Y £22.95
Basics Of Animation	-1C-16K-BG57N £11.95
Basics Of Animation	-1D-24K-BG58R £11.95
Player Missile Graphics	-1C-32K-BG59P £18.95
Player Missile Graphics	-1D-32K-BG60Q £18.95
Display Lists	-1C-16K-BG51F £11.95
Display Lists	-1D-24K-BG52G £11.95
Horiz./Vert. Scrolling	-1C-16K-BG53H £11.95
Horiz./Vert. Scrolling	-1D-24K-BG54J £11.95

Page Flipping	-1C-16K-BG55K £11.95
Page Flipping	-1D-24K-BG56L £11.95
Sounds & Music	-1C-16K-BG04E £11.95
Sounds & Music	-1D-24K-BG05F £11.95
Tricky Tutorials	-3C-32K-BG06G £59.95
Tricky Tutorials	-3D-32K-BG07H £59.95

Business Programs

Visicalc	-1D-32K-YL39N £119.95
Atari Word Processor	-1C&3D-48K-YG42V £99.95
Text Wizard	-1D-32K-BG99H £69.95
Mini Word Processor	-1C-32K-BG08J £11.95
Mini Word Processor	-1D-32K-BG09K £11.95
Calculator	-1D-24K-YG50E £16.95
Graph It	-2C-16K-YG51F £13.95
Statistics	-1D-16K-YG52G £13.95
Personal Financial Management	-3D-32K-BG65V £49.00
Mortgage & Loan Analysis	-1C-16K-BG66W £13.95
Bob's Business	-1C-32K-BG11M £9.95
Bob's Business	-1D-32K-BG12N £9.95

Adventure Games

Galactic Empire	-1C-32K-BG14Q £14.95
Rescue At Rigel	-1C-32K-BG21X £22.45
Rescue At Rigel	-1D-32K-BG80B £22.45
Datestones Of Ryn	-1C-32K-BG22Y £14.95
Datestones Of Ryn	-1D-32K-BG82D £14.95
Star Warrior	-1C-32K-BG24B £28.95
Star Warrior	-1D-32K-BG25C £28.95
Invasion Orion	-1C-24K-BG23A £18.95
Invasion Orion	-1D-32K-BG81C £18.95
Star Trek 3.5	-1C-32K-BG15R £14.95
Star Trek 3.5	-1D-40K-BG83D £18.95
Crush, Crumble & Chomp	-1C-32K-BG83E £22.45
Crush, Crumble & Chomp	-1D-32K-BG84F £22.45
Mission: Asteroid	-1D-40K-BG91Y £17.19
Wizard & The Princess	-1D-40K-BG25C £21.79
Ulysses & The Golden Fleece	-2D-40K-BG92A £20.64
Zork I	-1D-32K-BG94C £29.95
Zork II	-1D-32K-BG95D £29.95
Ali Baba & The 40 Thieves	-1D-32K-BG78K £27.95
Temple Of Apshai (Part 1)	-1C-32K-BG95G £28.95
Temple Of Apshai (Part 1)	-1D-32K-BG86T £28.95
Upper Reaches Of Apshai (Part 2)	-1D-32K-BG87U £14.95
Upper Reaches Of Apshai (Part 2)	-1D-32K-BG88V £14.95
Curse Of Ra (Part 3)	-1C-32K-BG89W £14.95
Curse Of Ra (Part 3)	-1D-32K-BG90X £14.95
Analog Adventure	-1D-32K-BG33L £16.95
Adventure Land	-1C-24K-BG00A £14.95
Pirates Adventure	-1C-24K-BG01B £14.95
Mission Impossible	-1C-24K-BG02C £14.95
Voodoo Castle	-1C-24K-BG03D £14.95
The Count	-1C-24K-BG04E £14.95
Strange Odyssey	-1C-24K-BG05F £14.95
Mystery Fun House	-1C-24K-BG06G £14.95
Pyramid Of Doom	-1C-24K-BG07H £14.95
Ghost Town	-1C-24K-BG08J £14.95
Savage Island I	-1C-24K-BG09K £14.95
Savage Island II	-1C-24K-BG10L £14.95
Golden Voyage	-1C-24K-BG11M £14.95
Sorcerer Of Zurcon	-1D-40K-BG93B £20.95
Deadline	-2D-32K-BG96E £34.95
The Shattered Alliance	-1D-48K-BG98G £28.95
The Battle Of Shiloh	-1C-40K-BG81F £28.95
The Battle Of Shiloh	-1D-40K-BG97F £28.95
Energy Czar	-1C-16K-YG53H £9.95
Kingdom	-1C-8K-YG55K £9.95
Space Shuttle Module 1	-1D-32K-BG65V £19.95

Arcade Games

Star Raiders	-1E-8K-YG66W £39.95

ECREDIT

and Dragon 32 computer hardware

(Subject to approval which can take up to 48 hours) (APR = 0%)

64
re comes
graphics,
80 micro
un CP/M
collision
4 wave-
ed music
rice ever.
£339.00

ATARI SOFTWARE continued

Asteroids	-1E-BK YG60Q £9.95	Blackjack	-1C-BK YG62S £9.95
Space Invaders	-1E-BK YG70M £29.95	Hangman	-1C-BK YG54J £9.95
Missile Command	-1E-BK YG64U £29.95	Super Cubes & Tilt	-1C-16K BG48C £14.95
Caverns of Mars	-1D-16K BG69A £24.50	Humpty Dumpty & Jack & Jill	-1C-16K BG38R £19.95
X Ray Shoot Out	-1E-BK BG63T £29.95		
X Ray Knitters	-1E-BK BG51F £29.95	Hickory Dickory Dock & Baa Baa Black Sheep	-1C-16K BG39N £19.95
K Star Patrol	-1E-BK BG23Q £29.95	British Heritage Jigsaw Puzzles	-2C-16K BG40T £19.95
Pathfinder	-1D-32K BG33L £27.95		
Crossfire	-1D-32K BG23E £27.95	European Scene Jigsaw Puzzles	-2C-16K BG41U £19.95
Crossfire	-1D-32K BG23A £20.64	Video Easel	-1E-BK B372F £24.50
Protector	-1D-32K BG24B £21.80	Micro Painter	-1D-48K BG56L £29.95
Protector	-1D-32K BG23C £21.80		
Threshold	-1D-40K BG18U £27.54	**Music Programs**	
Deluxe Invaders	-1D-16K BG19C £19.95	Music Composer	-1E-BK YG48C £35.95
Galactic Chase	-1C-16K BG62S £16.95	Movie Themes	-1C-BK BG34M £9.95
Galactic Chase	-1D-16K BG61R £16.95		
Raze in Space	-1C-16K BG39Q £14.95	**Computer Languages**	
Raze in Space	-1D-16K BG39M £16.95	Assembler	-1C-16K YL32K £19.95
Space Chase	-1C-16K BG42V £10.95	Assembler Editor	-1E-BK YG68Y £39.95
Space Chase	-1D-24K BG43W £12.95	Macro Assembler	-1D-32K BG79Q £59.95
Centipede	-1E-16K BG70M £29.95	Basic A+	-1D-48K BG31J £49.95
Ample Worms	-1C-8K BG50E £10.95	Basic A+ & Operating System A+	-1D-48K BG32K £99.50
Lunar Lander	-1C-24K BG16S £10.95	Microsoft Basic	-1D-32K BG74R £59.95
Lunar Lander	-1D-24K BG42Y £14.95	Pilot (Educator)	-1E & 2C-16K BG75S £79.95
Jumbo Jet Lander	Available November	Pilot (Compiler)	-1E-16K YG69A £54.00
Submarine Commander	Available November	QS Forth	-1D-24K YL39G £49.95
Rattelisteer	-1D-32K BG35Q £22.95	Tiny C	-1D-48K BG62S £64.95
Shooting Gallery	-1C-16K BG22P £9.95	Inter Logo/65	-1D-48K BG61R £87.00
Shooting Gallery	-1C-16K BG19V £16.95		
Shooting Arcade	-1C-16K BG15R £24.95	**Utilities**	
Shooting Arcade	-1D-16K BG14Q £29.95	Programming Aids Package 1	-1C-16K BG60Q £ 9.95
Super Breakout	-1E-BK YG67K £24.50	6502 Disassembler	-1C-BK YL30H £9.95
Dodge Racer	-1C-16K BG29G £19.95	6502 Disassembler	-1D-BK YL31J £12.95
Dodge Racer	-1D-24K BG30H £19.95	Atari World	-1D-40K BG27E £43.95
Mashmazer	-1C-16K BG31J £23.95	3D Supergraphics	-1C-40K BG29G £29.95
Mashracer	-1D-16K BG32K £23.95	3D Supergraphics	-1D-40K BG28F £29.95
Moustakman	-1D-32K BG77J £22.95	File It 2	-1D-48K BG10L £34.95
Jawbreaker	-1C-16K BG17T £20.64	Filemanager 800	-1D-40K BG59F £72.80
Jawbreaker	-1D-32K BG20D £20.64	K DOS	-1D-32K BG76H £49.95
Ghost Hunter	-1C-16K BG64U £19.95	Disk Manager	-1D-32K BG58N £21.80
Pac Man	-1C-16K BG13P £14.95	Disk Detective	-1D-16K BG57M £24.95
Pacific Coast Highway	-1C-16K BG13F £24.95	Operating System A+	-1D-32K BG30H £49.95
Pacific Coast Highway	-1D-16K BG14Q £20.64	Telelink	-1E-BK YG59P £21.50
Chicken	-1C-16K BG27E £21.80	The Next Step	-1D-32K BG64U £27.54
Chicken	-1D-16K BG28F £21.80		
Tumble Bugs	-1C-24K BG46A £24.95	**Books**	
Bug Attack	-1C-24K BG39F £24.95	Master Memory Map	-XH57M £4.00
Bug Attack	-1D-40K BG37S £23.95	De Re Atari	-WG56L £16.95
Canyon Climber	-1C-16K BG44X £24.95	Operating System User's Manual	-WG46A £16.95
Canyon Climber	-1D-16K BG45Y £20.64	A to Hardware Manual	-WG55K £5.24
Mountain Shoot	-1C-16K BG12N £10.95	Atari Basic Learning By Using	-WG47B £45.00
Haunted Hill	-1C-16K BG11M £14.95	Games For The Atari	-WG58P £6.80
Haunted Hill	-1D-16K BG39N £19.95	Atari Basic	-WG05F £6.80
Time Bomb	-1C-16K BG40T £10.95	Atari Sound & Graphics	-WA39N £8.25
Time Bomb	-1D-24K BG41U £12.95	Your Atari Computer	-WA40T £13.45
Tank Trap	-1C-16K YL34M £9.95	6502 Assembly Language Subroutines	-WA05F £12.45
Tank Trap	-1D-32K YL35Q £12.95	Advanced 6502 Interfacing	-WA41U £12.95
Thunder Island	-1C-16K BG37S £10.95	Beyond Games (6502)	-WA45Y £13.00
		Computers For People	-WA06A £8.25
Home Game Programs		Analog: The Magazine For Atari	
Scram	-1C-16-24K YG58N £17.50	(6 issues) Annual Subscription	-GG24B £9.00
Basketball	-1E-BK YG61P £9.50		
Cypher Bowl	-1C-16K BG20W £29.50	**Send sae now for our new software leaflet with details of all the above programs.**	
Sunday Golf	-1C-16K BG21X £29.95	**Order As XH52Q — Issue 3.**	
Darts	-1C-16K BG42V £19.95	**Key:** C = Cassette D = Disk E = Cartridge	
Tournament & 8 Ball Pool	-1C-16K BG43W £14.95	2C = 2 Cassettes etc. 8K, 16K shows minimum memory requirement.	
Shooter & Billiards	-1C-16K BG44X £19.95		
Ricochet	-1C-16K BG47B £14.95		
Ricochet	-1D-32K BG48C £14.95		
Computer Chess	-1E-BK YG63T £24.50		
3rd Grammon	-1C-BK YL33L £16.95		
Gomoku	-1C-16K BG18U £14.95		
Gomoku	-1D-16K BG05K £14.95		
Reversi	-1C-16K BG19V £14.95		
Reversi	-1D-16K BG54J £19.95		
Cribbage & Dominoes	-1C-16K BG43W £14.95		
Poker Solitaire	-1C-16K BG21T £10.95		
Poker Solitaire	-1D-16K BG53H £14.95		

Note: Order codes shown in brackets. Prices correct at time of going to press. (Errors excluded).

VIC20 COLOUR COMPUTER

Hardware		
VIC20 Console	(AF478) £169.99	
C2N Cassette Unit	(AF48C) £44.95	
VIC Printer	(AF49D) £230.00	
VIC Disk Drive	(AF50E) £286.00	
3K RAM Cartridge	(AF51F) £29.95	
8K RAM Cartridge	(AF52G) £44.95	
16k RAM Cartridge	(AF53H) £74.95	
Joysticks and Paddles		
Single Joystick	(AC53H) £7.50	
Pair of Joysticks	(AC37S) £13.95	
Le Stick	(AC45Y) £24.95	
Pair of Paddles	(AC39H) £13.95	
Programming Aid Cartridges		
Super Expander 3K RAM and Hi-res graphics	(AC54J) £34.95	
Programming Aid. Additional commands, function Key programming etc	(AC55K) £34.95	
Machine Code Monitor	(AC56L) £34.95	
Software (all 3K unless stated)		
Introduction to BASIC Cassettes		
Part 1	(AC57M) £14.95	
Part 2	(AC58N) £14.95	
Game Programs		
Avenger Cartridge	(AC59P) £19.95	
Star Battle Cartridge	(AC60Q) £19.95	
Super Slot Cartridge	(AC61R) £19.95	
Jelly Monsters Cartridge	(AC62S) £19.95	
Alien Cartridge	(AC63T) £19.95	
Super Lander Cartridge	(AC64U) £19.95	
Road Race Cartridge	(AC65V) £19.95	
Rat Race Cartridge	(AC66W) £19.95	
Blitz Cassette	(AC67X) £4.99	
Mole Attack Cartridge	(AC86G) £24.95	
Adventureland Cartridge	(AC87H) £24.95	
Pirate Cove Cartridge	(AC88J) £24.95	
Mission Impossible Cartridge	(AC87U) £24.95	
Voodoo Castle Cartridge	(AC88V) £24.95	
The Count Cartridge	(AC89W) £24.95	
Sargon 2 Chess Cartridge	(AC77J) £24.95	
Gort Cartridge	(AC90X) £24.95	
Omega Race Cartridge	(AC91Y) £24.95	
Another VIC in The Wall Cassette	(AC78K) £7.00	
VIC Panic Cassette	(AC79L) £7.00	
Cosmads Cassette	(AC80M) £7.00	
Backgammon Cassette (+3K)	(AC81C) £7.00	
VIC Men Cassette	(AC92D) £7.00	
VIC Asteroids Cassette	(AC83E) £7.00	
Business Programs		
Simplicalc Disk (+16K)	(AC92A) £24.95	

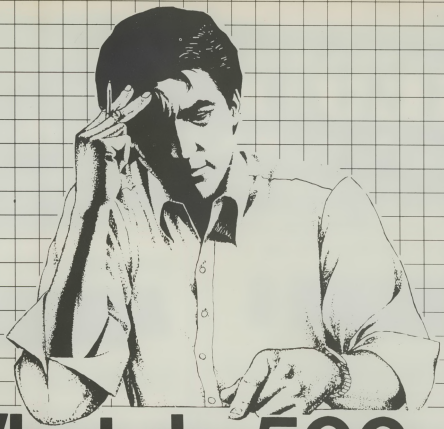
Simplicalc Cassette (+16K)	(AC93B) £19.95
VIC Stock Control Cassette (+8K)	(AC94C) £19.95
VIC File Disk (+16K)	(AC86Q) £24.95
VIC Writer Disk (+8K)	(AC96E) £24.95
VIC Writer Cassette (+8K)	(AC97F) £19.95
Education (CSE & 'GCE 'O' Level Revision) All cassette based and require at least 8K expansion memory.	
English Language	(AC98G) £9.99
Mathematics 1	(AC99H) £9.99
Mathematics 2	(BC00A) £9.99
Biology	(BC01B) £9.99
Chemistry	(BC02C) £9.99
Physics	(BC03D) £9.99
Computer Studies	(BC04E) £9.99
Geography	(BC05F) £9.99
History	(BC06G) £9.99
Arithmetic for 9 to 11 year olds	(BC07H) £9.99
Reading for 9 to 11 year olds	(BC08J) £9.99
General Knowledge for 9 to 11 year olds	(BC09K) £9.99
Spelling for 9 to 11 year olds	(BC10L) £9.99
Home Programs	
All cassette based and require at least 8K expansion memory.	
Quizmaster	(BC11M) £9.99
Know Your Own IQ	(BC12N) £9.99
Junior IQ	(BC13P) £9.99
Know Your Own Personality	(BC14Q) £9.99
The Robert Carner Family Menu Planner	(BC15R) £9.99
VIC Money Manager	(BC16S) £9.99
VIC Road User & Highway Code	(BC17T) £9.99
Garden Planner	(BC18U) £9.99
Interior Designer	(BC19V) £9.99
BBC Mastermind The Family	(BC20W) £9.99
BBC 'Mastermind'	(BC21X) £9.99
'Mastermind' additional General Knowledge	£2.50
Data 1	(BC22Y) £2.50
Data 2	(BC23A) £2.50
Data 3	(BC24B) £2.50
Data 4	(BC25C) £2.50
'Mastermind' additional Specialist Knowledge	
Wine & Food	(BC26D) £2.50
Music	(BC27E) £2.50
Sport & Games	(BC28F) £2.50
Films & TV	(BC29G) £2.50
Books About VIC	
Learn Programming on the VIC	(WA31J) £2.50
VIC Revealed	(WA32K) £10.00
VIC Programmers Reference Guide	(WA33L) £9.95
VIC Graphics	(WA48C) £10.00

MAPLIN

Maplin Electronic Supplies Ltd., P.O. Box 3, Rayleigh, Essex. Tel: Southend (0702) 552911/554155.

Demonstrations at our shops NOW. See the computers in action at 159-161 King St., Hammersmith W6. Tel: 01-748 0926
284 London Road, Westcliff-on-Sea, Essex. Tel: (0702) 554000
Lynton Square, Perry Barr, Birmingham: Tel: (021) 356 7292.

● Circle No. 136



What do 500 computer dealers know that you don't?

They know that they have found an unbeatable combination – Pete & Pam Computers' service, with the Pete & Pam Price Promise, "We will not be undersold" Over 500 dealers throughout the UK, Europe and the Gulf States buy from Pete & Pam Computers. They choose from over 900 products in our catalogue. Products from 146 different companies such as Apple, BASF, Epson, Microsoft MicroPro, NEC, Saturn Systems, Sirius Software, Versa Computing, Videx, VisiCorp and Zenith – and all at highly competitive prices. Products which are backed by our comprehensive service facilities, with same-day shipping. Over 500 dealers know our reputation for sound advice, and for being well informed in what's new in microcomputing. They know our service is friendly, fast and efficient. In short – they know us. Isn't it time you were "in the know" and opened an account with Pete & Pam Computers? We have a lot to offer you.

Send for our free Price List and our product literature. We promise you that you will not be disappointed.

Pete & Pam Computers

Head Office: New Hall Hey Road, Rossendale, Lancashire, BB4 6JG Tel 0706 227011 Telex 635740 PETPAM G

London Office: 103-5 Blegborough Road, London, SW16 6DL Tel 01-769 1022/3/4 & 01-677 2052 Telex 923070 PPCOMP G

● Circle No. 137

Now the VIC 20 and 64 can communicate with PET peripherals



VIC and 64 users

Would you like to be able to access **any** of these peripherals from your computer?

- ⅓ megabyte disks (Commodore 4040 drive)
- 1 megabyte disks (Commodore 8050 drive)
- 10 megabyte disks (Commodore 9090 hard disk)
- Printers including a wide range of inexpensive IEEE and RS232 matrix and quality printers
- IEEE instruments such as volt meters, plotters etc.

Now you are no longer limited by the VIC or the 64's serial bus. Simply by attaching INTERPOD you can vastly increase the power of your VIC 20 and when used with the new 64, INTERPOD turns the computer into a really powerful system.

With INTERPOD the VIC and 64 become capable of running really professional quality software such as Word-processing, Accounting, Instrument control and many more.

INTERPOD will work with any software. No extra commands are required and INTERPOD does not affect your computer in any way.

Using INTERPOD is as easy as this:

Simply plug INTERPOD into the serial port of your computer, power-up and you are ready to communicate with any number of parallel and serial IEEE devices and any RS232 printer.

INTERPOD costs £95.95 + VAT

INTERPOD

Oxford Computer Systems (Software) Ltd. The Old Signal Box, Hensington Road, Woodstock, Oxford OX7 1JR Tel. (0993) 812700

● Circle No. 138

NCC

The National Computing Centre

INTRODUCING COMPUTERS

by **M. Peltu**

Aims to describe the background to computers, and to provide a comprehensive introduction to the main aspects of computers and computing. Topics covered include: key practical developments and theoretical concepts, how computers and silicon chips work, computer programming, systems design, databases, telecommunications, and the human and organisational aspects of applying computer power. The importance of designing computer systems to meet real user needs is emphasised, and many examples are given to show how computers are being applied in all walks of life.

Jan'85 approx. 230pp
085012 321 6 approx. £5.50

PRIVACY IN THE COMPUTER AGE

by **G.L. Simons,** *Chief Editor, N.C.C. Publications*

Describes the background to the present privacy debate, indicating the issues in question and highlighting the specific areas of concern (e.g. detailed files of personal information held by police, banks, hospitals, governments, etc.). Discusses the various efforts being made at U.K. legislation and the main features of U.K. reports (Younger and Lindup) in this field. A profile is given of international factors, detailing the impact of modern networking and legislation in various countries, and other aspects. The current U.K. government proposals and philosophy, likely to result in legislation, are reviewed, and an indication is given of the expert response (including that of Lindup) to these proposals.

Nov'82 148pp
085012 348 8 £6.50

HANDBOOK OF DATA COMMUNICATIONS, 2nd Ed.

by **The National Computing Centre**

The background to the modern communications scene is profiled, with mention of early communications methods and the impact of modern computers. Modern communications techniques, developing out of early telephony and related methods, are described and attention is given to different types of protocols and other data transmission requirements and concepts.
Performance and error control in data communications systems are considered and a profile is included of network design factors and principles of network management.
Attention is also drawn to new/emerging network systems.

Nov'82 498pp
085012 363 1 £15.00

AUDIT AND CONTROL OF MINI- AND MICROCOMPUTERS

by **I.J. Douglas**

After a preliminary discussion of mini and microcomputer hardware and software, the author describes the main control and audit problems introduced by small computer systems and considers an audit approach for a financial audit of a stand-alone mini or microcomputer system.
The approach adopted is that recommended in the UK Audit Practices Committee Exposure Drafts issued in 1982 (Internal Control in Computer Systems and Computer Assisted Audit Techniques).

Nov'82 approx. 85pp
085012 368 2 approx. £6.50

SMALL BUSINESS COMPUTERS FOR FIRST-TIME USERS

by **I.R. Beaman**

Aims to assist the small business through the various stages of computerization, and to remove much of the mystique that surrounds computers.
The first-time user is given guidance on computer selection and on how to ensure that subsequent implementation proceeds smoothly.

Dec'82 approx. 240pp
085012 374 7 approx. £9.55

OFFICE PRINTERS:
A Practical Evaluation Guide

by **M.A. Condon,** *Senior Consultant, Office and Communication Systems Division, The National Computing Centre*

Describes the types of office printers available (impact and non-impact), and the author discusses the criteria to be considered when choosing an office printer.

Nov'82 66pp
085012 371 2 (paper only) £6.50

WILEY COMPUTER BOOK MONTH—FEBRUARY 1983
A wide range of Computer Books and Software on display at leading Bookshops and selected Computer Stores throughout the UK
(Checklist of titles available from Wiley)

BUSINESS BASIC — A SELF-TEACH PROGRAMMING COURSE

by **The National Computing Centre**

The Business Basic – A Self-Teach Programming Course is an imaginative, practical, and realistic approach to learning the most widely used of all microcomputing programming languages. The course draws on N.C.C.'s unrivaled expertise in developing effective training methods. It is based on the centre's wide experience of the real needs of the business user. It teaches not only Basic as a business programming language but also good business computing practice, and it is applicable to Basic on any microcomputer.
The heart of the package is the Workbook: a systematic step-by-step guide through every feature of Business Basic. It provides hundreds of practical 'activities' which illustrate the facilities of Basic and their use.
The Audio Tape is an integral part of the package which is used throughout the course. Its purpose is to introduce new ideas, emphasise important concepts, and give a detailed explanation of some of the more difficult tasks. The Workbook contains a number of problems and exercises and solutions to these problems are contained in the separate Answer Book.

085012 319 4 Feb'83 approx. £16.95 (+ VAT)

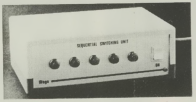
Marketed by
John Wiley & Sons Limited
Baffins Lane · Chichester · Sussex PO19 1UD · England

● Circle No. 139

Wego Computers Ltd



The Sequential Switching Unit for powering up and down various devices in the correct sequence. **£75 + VAT**



BackPack – A standby power supply that fits internally within the PET and Disk Drive. It gives at least 15 minutes to close the system down in an orderly fashion. **£140 + VAT**



The Card Reader is now available with an optical read head, which can also read punch cards. **from £650 + VAT**



The TNW 1000 – an output only addressable serial interface IEEE to RS232C. **£110 + VAT**

Wego Computers Ltd
22a High Street Caterham Surrey CR3 5UA
Tel. Caterham 47235 Telex 933660 WEGO-G

● Circle No. 141

Somewhere handy to put your mini disks



The Willis Mini-Disk file is the idea you hoped someone would come up with. A handsome virtually indestructible file which holds your valuable programs and data files neatly filed and indexed ready for immediate use.

Disks are stored in 10 sections, each with an ingenious lift mechanism, which enables you to fan display them five at a time, using only the thumb and forefinger.

The file holds fifty 5¼" Mini Disks and you'll wonder how you ever did without it.

Just one of the items from the Willis Catalogue.

To order please use coupon. By taking advantage of this cash with order offer, you are saving £5.55 on the normal price. *Virtually indestructible with smart cream plastic base and tinted polycarbonate lid. *Lockable for security and easily transportable with carrying handles. *Each disk neatly filed even if box is not fully loaded.

Just £35.00 (Plus £2 p&p)

To: Willis Computer Supplies Ltd., FREEPOST, PO Box 10, Southmill Road, Bishop's Stortford, Herts CM23 1BR. Telephone: Bishop's Stortford (0279) 506491.

Please send ..... Mini Disk File(s) at £35.00 plus £2.00 p&p and your colour catalogue.

Name .....

Address .....

..... Post Code .....

I enclose my cheque/PO for £..... or debit my Access or Barclaycard.

Card Number [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

Signature .....

PC1/83

WILLIS Computer supplies



● Circle No. 140

TTL							
74 SERIES		74LS85	40p	74LS197	45p	74LS645	100p
		74LS90	45p	74LS221	90p	74LS668	100p
7406	18p	74LS90	22p	74LS240	95p	74LS669	100p
7407	18p	74LS92	25p	74LS241	95p	74LS670	120p
7418	18p	74LS93	22p	74LS242	95p	74LS682	300p
7417	18p	74LS95	45p	74LS243	95p	74LS684	300p
7425	18p	74LS107	30p	74LS245	70p		
74121	25p	74LS109	27p	74LS251	30p		
74128	36p	74LS112	20p	74LS253	30p	74S SERIES	
74159	75p	74LS113	20p	74LS257	30p	74S00	30p
74182	40p	74LS114	22p	74LS258	35p	74S04	30p
74184	90p	74LS122	25p	74LS259	80p	74S05	60p
74185A	90p	74LS123	34p	74LS260	22p	74S08	60p
		74LS124	90p	74LS266	22p	74S10	40p
74LS SERIES		74LS125	24p	74LS273	65p	74S11	50p
74LS00	11p	74LS126	24p	74LS275	95p	74S20	40p
74LS01	11p	74LS132	34p	74LS280	100	74S30	40p
74LS02	11p	74LS133	22p	74LS283	45p	74S32	70p
74LS03	12p	74LS136	28p	74LS293	40p	74S37	60p
74LS04	12p	74LS138	27p	74LS295	70p	74S74	70p
74LS08	12p	74LS139	27p	74LS298	95p	74S85	450p
74LS09	12p	74LS145	70p	74LS299	150p	74S86	60p
74LS10	13p	74LS147	100p	74LS323	180p	74S113	90p
74LS11	13p	74LS148	75p	74LS324	180p	74S114	90p
74LS12	13p	74LS151	40p	74LS348	90p	74S124	300p
74LS13	18p	74LS153	40p	74LS352	90p	74S132	110p
74LS14	28p	74LS155	30p	74LS356	250p	74S133	60p
74LS15	12p	74LS156	30p	74LS363	140p	74S138	120p
74LS20	13p	74LS157	25p	74LS364	140p	74S139	120p
74LS21	13p	74LS158	30p	74LS365	30p	74S157	250p
74LS22	13p	74LS160	39p	74LS367	30p	74S163	300p
74LS26	40p	74LS161	39p	74LS368	30p	74S174	250p
74LS27	13p	74LS162	39p	74LS373	75p	74S175	320p
74LS28	40p	74LS163	39p	74LS377	75p	74S188	150p
74LS30	13p	74LS164	40p	74LS375	70p	74S189	150p
74LS32	13p	74LS165	70p	74LS378	90p	74S194	320p
74LS33	14p	74LS166	60p	74LS378	45p	74S200	450p
74LS37	14p	74LS170	70p	74LS390	45p	74S240	150p
74LS38	14p	74LS173	55p	74LS393	45p	74S225	510p
74LS40	20p	74LS174	40p	74LS395	90p	74S241	300p
74LS42	40p	74LS175	40p	74LS399	180p	74S260	70p
74LS48	46p	74LS181	90p	74LS445	90p	74S262	850p
74LS51	14p	74LS183	120p	74LS540	90p	74S263	850p
74LS55	14p	74LS190	39p	74LS541	90p	74S287	150p
74LS73	30p	74LS191	38p	74LS610	419	74S288	150p
74LS74	19p	74LS192	39p	74LS612	419	74S373	400p
74LS75	19p	74LS193	39p	74LS640	100p	74S374	400p
74LS78	19p	74LS194	35p	74LS642	100p	74S474	400p
74LS83	36p	74LS195	35p	74LS643	100p	74S571	820p
74LS85	40p	74LS196	45p	74LS644	100p	74S573	900p
74LS157	40p						

VOLTAGE REGULATORS FIXED PLASTIC			
1A	+ve	−ve	
5V	7805	40p	7905 45p
12V	7812	40p	7912 45p
15V	7815	40p	7915 45p
18V	7818	40p	7919 45p
24V	7824	40p	7924 45p
5V 100mA	78L05	30p	79L05 50p
12V 100mA	78L12	30p	79L12 50p
15V 100mA	78L15	30p	79L15 50p

OTHER REGULATORS			
LM309K	140p	78HO5KC	550p
LM323K	450p	78GU1C	200p
LM337T	225p	79GU1C	225p
MC1723C	300p	ICL7660	200p
TL494	300p	TL497	300p
78S40	225p	LM305AH	250p
78HGKC	600p		

MICRO COMPUTER

OFFICIAL DEALER

BBC Model A £299 Model B £399

(inc VAT) carr: £8/unit

Model A to Model B upgrade kit £50

Fitting charge £15

Full Range of Connectors in stock

Please phone for availability: send s.a.e. for BBC leaflet.

SOFTY II INTELLIGENT PROGRAMMER

The complete micro processor development system for Engineers and Hobbyists. You can develop programs, debug, verify and commit to EPROMS or use in host computer by using softy II as a controller. Powerful editing facilities permit bytes, blocks of bytes changed, deleted or inserted and memory contents can be observed on ordinary TV. Accepts most +5v Eproms. Softy II complete with PSU, TV Lead and Romulator lead **£169.**

MICROTIMER

6502 Based Programmable clock timer with

* 224 switching times/week cycle
* 24 hour 7 day timer
* 4 independent switch outputs directly interfacing to thyristor/triacs.
* 1 digit 7 seg. display to indicate real time, ON/OFF and Reset times.
* Output to drive day of week switch status LEDS.

Full details on request. Price for kit £57.00.

COMPUTER COMPONENTS

CRUs	
1802CE	650p
2650A	£12
6502	350p
6502A	500p
6800	225p
6802	250p
6809	£12
6809	650p
6809E	£12
6809E	£12
8035L	280p
8039	£3
8048A	250p
8080A	250p
INS8060	£11
INS8980	£12
Z8	£24
Z80	250p
Z80A	320p
Z80B	350p
8088	£18
TMS 9995	£12

SUPPORT	
3242	800p
3245	450p
3520	250p
6522	310p
6532	1500p
6551	650p
6821	250p
6840	1000p
6840	270p
6845	1100p
6850	110p
68850	280p
6852	250p
6875	£7
6875	500p
8154	1500p
8155	350p
8156	350p
8205	225p
8212	110p
8216	100p
8224	180p
8226	250p
8228	220p
8250	250p
8251	£5
8253	350p
8255	280p
8256	£36
8257	£4
8259	£4
8272	110p
8279	440p
8284	280p
8288	£11
AM2910A	800p
280PIO	250p
280APIO	250p
280CTC	250p
280ACTC	280p
280ADART	700p
280ADMA	£10
280ASIO 0/1/2	£9
2810/12	£20

MEMORIES	
2101A	400p
2102	100p
2107B	500p
2111A	300p
2114 2L	190p
2147	450p
4027 3	300p
4116 15	120p
4118 20	100p
4118 3	500p
4118 4	500p
4164 2	250p
4164 3 P/S	280p
5101	450p
6116P 3	420p
6116P 4	350p
7489	180p
74S1400	250p
74S201	350p
74S474	250p

ROM & PROM	
74S188	325p
74S287	225p
74S288	225p
74S387	350p
74S471	650p
74S473	650p
74S474	400p
74S570	250p
74S571	650p
74S572	650p
6653	650p
6823	700p
2708	250p
2716	280p
2716 5V	280p
2732 3	700p
2732 35	600p
2732 45	375p
2716 350	£5
2732 350	600

BAUD RATE
U1T/R&A1T/R&S
COM8116 £7
74MC14411 £15p
4702 750p

UARTs
AY 3 8910/5P 300p
AY 5 1013P 300p
IM6402 450p
TR1602 300p
COM5017 300p

MODULATORS
6MHz UHF 375p
8MHz UHF 450p

INTERFACE ICs	
AD558CJ	775p
AM2812	£20
AM2551/6	350p
AM26LS25/31	£2
AM26LS32	125p

COMB116	£8
DAC80	£28
DM8131	275p
DP8304	250p
DS8831	140p
DS8832	250p
DS8833	225p
DS8835	200p
DS8836	150p
LF13201	450p
MC1488	55p
MC1489	55p
MC14411	575p
MC3486	500p
MC3418	950p
MC3446	300p
MC3486	850p
MC3486	500p
MC3487	300p
MC4024	325p
MC4044	325p
MM58174	800p
ULN2003A	75p
ULN2004A	75p
75107	90p
75110	90p
75112	160p
75114/15	160p
75150P	350p
75152	95p
75154	350p
75361-1/2	165p
75365	190p
75451/2	75p
75491/2	65p
81LS95/96	250p
81LS97/98	80p
8T26 28	120p
8T95 96	90p
9602	220p
9637AP	160p
ZN425E 8	350p
ZN426E 8	350p
ZN427E 8	650p
ZN428E 8	£5

CRT CONTROLLER
COM5027 £18
COM5037 £18
S 93634 £8
6367 £16
6545 950p
6545 950p
6845 650p
6847 650p
6864 £60
TMS9918 £50
EF9366 £70
9365 £45

HITACHI
4864 RAMS for 16 Res available.

CRYSTALS	
32 768Hz	100p
100kHz	250p
200kHz	280p
1 0MHz	270p
1 008MHz	210p
1 8432MHz	210p
2 0MHz	225p

TEXTOOL
ZIF SOCKETS
24 pin 500p
28 pin 800p
40 pin £1

WIRE WRAP SOCKETS BY TEXAS				
8 pin	25p	18 pin	50p	24 pin 70p
14 pin	35p	20 pin	60p	28 pin 80p
16 pin	40p	22 pin	65p	40 pin 100p

LOW PROFILE DIL SOCKETS BY TEXAS			
8 pin	9p	18 pin	16p 24 pin 24p
14 pin	10p	20 pin	18p 28 pin 26p
16 pin	11p	22p	22p 40 pin 30p

PRINTERS

NEC PC 8023 BE-C

100 CPS, 80 cols Logic Seeking, Bidirectional, Forward and Reverse Line Feed, Proportional Spacing, Auto Underline, Hi-Res and Block Graphics, Greek Char. Set. Only **£320** + carr. **£8.00.**

SEIKOSHA GP 100A 80 cols 30CPS Full ASCII & Graphics 10" Wide Paper Now only **£175** + **£6.00** carr. Ask for details on GP250A.

DRAGON 32K

* 32K RAM * Colour
* HI-LO Res Graphics *SOUND
* Real Time Clock *PRINTER PORT

Phone for availability

£173 + £4.00 Carr.

CONNECTOR SYSTEMS

RIBBON LEADS

24" cable with 25 way D. Conn.
Male **950p** Female **800p**

24" Cable with DIP Headers

	14pin	16pin	24pin	40pin
Single	180p	200p	240p	380p
Double	210p	230p	345p	540p

Cable with Sockets

	14way	16way	24way	40way
Single	24" 185p	210p	270p	300p
Double	18" 350p	380p	480p	540p

ID CONNECTORS (SPEED BLOK TYPE)

	No. of Sts.Pin	Ang. Pin	Recep-tacle	Edge Conn.
10 way	90p	90p	85p	200p
16 way	150p	150p	130p	250p
26 way	175p	190p	180p	380p
34 way	205p	220p	190p	380p
40 way	220p	230p	190p	450p
50 way	235p	260p	230p	600p

AMPHENOL CONNECTORS

26 way plug/socket £5.90
24 way plug/socket £5.50
Available in IDC or Solder version

EUROCONNECTORS

	Pin	Socket
DIN 41612 21 way	180p	180p
DIN 41612 31 way	200p	200p
DIN 41612 2 + 32 way		
Angled	290p	330p
2 x 32 way eng. pin	325p	450p
2 x 32 way wire wrap	325p	375p
3 x 32 way DIL strip	350p	425p
3 x 32 way Angled pins	350p	
IDC Connector A + B		475p
IDC Connector A + C		525p
2 + 32 way IDC connector = £15 (please specify a + b or a + c)		

MIN. D CONNECTORS

No. of ways	9	15	25	37
Solder	95p	135p	160p	250p
Angled	180p	230p	210p	425p
FEMALE				
Solder	110p	160p	210p	350p
Angled	190p	250p	250p	500p
Hood	100p	100p	100p	130p
(Top or Side Entry)				

EDGE CONNECTORS

	0.1"	0.156
2x18 way	140p	140p
2x22 way	200p	250p
2x23 way	200p	—
2x25 way	225p	300p
2x43 way	260p	—
2x43 way	395p	—
1x77 way	700p	—

DIP HEADERS

14pin 16pin 24pin 40pin

Solder type 40p 50p £1 £2
IDC type **120p 140p £2 £2.25**

RIBBON CABLE (Grey)

Price/metre	
10 way 50p	26 way 120p
14 way 60p	34 way 160p
16 way 70p	40 way 180p
20 way 90p	50 way 230p
24 way 110p	64 way 370p

DIL SWITCHES

4 way 70p	8 way 90p
6 way 80p	10 way 100p

SPECIAL OFFER

	1-24	25-99
2114-200nS	80p	75p
2716 (+5V)	250p	225p
2532	350p	335p
4116-2	80p	75p
4164-2	450p	435p
6116P-3	350p	335p

MONITORS

HI RES GREEN SCREEN
ANTIGLARE 12" **£99** + **£6** Carr.
BMC 14" COLOUR **£240** + **£8** Carr

UV ERASERS

UVIB up to 6 Eproms **£47.50**
UV140 up to 14 Eproms **£61.50**
UVIT with Timer **£60.00**
UV141 with Timer **£78.00**
(Carr £2/eraser)

All erasers are fitted with mains switches and safety interlocks.

ALSO AVAILABLE FROM STOCK FULL RANGE OF TTL's, CMOS and LINEAR IC's
FOR DETAILED PRICE LIST PLEASE SEND S.A.E.

TECHNOMATIC LTD

MAIL ORDERS TO: 17 BURNLEY ROAD, LONDON NW10 1ED
SHOPS AT: 17 BURNLEY ROAD, LONDON NW10
(Tel: 01-452 1500, 01-450 6597. Telex: 922800)
305 EDGWARE ROAD, LONDON W2

PLEASE ADD 40p p&p & 15% VAT
(Export: no VAT, p&p at Cost)

Orders from Government Depts. & Colleges etc. welcome

Detailed Price List on request

Stock items are normally by return of post

WHEN IT COMES TO MICROCOMPUTER SOFTWARE WE WROTE THE BOOK



How do you stay up-to-the-minute with the rapidly changing world of microcomputer software? Get the Lifeboat Catalogue.

The latest innovations The new Lifeboat Catalogue is packed with the latest state-of-the-art software. And if we publish a new program after the latest catalogue has gone to press, we enclose a flash bulletin in your copy.

The greatest selection Because Lifeboat is the world's largest publisher of microcomputer software, our catalogue offers you the greatest selection of programs for business, professional and personal use. Our more than 200 programs range from the integrated accounting and professional practice systems to office tools for book-keepers and secretaries to sophisticated tools for programmers. Included are business systems, word processors, programming languages, database management systems, application tools and advanced system utilities.

We specialise in software that runs on most small business computers. Our more than 60 media formats, including floppy disks, data cartridges, magnetic tape and disk cartridges, support well over 100 different types of computer.

Get full service We give the crucial dimension of after-sales service and full support to everything we sell.

That includes:

- An update service for software and documentation.
- Telephone, telex and mail-order services in the London office and at overseas offices in the United States, France, Switzerland, West Germany and Japan.
- Subscriptions to Lifelines™, the monthly magazine that offers comparative reviews, tips, techniques, identified bugs and updates that keep you abreast of change.

Get it now Lifeboat now serves tens of thousands of satisfied customers with our breadth of up-to-date, fully tested, fully supported and competitively priced software.

You may not need all we offer, but we offer just what you need. After all, we wrote the book.

Lifeboat Associates

World's foremost software source

Mail coupon to: Lifeboat Associates
PO Box 125, London WC2H 9LU or call 01-836 9028

☐ Please send me a free lifeboat catalogue.

Name

Title

Company

Address

Postcode

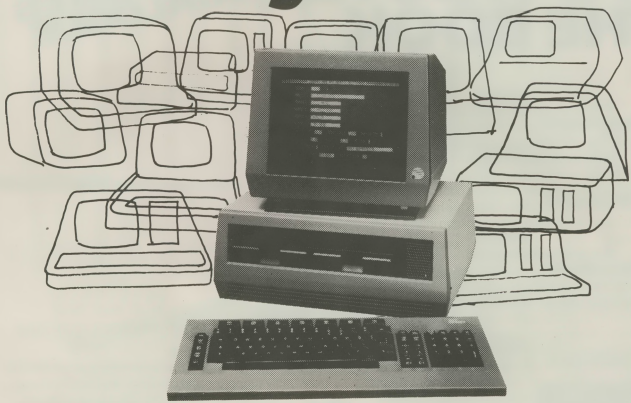
Copyright © 1981, by Lifeboat Associates.

Lifeboat Worldwide offers you the world's largest library of software. Contact your nearest dealer of Lifeboat.

USA Lifeboat Associates 1651 Third Ave. New York NY 10028 Tel (212) 860-0300 Telex 640693 (LIBSOFT NYK) TWX 710 581-2524 **JAPAN** Lifeboat Inc. OK Bldg. 5F 1-2-8 Shiba-Daimon Minato-ku Tokyo 105 Japan Tel 03-437-3901 Telex 2423296 (LBJTYO) **ENGLAND** Lifeboat Associates Ltd PO Box 125 London WC2H 9LU England Tel 01-836 9028 Telex 893709 (LBSOFTG) **SWITZERLAND** Lifeboat Associates GmbH Hintertergstrasse Postfach 251 6330 Cham Switzerland Tel 042-36-8686 Telex 865265 (MICO CH) **W GERMANY** Intersoft GmbH Schlossgartenweg 5 D-8045 Ismaning W. Germany Tel 089-966-444 Telex 5213643 (ISOFD) **FRANCE** Lifeboat Associates SARL 10 Grande Rue Charles de Gaulle 92600 Asnieres France Tel 1-733-08-04

● Circle No. 143

Which one's for you?



We choose the ACT Sirius 1

. . . and we make it our business to know just what the best options are in the micro jungle.
We specialise in Management Information Systems for large organisations offering a complete and comprehensive service to financial and business managers.

- **We will identify the hardware and software options**
- **We will design and develop systems to meet your needs**
- **We will train you and your staff**
- **And we back you up by giving ongoing support**

With a customer base that reads like the Times Top 1000, you can be sure that our systems specialists speak your language, no matter what the industry.

Applied Micros

Applied Micros Limited, The Genesis Centre, Birchwood Science Park, Warrington. Tel: (0925) 819939

(SIRIUS is the registered trade mark of Applied Computer Techniques (Holdings) p.l.c.)

So if you want to plan a system, install a system, develop an existing system or just want to know more about Management Information Systems – speak to Applied Micros and find out why we choose the ACT SIRIUS I to give you the full service.

Applied Micros also offer the following technologies and products: dBASE II, MicroModeller, SuperCalc, Multiplan Wordstar . . . Networking, Communications, Hard Disks . . . We are also a PULSAR SOFTWARE CENTRE.

Cut out and post this coupon if you want to find out how your organisation can benefit from our experience in Management Information Systems.

Name _____

Position _____

Name of Company _____

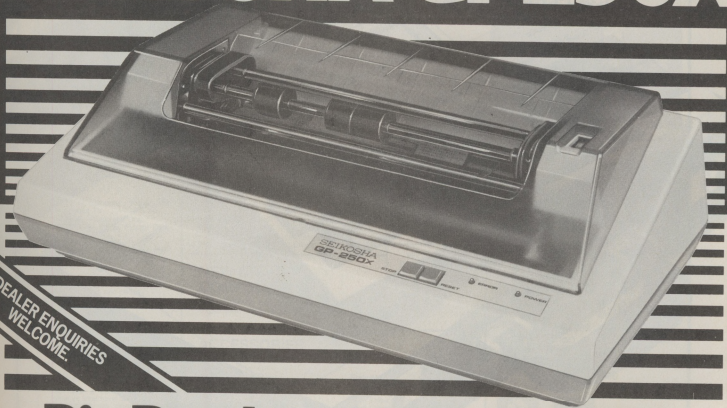
Address _____

_____

Tel. No. _____

● **Circle No. 144**

SEIKOSHA GP250X



DEALER ENQUIRIES WELCOME.

Big Brother to the GP100A

programmable graphics for around £260 EX. VAT

The Seikosha GP100A has been around long enough now to establish itself as a low cost, good quality, reliable graphics printer.

It has now been joined by the GP250X which has been developed to be the printer with the best cost/performance characteristics available.

The standard features give you a printer which enables you to enhance your computer output. The Serial and Centronics parallel output ports enable all computers to be interfaced to the printer with ease. Full service support is provided by DRG Business Machines' nationwide distributor network.

FEATURES INCLUDE:

- 128 characters, with decenders in ROM.
- 64 user definable characters in RAM (384 bytes).
- Programmed printing (80 bytes of memory) for storing your own print sequences.
- Dot addressable graphics with repetitive graphics data printing.
- Double width and/or double height character printing.
- Intermixed printing on a line.
- Print speed 50 characters per second.
- RS – 232C Serial and Centronics parallel interfaces.
- Selectable no. of line feed per LF command.
- Paper empty function and buzzer.
- Selectable space between characters.
- Self test routine.

DRG BUSINESS MACHINES

Telephone the number below and we'll tell you where your nearest distributor is located.
See the remarkable Seikosha GP250X in action.

(Peripherals & Supplies Division) 13/14 Lynx Crescent, Winterstoke Road, Weston-super-Mare, BS24 9DN. Tel: (0934) 416392.

THE FINEST WORLDWIDE SUPPORTED NATIONWIDE.

DRG (UK) Ltd, Reg No. 22419 England.

● Circle No. 145



The Portable Electronic Office is here at last

Ask Midlectron about the Epson HX-20, and you'll soon see it's not just another advanced calculator.

It's got a printer, cassette storage, and a unique virtual LCD screen built in. Plus a full-size typewriter keyboard. Yet it actually fits into any briefcase.

It runs professional software too. Like word processing and sales forecasting packages. So busy salesmen, engineers and managers can take advantage of real business computing – anywhere.

The amazing HX-20 is available off the shelf from Midlectron. At a price that's even more amazing.

The Briefcase Computer for £486

MIDLECTRON
Computer Systems and Terminals

Midlectron House, Nottingham Road, Belper, Derby DE5 1JQ.
Telephone: Belper (077 382) 6811 Telex: 377879

Southern Sales Office: Balfour House, 390-398 High Road, Ilford, Essex. Telephone: 01-514 1188

● Circle No. 146

SPECIAL OFFERS

PETS

CBM 4016 — 16K 12" Screen 40 Col. Computer.
CBM 4032 — 32K 12" Screen 40 Col. Computer.
CBM 2031 — 170K Single Drive Floppy Disk.
CBM 4040 — 340K Twin Floppy Disk Drive.
CBM 4022 — 80 Col. 65cps Tractor Printer.
CBM 8032 — 32K 80 Col. 12" Screen Computer.
CBM 8096 — 96K 80 Col. 12" Screen Computer.
CBM 8050 — 1 Meg. Twin Floppy Disk Drive.
CBM 8422 — 22 Meg. Winchester Disk Drive.
Please phone for latest prices.
We offer sorrte of the best deals around!

VIC

VIC20 — Computer. Works with your colour TV.
VIC1530 — Cassette Unit.
VIC1540 — Single Floppy Disk Drive.
VIC1515 — Printer.
Expansion Memory, Games Cartridges, Programmers Aids & Tutorials.
Low price computer. New accessories coming in all the time. Call for latest news and prices.

BOOKS

Full range of computer books available from Beginners Guides to Advanced Machine Code Programming.

2'ND HAND

We have a constant changing range of 2nd hand and ex-demo equipment at considerable savings.

APPLES

Apple II — 48K Computer.
Apple III — 128K Computer.
Video Monitors — Colour and Black & White.
Disk Drives.
Silentype Printer.
All Apple related products available. Please call for prices.

PRINTERS

Epson MX80FT — 80/132 Col. Friction/Tractor.
Auto Bi-Directional. 9x9 Head True Descenders.
Ricoh RP1600 — 164 Col. 60cps Daisy Printer.
Scripta — 17cps Daisy Printer at low prices.
We will quote for any type or make of printer available.

SOFTWARE

Word-processing
Payroll
Incomplete Records
Book-keeping
Invoicing
Stock Control
Sales Ledger
Purchase Ledger
Inecord Keeping
Financial Packages
Time Recording
Silicon Office

NEW DRAGON COMPUTER

Nine colours, 32K, full size keyboard, full expansion capabilities £199.50 inc VAT.

ACCESSORIES

All types of accessories and stationery supplied.

Floppy Disks
Storage Boxes
Printer Ribbons
Tractor Feeds
Cassettes
Maintenance
Stationery
Continuous Labels
Daisy Wheels
Auto Sheet Feeders
Dust Covers
Installation & Training

DEMONSTRATIONS AT YOUR PLACE

We are able to demonstrate complete business systems at your site in our mobile demonstration unit (up to 4 people at a time).
Just phone for an appointment anytime.





SEE THE NEW
SYSTIME
Systime S500
MULTI-USER MULTI-TASKING 16BIT MICRO VERY FAST & POWERFUL

DAVINCI COMPUTER SHOP

65 High Street, Edgware, Middx. HA8 7DD.
Open Mon-Fri 9.00-5.30
Sat 9.30-5.00
Telephone: 01-952 0526

Buy with confidence
BARCLAYCARD VISA

● Circle No. 148

NOW BETTER THAN EVER

Now You Can Back-Up Your Protected Software

COPY II PLUS

Version 4

The Ultimate Utility for the Apple® II

Versatile — Back-up Visicalc **and all your Visis,** PFS and PFS Report, . . . and many, many more

Fast — Only 45 seconds for Fast Copy
Less than 3 minutes for Bit Copy

Easy to Use — Menu driven for ease of use. Full instructions on backing up dozens of popular programs.

Comprehensive — Includes all the file handling and DOS utilities you will ever need
- change booting program
- copy or remove DOS
- verify and compare files for differences
- analyse disks with the nibble editor
- check disk drives

Best Value — All this at a price which makes Copy II Plus better value than ever

Send cash with order, or quote your Access or Diners Card to:

ORCHARD SOFTWARE

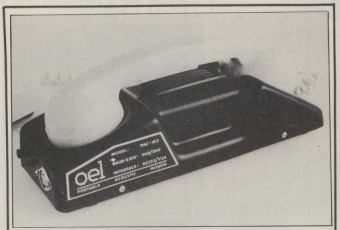
17 Wigmore Street
London W1
Tel: 01-580 5816

Amazing Value at
£35 + VAT
Why Pay More ?

Dealer Enquiries Welcome

Current Copy II Plus Owners: Send your original disk with £15 + VAT for an update to Version 4

● Circle No. 147



PORTABLE ACOUSTIC COUPLERS

Typical Applications

- Networking computers
- Linking to electronic mail system (Euronet)
- Converting microcomputer to Viewdata (Prestel) receiver

Key Features

● Snap-fit acoustic link between standard telephone handset and terminal equipment ● Low cost ● Slimline design ● Lightweight and compact ● Specially designed acoustic chambers need no rubber seals

PAC-M1: This acoustic modem provides a link between telephone line and Serial Data socket of a microcomputer, thus allowing conversion into a Prestel receiver and facilities for transfer of telesoftware programmes. £135 + VAT, P&P.

PAC-M2: Specifically for fully interactive data communication at 300/300 Baud rate, this acoustic modem is designed for networking computers and for electronic mail system. It operates in an originate mode to the CCITT V21 standard and connects Serial Data via an RS232 socket. £135 + VAT, P&P.

PAC-1: Provides an acoustic link between standard telephone handset and all types of Prestel and private Viewdata terminals, TV sets and adaptors. Powered by a single PP3 battery, this acoustic coupler allows Viewdata equipment to be used in office or home without a fixed BT socket. £85 + VAT, P&P.

Technical Approval

All products meet the British Telecom Technical Guide for acoustic coupling.

Software Available for:

PET Series, Apple, BBC Micro and many others.

O.E.Limited, Industrial Estate, Appleby-in-Westmorland, Cumbria CA16 6HX. Tel. (0930) 51909. Telex 64157.

oel

PLEASE SEND MORE DETAILS OF THE PORTABLE ACOUSTIC COUPLERS. PAC-1 ☐ PAC-M1 ☐ PAC-M2 ☐ (tick as required)

NAME .....

COMPANY .....

ADDRESS .....

.....

TEL. ..... (Ref. PC1/83

● Circle No. 149

REGISTERED REFERRAL CENTRE FOR THE BBC PROJECT

BEEBUG FOR THE BBC MICRO

INDEPENDENT NATIONAL USER GROUP FOR THE BBC MICRO

MEMBERSHIP NOW EXCEEDS 10,000

10,000 MEMBERS CAN'T BE WRONG — BEEBUG PROVIDES THE BEST SUPPORT FOR THE BBC MICRO. BEEBUG MAGAZINE — NOW 36 PAGES — DEVOTED EXCLUSIVELY TO THE BBC MICRO.
Programs — Hints & Tips — Major Articles — News — Reviews — Commentary. PLUS members discount scheme with National Retailers. PLUS members Software Library — a growing range of software from around £3.50 per cassette. 10 Magazines a year. First issue April 1982. Reprints of all issues available to members.
April Issue: Program Features: 3D Noughts and Crosses, Moon Lander, Ellipse and 3D Surface. Plus articles on Upgrading to Model B, Making Sounds and Operating System Calls.
May Issue. Program Features: Careers, Bomber, Chords and Spiral. Plus articles on Graphics, Writing games Programs and Using the Assembler.
June Issue. Program Features: Mazetrap, Mini Text Editor, Polygon: Plus articles on upgrading The User Port, TV set and Monitor review, Graphics part II. More Assembler Hints, Structuring in BBC Basic. Plus BBC Bugs.
July/August Issue. Program Features: Beeb Invaders, Patchwork Programming, Screen Dump, Plus Teletext articles using the mode, BBC Cassette, Bugs Fix, Software Review, using the User Port, more on Structuring in Basic, Using User Defined Keys, Input Function and many Hints & Tips.
September Issue. Games Programs: Higher/Lower and Hangman, plus String Search Program, Articles on Debugging Programs, a safe verify, new user guide, Errata, Creating and Moving Multicoloured Characters, Logic on the Beeb, Ideas on Colouring and Shading, Acorns ROM replacement charge, plus much more.
October Issue. Program Features: Alien Attack, Calender Generator, Union Jack, and Memory Display Utility. Plus articles on Debugging, Improving Key Detection, Acorn Press Release on O.S. 1.2 and Issue II Basic, The Tube and Second Processor Options, a New Series for Less Experienced Users and Software Reviews.

MEMBERS SOFTWARE LIBRARY —
GAMES 1. STARFIRE (32K). GAMES 2. MOONLANDER (16k). 3D NOUGHTS AND CROSSES. GAMES 3. SHAPE MATCH (16k). HANGMENDER (16k). GAMES 4. MAGIC EEL (32k).

Send £1.00 & SAE for Sample.
Membership: UK £4.90 for six months
£8.90 for one year
Overseas one year only:
Europe £15.00 Middle East £18.00
Americas & Africa £20.00
Other Countries £22.00

Make cheques to BEEBUG and send to:
BEEBUG Dept. 374 Wandsworth Rd London SW3 4TE

Editorial Material to PO Box 50, St Albans, Herts. AL1 1AR

● Circle No. 215

VENTGUARD



Acoustic Covers

TO SUIT ALL TYPES OF PRINTERS

WORD PROCESSORS : TELEX : TELEPHONE HOODS

Inc. Qume; Diablo; Ricoh; Anadex; Xerox; N.E.C.; Commodore; Centronics; N.C.R.; Epson; Phillips etc. Dot Matrix; Daisywheel; Tractor or sheet feed.

Our acoustic covers reduce noise by as much as 90%

Manufactured in metal from top quality materials to ensure complete customer satisfaction.

Phone or send for details to

VENTGUARD LTD.

UNIT 12, HIGH VIEW AVENUE, KEYWORTH, NOTTS NG12 5EL
Telephone: (06077) 5856 Telex: 341819

● Circle No. 216

NOW in Birmingham – the centre of industrial Britain . . .

THE Midland Computer Fair

Personal computers
Home computing
Small business systems

Bingley Hall, Birmingham.
April 28-30, 1983

Sponsored by Practical Computing and YOUR COMPUTER



This exhibition is the ideal showcase for companies who need to demonstrate their products to the fast expanding market for home and personal computers, small business systems and associated software. When you consider that the markets for personal computers are regional and that Birmingham has a developing computer awareness with a great deal of computer expertise in the area, you'll appreciate the need for The Midland Computer Fair. The public has already demonstrated its appreciation of The Computer Fair in London by sheer volume of numbers. We know the success will continue in Birmingham.

Personal computers are part of everyday life.

Make Sure Your Computer Products And Services Are Seen At The Midland Computer Fair.

For the full story contact the Exhibitions Manager, The Midland Computer Fair, IPC Exhibitions Ltd, Surrey House, 1 Throwley Way, Sutton, Surrey SM1 4QQ.

Please contact me with further information about exhibiting at The Midland Computer Fair.

Name _____

Position in Company _____

Company _____

Address _____ Tel _____

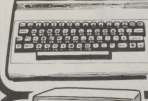
THE Midland Computer Fair

The64 from commodore

CHROMASONIC
business systems



EPSON MX 100 MX-80 MATRIX PRINTERS



01-263 9493/5

48 JUNCTION RD, ARCHWAY, LONDON N19 5RD Telex 22568

ACT SIRIUS 1



CP/M 2.2 DOS

SYSTEMS SUPPLIED NATIONWIDE

APPOINTED DEALER FOR ALL THESE MANUFACTURERS

FULL SUPPORT ON ALL PRODUCTS!

transtec computers

SOFTWARE:

PEGASUS
ACCOUNTS
SALES, PURCHASE & NOMINAL LEDGERS
INVOICING & STOCK CONTROL

WORD PROCESSING
SUPERSCRIPT (CBM)
WORDSTAR (TRANSTEC)
SELECT (SIRIUS 1)

VISICALC
FINANCIAL PLANNING

D.M.S.
DATA MANAGEMENT PACKAGE

TEC
DAISY WHEEL PRINTERS

BCM SMITH-CORONA



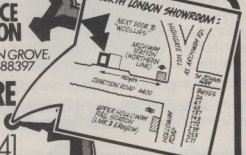
Leeds Office

'PHONE FOR ADVICE, PRICE & DEMONSTRATION

Northern Address: 6 WIGTON GROVE, LEEDS LS17 7D2 Tel: (0532) 688397

SOFTWARE HOTLINE: 01-263 7341

NORTH LONDON SHOWROOM:



Post to **CHROMASONIC Business Systems**, 48 Junction Road, Archway, LONDON N19 5RD

Please send me further details about your business systems. I am particularly interested in:

NAME:

POSITION:

COMPANY:

ADDRESS:

TELEPHONE:

commodore

apple II



TERMS OF BUSINESS: Please add 15% VAT to all prices. Delivery charged at Cost. Prices valid for cover date of this magazine. Access and Barclaycard orders welcome.

POST YOUR COUPON NOW!

Buy it with Access VISA

● Circle No. 151

Reliable hardware alone is not enough

Today's micro-computers are extremeley efficient business machines with large information storage capabilities and amazing computing speeds. However, the quality of the output is only as good as the software input. With a Toshiba T-200 micro-computer not only will you have a high quality computer but also you will have a range of software available to you that will meet virtually any business need from single and double entry book-keeping, invoicing, wages and salaries, inventories. Both in our own highly efficient Toshiba business BASIC and in the wealth of software available with CP/M.*

The T-200 has yet more trumps in its hand. It's well styled, manufactured by one of the worlds most substantial technology operations with a heavy R and D committment and a proven success in the home, office and industry.
When you buy a Toshiba T-200 you also get the finest back-up from the largest business equipment retailer in Europe with our own 120 outlets throughout the UK. So wherever you are back-up and help is not far away.

* CP/M is the trademark of Digital Research Inc.

Toshiba micro computer T-200 from £ 2400,–



Office International
International House
Windmill Road, Sunbury
Middlesex, TW16 7HR
Tel: Sunbury 85666

Send for more details today.

Name

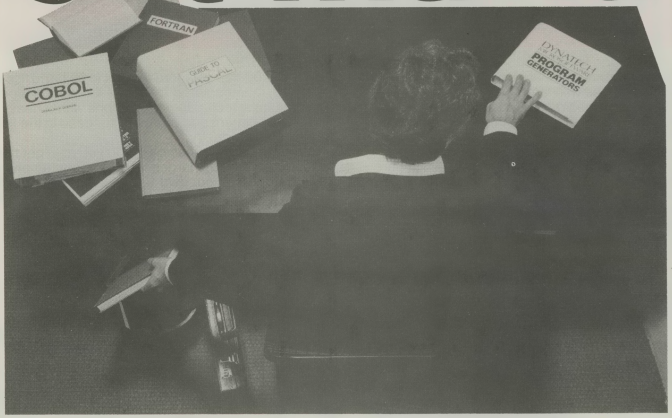
Address

Tel.

TOSHIBA
... in touch with tomorrow

● Circle No. 152

Get with it!



COBOL, FORTRAN, PASCAL & other complexities of the past ... forget them!

Design and write your own systems in ENGLISH with

DYNATECH'S PROGRAM GENERATORS

Professionals can increase their output tenfold and complete novices can learn how to write professional programs in minutes using C.O.R.P.* and Codewriter* - now selling worldwide.

What are the benefits?

- Save time...up to 90%
- Improves efficiency
- Provides information, faster
- Any member of staff can operate them
- User modifiable programs can be compiled for high speed operation

Save your business pounds and pounds.

Seminars are held in London and other major cities throughout the year.

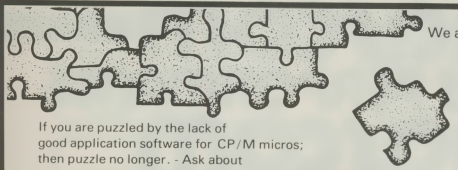
We have Program Generators available now for Apple II, III*, CP/M*, CBM Pet*, Sirius* and Osborne* - with more to come.

*Registered Trade Marks.

DYNATECH MICROSOFTWARE LTD
Summerfield House, Vale, Guernsey, Channel Islands
Telephone: 0481 45934 Telex: 4191130

Please send me details on Dynatech's Program Generators.
What type of micro-computer do you have or are considering purchasing?
Name
Address
Tel.
PC1

● Circle No. 153



If you are puzzled by the lack of good application software for CP/M micros; then puzzle no longer. - Ask about

We are exclusive distributors for UK of SERENDIPITY SYSTEMS packages for Apple & CP/M; of MAGSAM index sequential access routines for CBASIC and IFO-Information File Organiser - the best data base package available for use with Apple.

our

GANG OF FOUR

MAILFLOW

Automatic Mailshot system works with DATAFLOW to produce individually addressed letters to selected addressees at a rate of 200 per hour. Allows you to send out more mailshots, at lower cost, with better response. Special price £75.

MINIMODEL

Financial Modelling system for CP/M: Very easy to use: Flexible report layouts: consolidation: can handle large models simply and practicially. Designed by business consultants for use by real businessmen. R.R.P. £299.

DATAFLOW

The easy-to-use, fast and flexible Database management and information retrieval package for CP/M systems. If you can file it manually; then you can file it faster and better with DATAFLOW. R.R.P. £99.95

BILLFLOW

Client Billing for "Professional" business - Accountant, Consultant, Engineer, Surveyor: Invoicing, Sales Ledger, Work-in-progress, Analysis Contribution by Fee-earner: With Nominal Ledger forms complete system from Time Sheet to Balance Sheet. R.R.P. £375.

Also ask about; Inter-Stat, Advanced Maths and Video Message packages for Apple
Ask for leaflet on; Serendipity Ledgers and Stock Control for CP/M
All CP/M packages NOW AVAILABLE for **APPLE II**

GREAT NORTHERN Computer Services Limited

16 Town Street, Horsforth, Leeds LS18 4RJ. Telephone (0532) 589980

● Circle No. 155

CITY MICROSYSTEMS LIMITED

65 LONDON WALL, LONDON EC2M 5TU
01-588 7272

ACT Sirius 1



The NEW generation Microcomputer IMb disc capacity 128K RAM. CP/M 80 compatibility available.

TELEVIDEO



Stand alone and Multi-User, Multi Task, Multi Processor systems.
Televideo reliability with complete expandability one to sixteen users.

BRITISH MICRO



MIMI 802 now available 700K disc drives. CP/M operating system. Computer & monitor £1,440 + VAT

Complete business accounting systems from £2,400. Word processors from £2,400.

Programme Packages for most applications.

ADVICE, TRAINING AND MAINTENANCE

ALL YOUR COMPUTER REQUIREMENTS READILY AVAILABLE IN THE CENTRE OF THE CITY — LONDON EC2
VISITORS TO OUR OFFICES MOST WELCOME.

● Circle No. 154

nascom
MEANS PERFORMANCE
nascom
MEANS SOLUTIONS

NASCOM have come a long way since their acquisition by Lucas. With the knowledge of over 30,000 units already in the field you can buy with confidence from NASCOM.

PRODUCTS:
We have kits, built and tested boards, and our fully assembled and tested NASCOM 3 system with a full choice of configuration either cassette or disc based. Alternative operating systems include NAS DOS and CP/M.

Nascom introduce a newsletter. Send SAE for registration form.

NEW SOFTWARE

Nas Dos

Nas Cal (Financial Modeller)	£70.00
Manor (Data Base Manager)	£50.00
Corplan (Business Modeller)	£59.95

CP/M

Calcstar (Financial Modeller)	£150.00
Wordstar (Word Processor)	£250.00
FMS 81 (Data Base Manager)	£325.00
FMS 82 (Enhancement to FMS 81)	£325.00
Finas (Six module fully integrated accounts program suite)	£1249.00

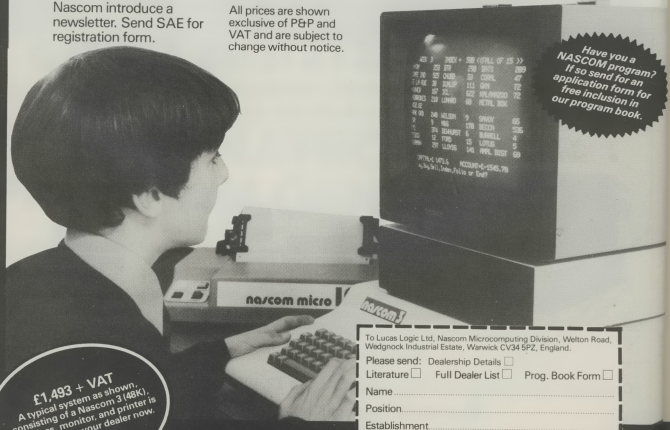
All prices are shown exclusive of P&P and VAT and are subject to change without notice.

NEW HARDWARE

AVC (Hi Res colour graphics)	£185.00
AVC (80 col x 24 lines – CP/M)	£185.00
Single disc (Complete 0.75 Mb system)	£599.00
Dual disc (Complete 1.5 Mb system)	£949.00
Nas Case	£64.95
Card Frame (For use with Nas Case)	£49.50
Printer 1 (GP100A)	£215.00

NEW FIRMWARE

Pascal (Compiler included)	£75.00
Poly Sys 4	£35.00



Have you a NASCOM program? If so send for an application form for free inclusion in our program book.

£1,493 + VAT
A typical system as shown, consisting of a Nascom 3 (48K), dual discs, monitor, and printer is available from your dealer now.

To Lucas Logic Ltd, Nascom Microcomputing Division, Welton Road, Wedgnock Industrial Estate, Warwick CV34 5PZ, England.

Please send: Dealership Details ☐
Literature ☐ Full Dealer List ☐ Prog. Book Form ☐

Name.....

Position.....

Establishment.....

Address.....

.....

Tel:.....

PC 7

Lucas Logic

authorized stockists

semicomps
NORTHERN LIMITED
Semicomps Northern Ltd.
East Bowmont Street,
Kelso, Roxburghshire. Tel: (0573) 24366

B&J Micro Computers
In the heart of the Nascom country lies Business & Leisure
We specialise in tailoring systems to your specific requirement.
16 The Square, Kenilworth, CV8 1EB
Tel. Kenilworth (0926) 512127

Eley Electronics
Eley Electronics, 100/104 Beatrice Road,
(off Fosse Road North), Leicester. Tel: 0533 871522

Llandaff Radio & Television
24/26 High Street, Llandaff, CARDIFF
Telephone: 0222 563760
Contact: G. Marshall

MID-SHIRE'S COMPUTER CENTRE
68 Nantwich Road, Crewe, Cheshire.
Tel: (0270) 211086

MAAS COMPUTER CONSULTANTS
Stationstraat,
6241 CL,
Bunde (L),
Netherlands.
Tel: 043 641147

MICROCOMPUTER SYSTEMS FOR
HOME BUSINESS & SPECIAL APPLICATIONS
18 Station Road, Lower Parkstone,
Poole, Dorset BH14 8UB.
Tel: Parkstone (0202) 746555
PE PARKSTONE ELECTRICS

CHRISALID for **nascom**
systems & software tel 74569
13 High Street BERKHAMSTED

MICRO COMMS Amateur radio C.B. radio Electronics Computers
372-374 George Street, Aberdeen.
Telephone: 0224 633385

MICRO-PRINT LTD
59 Church Street, Stoke-on-Trent, ST4 1DQ.
Tel:(0782)48348

JPS
9 East Street, Colne,
Nr. Huntingdon, Cambs.
Tel: Ramsey (0487) 840710
Contact Paul Jephcott

Newburn Electronics
Ballycarry Co. Antrim.
Whitehead 78330

SRS MICROSYSTEMS
94 The Parade, Watford, Herts.
Tel: 0923 26602

Crystal Computers & Components Ltd.
209 Union Street, TORQUAY TQ1 4AF
Telephone: 0803 22699 Contact: D. Skinner

58 Battersea Rise,
Clapham Junction,
London SW11 1HH
Tel: 01-223 7730
OFF Records

The Computer Centre, Watford, Limited
150 High Street, Watford, Herts.
Tel: 0923 50123/40601

SKYTRONICS LTD.
357 DERBY ROAD, NOTTINGHAM NG7 2DZ
TELEPHONE: 0602 781742 — Contact: Vernon Skitt
80 BRISTOL STREET, BIRMINGHAM 5
TELEPHONE: 021-622 6436 — Contact: Roger Watson

Electrovalue Ltd.
28 St. Judes Road, Englefield Green
Egham, SURREY TW20 0HB
Telephone: 0784 33603 Contact: D.A. Longland

DYAD Developments
SPECIALISTS IN COLOUR GRAPHIC SYSTEMS
The Priory, Great Milton, Oxford OX9 7PB.
Telephone: Great Milton (08446) 729

E.V. Computing Ltd.
700 Burnage Lane, Burnage, MANCHESTER M19 1NA
Telephone: 061-431 4866
Contact: Bob Hyde

Dealer Enquiries Welcome

● Circle No. 156

FORTUNE

WHILE THE ARGUMENT about whether "pseudo 16-bit" machines like the Sirius 1 and IBM PC are actually better than ordinary eight-bit Z-80 machines, or if they are not actually worse, one or two companies have already taken the next leap forward to 16/32-bit machines. The Fortune 32:16 is the first of these to become generally available. The Sage II, Corvus Concept and Alpha Micro AM-1000 are the other leading contenders hot on Fortune's heels.

The Fortune 32:16 is called that because it uses the Motorola 68000 microprocessor, which offers a 16-bit data bus instead of eight-bit, and 32-bit internal registers instead of 16. Data transfer rate is 19,200 bits per second. This gives it capabilities which are more generally associated with minicomputers, and in fact the Fortune will support up to 16 intelligent work stations, but at a microcomputer price.

However, the main point of the Fortune is not that it is technologically more advanced than most micros now available or announced. It is designed to be an ultra-smart and user-friendly piece of business equipment. Typical buyers will more likely be impressed by the colour and styling than what is inside it.

There are three units in the system. First there is a fluted, oblong box containing the operating system, main memory and two floppy-disc drives — or one floppy plus a mini-Winchester. Second there is a separate tiltable VDU, which can be changed for a colour monitor. Third there is a detached keyboard which is virtually a copy of Wang's better-known Word Processor keyboard. The keys are all round-edged and finished in elegant grey and white. The system is surprisingly compact, with the main unit being only 565mm. by 353mm. in size, and less than 150mm. deep. It leaves lots of room to work on the average desk top.

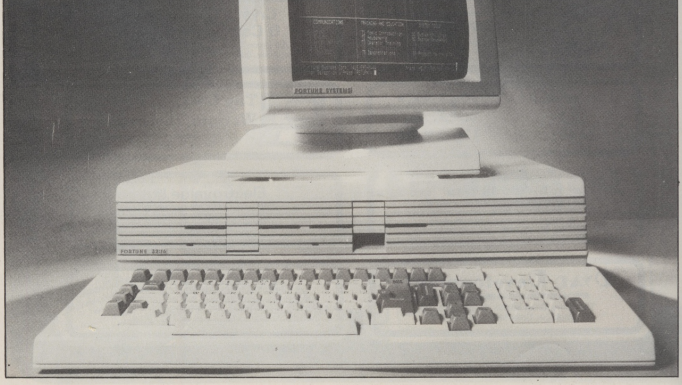
Up to 80Mbyte on disc

The main processor comes with 128K main memory, expandable up to 1Mbyte. Each floppy disc provides 720K of additional storage. The mini-Winchester hard disc can be 5, 10 or 20Mbyte, with the maximum configuration of four hard discs providing 80Mbyte. The System 5 we reviewed features one floppy and one 5Mbyte hard disc, along with a standard 1Mbyte of RAM. As a result, we never came across the Out of Memory error message.

The keyboard has the standard QWERTY layout, with a 15-key numeric keypad on the right, and a cursor-control pad of nine keys in between. There are 16 programmable function keys across the top, arranged as four groups of four. Then there are a few extra dedicated system keys, including Help, making 99 keys in all. A coiled cable links the keyboard to the front of the main processor.

The VDU is a non-glare green-screen 12in. monitor with adjustable brightness. It offers vertical tilt from +15° to -5°, and 90° horizontal swivel. The screen display is 80 characters by 25 lines, with each character being made up on a nine-by-20 dot matrix. There are 128 standard characters, 256 optional characters — to give a range of international ones — 13 characters for word processing and 15 graphics symbols. It supports overstrike, underline, double underline, reverse video, blink and highlight. With a colour monitor you can have 16-colour graphics with high-resolution mixed text and graphics.

The availability of software is often a problem with new machines, but since the system's launch in the U.S. in November a number of packages have been available. The most important are improved versions — supersets — of Wang's word-processing software, which are called For:Word and For:Word Plus, and the electronic spreadsheet program Multiplan. These will cater for most of the needs of the typical user con-



32:16

Some so-called 16-bit micros have disappointed their users. Una Sheehan discovers if scepticism is still in order for this 32/16-bitter.

figuration — a business executive plus secretary.

Fortune Systems has adapted some other popular micro packages for the Fortune, and some unusual ones like Troff typesetting and EQN multilevel maths programs usually available only on larger computers. Frank Burgess Associates is currently converting its respected U.K. financial system programs, written for minicomputers, to run on the Fortune. Most packages are in the £250 to £500 price range, about one-third of the price of the minicomputer versions.

The operating system is Unix, which was originally developed as a research tool for the Digital Equipment Corporation PDP-11 minicomputer at Western & Bell Laboratories, for use by professional programmers. It supports SMC Business Basic, with other languages including Pascal, Cobol, Fortan and C either implemented or planned. On the basic Fortune system it is supplied in a single-user version. There is also a multi-user version for local networking, which supports the Xerox Ethernet network.

Unix was specially adapted for the Fortune 32:16 at a reported cost of about £1 million. Most of this was spent on constructing a user-friendly "shell" around the conventional operating core, and improving file protection, to make the system easy to operate by non-specialist staff and occasional users. It includes a hierarchical manager/user password protection system, and occupies from about 64K to 100K of memory.

SMC Business Basic is compatible with Basic IV. Additionally, Fortune's literature says a set of "filters" have been developed which automatically translate applications written in some other Basic dialects into the Fortune's Basic. Filters are said to be available for Applesoft, TRS-80 Basic, Microsoft Basic and CBasic. We were not able to test these claims. A CP/M emulator is planned.

The system supplied for review by Fortune Systems and Text 100 was the System 5 version with several applications programs loaded on the hard disc. These included For:Word and Multiplan, as well as the system-training program and the Unix system utilities. We also confess to trying the games supplied — to gain familiarity with the system, of course.

With no loading to do, the system was easy to switch on and use straight away. A global menu laid out in a grid of mini-menus shows all the system's facilities at a glance. Reading the top row from top left, they are divided into:

Business Fuctions — for business programs handling general ledgers, purchase orders, etc.

Professional Tools — which include Multi-Plan on this system, graphics and space for other applications

Electronic Office Tools — including For:Word word processing, records processing, automated calendar, and room for other choices.

The bottom row, reading from left, has menus for

Communications — for local network and dial-up links

Training/Education — which has sections on

(continued on next page)





FORTUNE 32:16

(continued from previous page)

topic introduction, a self-introduction by the system, as well as a training program and other education software including some games and System Tools which makes Unix tools available, as well as various languages, dictionaries and facilities to add new programs.

Each of the mini-menus on this main global menu has a final choice called Additional Choices where more options can be added on to the system. This illustrates the system's commitment to expandability and user choice, and as a first impression of the system's capacities, gives users a feeling of getting an instant knowledge of the system they are about to use. Programs loaded on to that particular machine are highlighted on its global menu. This overall initial view to the user is where that £1 million shell adapting Unix for business use really shows it was well spent.

To date, Fortune Systems is the only company that has spent this kind of money adapting Unix for use by the relatively unskilled. Though this operating system has been around for several years, its poor user interface and lack of help for the user did not initially endear it to a general market. But Microsoft's version, Xenix, has helped it catch on, and nearly 300-odd applications programs are listed in a recent software catalogue produced by a Unix user group.

Specification

Microprocessor: Motorola 68000; 32-bit data and address registers; 24-bit memory-address bus; 16-bit data bus; 16Mbyte linear address space

Operating system: Unix

Memory: 256K to 1Mbyte RAM; 4K to 16K ROM

Disc storage: one to four 5.25in. floppy discs with 800K formatted; one to four 5.25in. hard discs with 5, 10 or 20Mbyte; one to four 8in. discs; maximum total 80Mbyte

Keyboard: detached QWERTY with 99 keys, including cursor controls, numeric keypad, system keys and 16 function keys

Display: 12in. green-screen monochrome with 80 characters by 25 lines; optional colour monitor with 16 colours and 132 columns by 60 lines

Ports: RS-232C and floppy-disc controller

Optional I/O ports: two or four RS-232C; one or two IEEE-488 or Centronics parallel ports; Ethernet controller; bit-mapped graphics video controller; Winchester hard-disc controllers

Dimensions: height x depth x width in mm.: monitor 327 x 348 x 312; keyboard 56 x 160 x 566; processor 147 x 353 x 566.

Weight: monitor 12 lb. keyboard 6 lb, processor 30 lb.

For:Word features

Document management

Create, edit, copy, delete, rename, archive, history and statistics, print request, index libraries, menu by-pass, Unix directories for file names

Printing

Left/right/centre justification, proportional spacing, soft and hard hyphenation, pagination, repagination, headers and footers, page numbering, fixed space, printer support, summary

Text editing

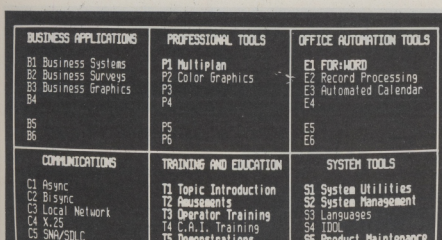
COMMAND KEYS: Return, Indent, Page, Centre, Format, Note, Search, Replace, Copy, Move, Command, Super/Subscript, Goto, Cancel, Execute, Insert, Delete, Cursor up/down/left/right, Next Screen, Previous Screen, Help. Underline, Double underline, Overstrike, Bold, Glossary, Tab and Decimal Tab, Search Backwards, Global Formats

CURSOR-MOTION MODES: by line, word, sentence, paragraph, page

GOTO: beginning/end of document, page number, top/bottom of page, right/left margin, next/previous page, bookmark, header/footer/work page.

Reread a page, copy and move between documents, file update, global search and replace

For:Word Plus offers many further facilities including Wang and IBM Series 6 communications, multiple print queues, multi-column and windowing, artwork space reservation, display of control codes, maths and sorts.



The menu-driven front end, part of Fortune's £1 million Unix adaptation for the 32:16, shows the system's facilities in an easy-to-understand way.

Using the global menu the user can select the facility needed and be transferred into a single menu opening that program. For example, the word-processing program has a menu that records when a document has last been used, how many keystrokes it has stored and how long the user spent working on that document. Also it records the date when the document was revised or printed. This helps the user keep track of system use which would be particularly helpful in any business, but especially a typing pool or agency.

At each step the system is well signposted with menus so the user will not be easily lost. To get into Unix, the main menu is cancelled "+ + UNIX" and then a code-word "root" is typed in, and the skilled user can proceed. To get out of Unix, all you have to do is type in"+ + menu", and, you are brought back to the main global menu. The System Tools section allow the average user access to Unix facilities in menu-format data processing.

The Training/Education section has two particularly interesting choices: Topic Introduction and Training. They represent two of the three levels of self explanation and help provided by Fortune's 32:16. Topic Introduction is a "this is what it is" feature which has information on all programs currently on the system. For example, the For:Word overview has two purposes — to provide information about this progam and operational facilities with the 32:16. Not only does it show you the information but it also examines the user on his grasp of each concept before it moves on.

The section on introducing word-processing concepts is succinct and enlightening: "word processing is a method of producing documents electronically on computerised equipment". The Training program builds on the user's knowledge provided by Topic Introduction and helps with procedural familiarity.

The third level of help provided to the user is the Help function activated by a dedicated, labelled Help key. This is divided into major sections — one for each screen selection — and subsection of each of the major sections. For example, when activated it comes up on a screen saying "Here's Help; note file contents on screen" which can be explained in a subsection on the next screen as you proceed through Help: "When you list file contents on screen, you'll see the file on screen exactly as it looks". The Help function explains all features on the system and does not disrupt procedures the user is engaged in. Error messages provided by the system are pretty reasonable, and the system also sounds an alarm "beep" to signal them to the user.

Anyone familiar with Wang systems will quickly be able to use the Fortune's full word-processing program. The For:Word package on the 32:16 has a row of dedicated keys on the top of the keyboard for frequently used functions like Centering, Search/Replace, Copy — for copying text within text as well as copying text to another document — and Move — for moving copy within a document and between documents. However, the Merge function is provided only with the more advanced. For:Word Plus package, along with sorting and a maths facility.

Insert and Delete, two most commonly used word-processing functions, are assigned special keys, along with Next Screen and Previous Screen, nearer to the well-designed and spaced cursor-control keys, to the right of the regular QWERTY keyboard.

The Cancel and Help functions also have dedicated keys on the right-hand side of the keyboard. The keyboard is pleasant to use and not too "springy" to the touch.

Fortune is particularly proud of the documentation provided with the system, where screens are reproduced in the manuals and are easy to recognise and follow accordingly. This is a particularly useful feature as many of even the best-designed systems are poorly documented and often let users down at this point. Documentation is also available for programming languages, for Unix itself, communications and graphics as well as the system and the popular programs.

The Fortune 32:16 offers two standard I/O controllers plus 10 slots. Five of these are for memory expansion in 128K or 256K increments. Five are for optional controllers, with a versatility that includes three types of RS-232C controller, IEEE-448, parallel printer-interface controller, etc. The ports can be assigned very neatly from the keyboard, using a graphics screen display.

Dedicated processor

The intelligent controller has its own Z-80B and buffer memory and is capable of supporting industry protocols such as 2780/3780, HSAP, 327x and HDLC/SDLC. The standard bit-mapped graphics display controller has its own 64K memory and provides 640-by-480 resolution and 800-by-480 high resolution for monochrome. The optional colour card contains a second MC-68000, provides a choice of 16 colours from a palette of 512 and offers resolution up to 1,024 by 1,024.

Up to 16 work stations can be supported, and Fortune says that up to eight can be run for word processing without any degradation of performance. Each work station has its own Z-80 processor with 64K of RAM built in.

This represents excellent versatility, and should allow the Fortune to be configured to meet most communications and control requirements. On power-up, the Fortune goes through a self-diagnostic routine and automatically configures itself to the system in use. Again, user-friendliness overlays the technology of the system.

Conclusions

- **The Fortune 32:16 is an advanced, sophisticated microcomputer which offers considerably more power and versatility than its eight/16-bit rivals.**
- **It is very expandable. With up to 1Mbyte of RAM and 80Mbyte of hard-disc storage, and with up to 16 work stations it could well replace a minicomputer for most office purposes.**
- **It has been designed as a piece of office equipment, looks smart and does not take up much space.**
- **It is much more user-friendly than the average computer.**
- **The word-processing package is far superior to that expected on microcomputers, and as good as or better than the standards set by dedicated word processors. It can also be used with other system tools.**
- **It is very reasonably priced at about £4,000 for an average small system with applications programs. For a multi-user set-up with four work stations costing around £10,000 it becomes extremely cheap.**

HAYDEN BOOKS

SOFTWARE GOURMET GUIDE & COOKBOOK SERIES FOR 6502, Z80, 8080, AND 6800 PROGRAMMERS

Essential guides designed to take BASIC language programmers into the realm of machine language programming. The complex chip instruction sets are clearly and carefully explained. Descriptions of the fundamental elements of each CPU, including the program counter, index registers, stack pointer, memory, and status flags, stress the creative advantages and programming power of each chip. General purpose subroutines, input/output processing, floating point routines are discussed in depth. Each volume contains appendixes with the instruction set mnemonics and machine codes, octal to hexidecimal conversion table, and ASCII character set.

6502 Software Gourmet Guide & Cookbook	08104 6277X	approx. 250pp	Feb'83	approx. £10.70
Z80 Software Gourmet Guide & Cookbook	08104 62761	approx. 250pp	Feb'83	approx. £13.90
8080 Software Gourmet Guide & Cookbook	08104 6208X	approx. 250pp	Feb'83	approx. £10.70
6800 Software Gourmet Guide & Cookbook	08104 62818	approx. 250pp	Feb'83	approx. £10.70

INTRODUCTION TO COMPUTER ANIMATION

by **N. Wadsworth**

Now you can produce amazing computer graphics - even if you can't draw a straight line. Learn how to draw lines and shapes, make graphs, draw pictures, and even do animation. Popular microcomputers such as the Apple II, Radio Shack's TRS-80 and the Commodore PET, are capable of producing low-resolution graphics. Now you can use low-resolution graphics to improve the presentation and impact of almost anything you want your microcomputer to do. It can be used to animate games or data, clarify educational materials, or just plain entertain.

Feb'83 approx. 120pp
0 8104 6279 6 approx. £8.20

CREATE WORD PUZZLES WITH YOUR MICRO-COMPUTER

by **E.E. Mau.**

A handy guide that enables home computer users to create their own acrostics, cryptograms, word-finds, quote-falls, fill-ins, and other word puzzles. There are 17 BASIC Programs for producing 25 puzzles - either blank puzzles with answer keys or printouts following puzzle magazine format.

Feb'83 approx. 180pp
0 8104 6251 6 approx. £12.35

CODES, CIPHERS AND COMPUTERS:

An Introduction to Information Security

by **B. Bosworth**

In addition to describing the fundamentals of secret communication, the book provides an understanding of computer security through computer cryptography. It details and illustrates traditional cryptography techniques developed before computers and discusses more recent concepts for the highest levels of information and data security, such as the NBS Data Encryption Standard and the Public Key Cryptosystem.

Nov'82 approx. 348pp
08104 51490 approx. £10.30

THE 8086/8088 PRIMER

An Introduction to their Architecture, System Design, and Programming, 2nd Edition

by **S.P. Morse**

Written by the man responsible for the design of the 8086 microprocessor, this revised edition has been updated to provide novices and professionals alike with a thorough introduction to Intel's 8086 and 8088 microprocessors.

Sept'82 288pp
08104 6255 9 £8.75

BASIC COMPUTER PROGRAMS FOR BUSINESS Volume 2

by **C.D. Sternberg**

Designed for small businesses, microcomputer entrepreneurs, and independent consultants, this book provides an invaluable variety of aplication programs that will make your microcomputer pay for itself as soon as it enters your office. Includes over 70 complete programs that can be used on a daily basis for critical facets of a business operation. Each program can be easily modified to meet your business's specific needs.

Oct'82 (paper only) 384pp
08104 5178 6 £11.50

WILEY COMPUTER BOOK MONTH FEBRUARY 1983

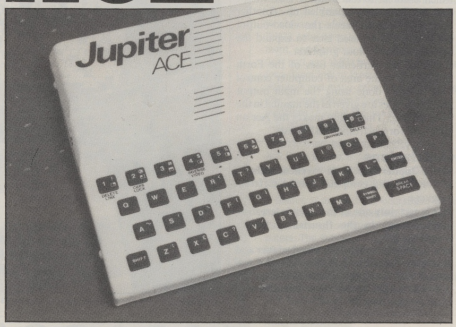
A wide range of Computer books and Software on display at leading Bookshops and selected Computer stores throughout the UK. (Checklist of titles available from Wiley)

Hayden Books available from all good Bookshops and Computer Stores — or from John Wiley & Sons Ltd.
A complete list of all Hayden Books and Software is available on request.

Marketed by
John Wiley & Sons Limited
Baffins Lane · Chichester · Sussex PO19 1UD · England

● Circle No. 157

JUPITER ACE



Bill Bennett analyses the attributes of the Ace.

FORTH is described as a "threaded interpretive language" and it is the native language of the Jupiter Ace. "Threaded", because small fundamental subroutines can be strung together to make more complex ones, these can in turn be strung together. At the final level, a complete Forth program — or to be precise the complete application, Forth programmers write applications not programs — is just another of these subroutines. In Forth, these subroutines are called words.

Forth is above all else a language ideal for control. It was originally developed by an astronomer, and fittingly first came to fame when it was used to control the cameras used in the shooting of the realistic space-action scenes in the film *Star Wars*.

The advantages of Forth, and therefore of the Jupiter Ace, are advantages that would only really appeal to the more sophisticated programmer. The type of computer user who is contemplating learning machine code will be attracted towards Forth. Forth is compact, a feature that is important in the Ace, because there is only 3K of user RAM. Most other micros have access to much larger memories, where compactness is not so important.

Forth is fast, working at up to 80 percent of machine-code speed. Combine this with the 3.25MHz processor speed of the Jupiter Ace and you have a very fast micro. Educationalists and teachers will like the Jupiter Ace because Forth is a structured language. However, I am not confident that it is an ideal language for a young beginner to learn as the concepts are fairly difficult. Maybe I have been prejudiced by years of Basic.

The real reason why I would not advise Forth to be thrust upon novices is that programs written in the language are so unreadable. Because each individual programmer defines his or her own words, higher-level words — that is, words using other words previously written by the programmer — are fairly meaningless. Forth programmers are no better than Basic programmers when it comes to leaving meaningful comment statements in their software.

Experienced Forth programmers tend to develop individual vocabularies of their own, frequently used, simple words. They fall into the habit of using these in a throwaway manner, just as if they were kernal words — the kernal being the fundemental set of words contained in the Ace's ROM. This is not a bad thing; however, trying to read someone else's Basic program is difficult enough, when reading someone else's Forth program even the words used will be meaningless. Maybe this is why Gary Kildall, founder of Digital Research, recently described Forth as a "write-only language".

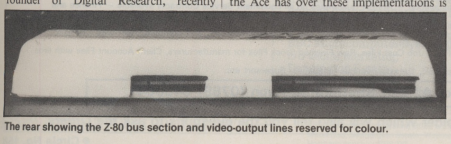
This illegibility is not so marked on the Jupiter Ace, because when a word is listed it is broken up into lines and indented to show the structure. Words incorrectly entered or containing bugs can be edited easily using the helpful editor contained within the system. The amended word is then placed on the top of the word list. The original version of that word remains where it was before.

Any other word lying between the two definitions of the same word and containing that word will refer to the version lower down the dictionary than itself. This could lead to confusion. The Ace rather cleverly gets around this logical conundrum with the inclusion of a Redefine word which deletes the latter copy of a word, having replaced the earlier version with the latter.

This last feature is of special interest because the cassette-based Forths for other micros lack this facility. Another advantage the Ace has over these implementations is that the stack is not likely to overflow and crash the system. Readers familiar with Forth will be interested to know that the Create or Builds structure has been replaced by Definer.

The cassette-based operating system is interesting. Rather than opt for the Screen

(continued on next page)



The rear showing the Z-80 bus section and video-output lines reserved for colour.

Specification

Processor: Z-80A
Speed: 3.25MHz
Memory: 8K ROM
3K RAM
Keyboard: small QWERTY moving keys
Display: memory-mapped 32 by 24 characters
chunky low-resolution graphics 64 by 46 pixels; high resolution achieved via programmable characters 256 by 192
Sound: internal speaker, accessed by Beep word
Language: Forth
Cassette: named tape files, 1,500 baud, works with most tape recorders. Verify command
Quartz timer: four-byte integral timer
Expansion port: allows connection of extra memory and control of other devices
Dimensions: 35 by 215 by 190mm.
Manufacturer: Jupiter Cantab, 22 Foxhollow, Bar Hill, Cambridge CB3 8EP

(continued on previous page)

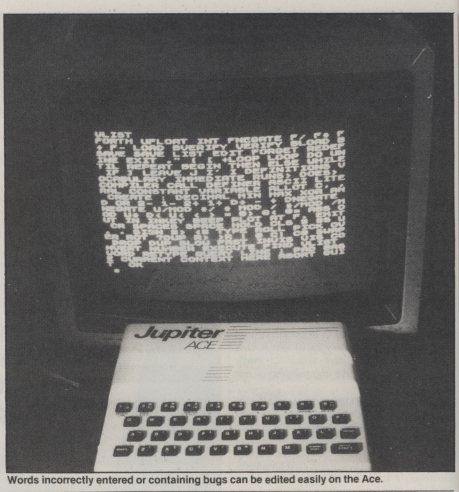
technique of storing Forth applications, the Ace allows the user to Save all the user-defined words in the vocabulary. A Verify command allows the user to check that which has been Saved.

Physically the Ace is similar to the ZX-80, with a Spectrum-like keyboard. I found that keys did not always register when pressed, so each character has to be read as it is entered. The rear of the of the Ace has two holes cut into it. The first is the Z-80 bus section, which is similar to that of the ZX-81, except that the lines are all jumbled up. Another hole on the rear reveals the video-output lines. This will be used later to expand the system to allow colour graphics.

One of the particular uses of the Forth language is in the area of computer control This is easily done using the main output port. Examples are given in the manual in the final chapter. This ability makes the Ace an ideal tool for electronics enthusiasts.

Conclusions

- **The Jupiter Ace is an excellent training device, teaching computer users a different language**
- **It is certainly one of the most interesting developments in the flourishing home-computer field.**
- **As a tool for control it is a real winner and as a games machine it is fast, but as a real computer the keyboard and small memory let it down. At £89 it was never intended as a business machine.**



Words incorrectly entered or containing bugs can be edited easily on the Ace.

'CFACC'

(Pronounced 'seefack')

"THE BEST ACCOUNTS PROGRAMME ON THE MARKET" – £1500

(Can be tailored to your own requirements)

Separate Payroll £250 Estimating Programmes on Application

MAIN MENU

1. ADDRESS PROGRAMME
2. SALES INVOICES
3. PURCHASE INVOICES
4. STOCK CONTROL
5. ORDER CONTROL
6. PAYROLL
7. PAYMENTS MADE
8. PAYMENTS RECEIVED
9. CREDITORS
10. DEBTORS
11. SUPPLIER STATEMENTS
12. CUSTOMER STATEMENTS
13. AGENTS STATEMENTS
14. PRINT CUSTOMER INDEX
15. PRINT SUPPLIER INDEX
16. BANK RECONCILIATION
17. PURCHASE LEDGER
18. SALES LEDGER
19. END OF MONTH PROCEDURE
20. VAT STATEMENTS
21. MANAGEMENT FINANCIAL REPORTS
22. PROFIT & LOSS ACCOUNT
23. BALANCE SHEET
24. CAPITAL ASSETS
25. DEPENDING ON VERSION
26. DISK DIRECTORIES
27. ALTER INCORRECT FILE ENTRIES
28. PRINT LEDGER CODES
29. PRINT STOCK LIST
30. FINISH USING 'CFACC'

C-Flow cash flow forecasting

JUST RELEASED

£210

1. The Programme resides totally "in core" leaving BOTH DISKS FREE for files and enabling disks to be changed during use.
2. Every Programme issued is "PERSONALISED" with your Company's details. Our "After Sales Service" is positive, giving you constant access to the Author of "CFACC" – We arrange Nationwide hardware support.
3. You need only enter invoices and payments in and out and "CFACC" will produce all the DATA for the MENU Programmes (it will ask the user for any other information it needs).
20. Full Random Access to any record in any file – No Limit on Record Lengths.
22. All sections of the Programme and files are fully integrated.
23. Some Programmes on the market claim to be easy to use with no need for a manual (BUT TO THE LAYMAN THEY SIMPLY ARE NOT). "CFACC" really is USER ORIENTATED – WE ARE PREPARED TO LET YOU PROVE THIS FOR YOUR SELF. MONEY REFUNDED IN FULL IF YOU CAN SHOW US A BETTER MICROCOMPUTER ACCOUNTS PROGRAMME WITHIN 7 DAYS OF USE.
24. The PRICE makes "CFACC" the best VALUE FOR MONEY on the Market.
26. All Equipment is fully tested by us prior to installation – Normal Guarantees on all Equipment Service Contracts available – Finance and Leasing can be arranged.
27. DELIVERY and INSTALLATION FREE within UK.
28. We have examples of other Accounts Programmes on the market which you are welcome to try, and compare them with "CFACC".
31. "CFACC" will run on any CP/M Micro with a true 64K.
32. Special versions available with 'Back Order Files', Job Cost Files, Raw Finished Stock Files for manufacturers, Client Account Files with time allocation for Service Industries.
33. We also stock other Software such as Supercalc, Datastar, various languages, Supersort etc.

Computers For All Ltd, Stratford on Avon (0789) 840064

Ring For Our Information Folder which will also tell you the questions to ask the Others.

● **Circle No. 158**



'Whether your interests lie in business, educational, scientific, control or games applications, this system provides a possibility for expansion which is unparalleled in any other machine available at present,' comments Paul Beverley in the July 1982 edition of *Personal Computer World*.

The BBC Microcomputer can genuinely claim to satisfy the needs of novice and expert alike. It is a fast, powerful system generating high resolution colour graphics and which can synthesise music and speech. The keyboard uses a conventional layout and electric typewriter 'feel.'

You can connect directly* to cassette recorder, domestic television, video monitor, disc drives, printers (dot matrix and daisy wheel) and paddles. Interfaces include RS423, inter-operable with RS232C equipment, and Centronics. There is an 8-bit user port and 1MHz buffered extension bus for a direct link to Prestel and Teletext adaptors and many other expansion units. The Econet system allows numerous machines to share the use of expensive disc drives and printers.

BASIC is used, but plug-in ROM options will allow instant access to other high level languages (including Pascal, FORTH and LISP) and to word processing software.

A feature of the BBC Microcomputer which has attracted widespread interest is the Tube, a design registered by Acorn Computers. The Tube is unique to the BBC Microcomputer and greatly enhances the expandability of the system by providing, via a high speed data channel for the addition of a second processor. A 3MHz 6502 with 64K of RAM will double processing speed; a Z80 extension will make it fully CP/M** compatible.

The BBC Microcomputer is also at the heart of a massive computer education programme. The government has recommended it for use in both primary and secondary schools. The BBC Computer Literacy Project includes two series of television programmes on the use and applications of computers.

There are two versions of the computer. Model A, at £299, offers 16K of RAM and Model B at £399 has 32K of RAM.

For technical specification and order form, send stamped addressed envelope to P.O. Box 7, London W3 6XJ and for details of your nearest stockist ring 01-200 0200.

Broader horizons

BBC Model B Microcomputers are available for immediate despatch by courier to your door.

If you would like to take advantage of our special delivery offer just fill in this coupon, but remember this only applies to the Model B, and only in the UK. Any other items have to be ordered on the standard order form or from a BBC Computer Stockist.

BBC Microcomputer System Offer
c/o Vector Marketing
Dennington Estate
Wellingborough
Northamptonshire NN8 2RL

Please send me by courier _____ BBC Model B Microcomputer(s) at £399 including VAT and delivery.

Cheque enclosed for £_____
payable to BBC Microcomputer System
readers a/c or charge
ACCESS BARCLAYCARD

Signed _____

Name _____

Address _____

Postal Code _____

Co Reg No 1403810 VAT No. 215400220

*Model A has a limited range of interfaces but can be upgraded to meet Model B specification.
**CP/M is a registered trade mark of Digital Research.

The BBC Microcomputer is designed, produced and distributed in the UK by Acorn Computers Limited.

The BBC Microcomputer System

BBC Microcomputer System Offer, c/o Vector Marketing, Dennington Estate, Wellingborough, Northamptonshire NN8 2RL.

● Circle No. 159

CLOSE!

NORTHSTAR	APPLE
OLYMPIA	DATA GENERAL
OSBORNE	DIGITAL
PET	HEWLETT PACKARD
PHILIPS	I.B.M.
SIRIUS	I.C.L.
WANG	. . .

You almost made it.

CHECK THESE OUTSTANDING FEATURES

VERSATILE AND HIGHLY ADAPTABLE By using the S100 bus the Minstrel will keep up to date with the latest developments, with over 1,000 boards available from numerous manufacturers covering every conceivable application. So you know the Minstrel will not become obsolete and that you don't have to rely on one manufacturer to bring you the latest innovations.

RELIABILITY AND SERVICING Many years' experience has enabled the Minstrel's designers to avoid the reliability problems encountered by many earlier systems. The Minstrel is specially designed for easy servicing and is outstandingly reliable.

HORIZON COMPATIBILITY The Minstrel is compatible with the North Star Horizon, so that Horizon software will run on the Minstrel.

SUPERLATIVE SOFTWARE We have a superlative range of application and system software including CP/M,® TurboDOS® and MINOS.®

BRITISH MANUFACTURE British manufacture brings you the benefits of U.K. hardware and software support, highly competitive prices (protected from currency fluctuations) and the assurance of readily available spare parts.

® CP/M Registered trade mark of Digital Research Inc.
® TurboDOS Registered trade mark of Software 2000 Inc.
® MINOS Registered trade mark of Hotel Microsystems Ltd.



The New British Minstrel *FROM* **£2,455**
with Winchester Drive

Generous Dealer and
Local Authority Discounts

t..but not quite!

TECHNICAL

Standard System

S100,
5-20 Mb Winchester Drive,
Z80A processor,
64K RAM
Horizon compatible,
400 Kb-1.6 Mb floppies.

Other configurations available

- Multi-user systems
- Multi-processor systems
- 16-bit processor, using powerful 68000 processor.

Invitation

For more information about the brilliant new British Minstrel computer or to find out your nearest U.K. or European Dealer, write or telephone:
Andrew Ward or Tony Harris



HOTEL MICROSYSTEMS LTD. **01-328 8737**
69 Loudoun Road, London NW8 0DQ. Telex: 266828

Minstrel

● Circle No. 160

A totally portable computer that runs on its own power supply for use anywhere.



It could mean the end of the rubber duck as we know it.

The HX-20 is a portable computer with a full size typewriter keyboard, LCD Virtual Screen, printer and micro-cassette facility actually built in. A computer with a rechargeable power source that's large enough for writing programs and manipulating data virtually anywhere, yet small enough to carry in a briefcase.

But don't let the size fool you. The HX-20 is not a gimmicky toy or an excuse for a calculator. It's a precision machine using a full extended version of Microsoft BASIC with 16k RAM, optionally expandable to 32k and 32k ROM expandable to 64k, RS-232C and Serial interfaces. The ASCII typewriter keyboard and five programmable keys brings ten separate program functions to your fingertips.

Power to your elbow.

The HX-20 runs on its own power supply for over 50 hours and can be easily recharged overnight, or whilst in use, with the ability to retain its memory in RAM even when switched off.

Keeping you in the picture.

The LCD screen is unique – showing any 20 characters by 4 lines at a time – enabling you to carry out word processing or data entry as if you are using a large screen.

Print Out. Built In.

The 24 column dot matrix impact micro-printer offers 42 LPM in a crisp, precise 5 x 7 matrix for perfect hard copies. Every time. And you can choose from a wide range of peripherals from bar code readers to acoustic couplers for total capability.

Epson. Reliability through Research.

You'll find our name on a highly successful range of computer printers. So you can be assured of the same quality and reliability through an extensive research programme prior to the launch of any Epson product.

Write or call us for further details and the name of your local stockist (because seeing really is believing).

You'll find that the HX-20 is the most complete portable computer you can buy. It could even change the face of bathtime.

Which is a bad day for ducks.



Epson (UK) Limited
Dorland House 388 High Road Wemb
Middlesex HA9 6UH
Telephone: 01-900 0466/9
Telex: 8814169



HX-20
PORTABLE COMPUTER

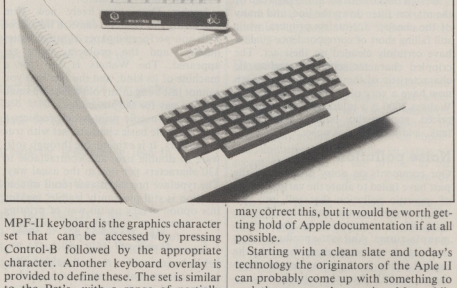
EPSON

Extraordinary product. Exceptional quality.

● Circle No. 161

MPF-II

With Apple II capability at a reduced price this Taiwanese micro should appeal to hobbyists, says Ian Stobie.



APPLE'S VAST USER BASE has recently been under assault from manufacturers of look-alike machines. The MPF-II from the Taiwan-based Multitech Corporation can hardly be described as a look-alike in any literal sense as it is about one-eighth the size of the Apple II, but it does run Applesoft Basic programs and resembles the Apple closely when looked at through programmers' eyes.

The hardware is completely different. Mounted in a small, flat box measuring 10in. by 7in. by 1in., the MPF II has a calculator-style keyboard in a scaled-down QWERTY layout. But beneath the keyboard is 48K of RAM and a 6502 processor, like the Apple. Two ROM chips house the 16K operating system and Basic. The circuit layout bears no resemblance to Apple's, so the MPF II can in no way be called a pirate machine.

Provision for expanding the system is limited. The Apple II has eight 50-pin slots mounted on the motherboard, into which printers, video interface boards, disc controllers and the whole huge range of add-on goodies can be fitted. The MPF-II has AC power, cassette, TV and monitor connections along the back of the case. Down the side are a ROM-cartridge slot for Multitech-provided software, a non-standard printer connector and a similar connector marked RCB. The initials stand for the remote-control box which is the sole means of expanding the system. The remote-control box can be used to connect two games controllers, a Chinese character input device, a full-size keyboard or, eventually, a disc drive. The MPF-II is not plug-compatible with the Apple II.

Just like Applesoft

What the MPF-II does provide is a software environment which appears to be identical to the Apple's and a Basic which behaves exactly like Applesoft, Apple's standard floating-point Basic. Memory is organised the same way, with two text pages of 1K each and two 8K graphics pages. All system addresses tried checked out the same; the only differences appear to be in the command-line interpreter and the peripheral handling parts of the monitor. The simplest explanation for this is that the monitor ROM is different but the Applesoft is either the same or very close.

The most obvious difference is the ability the MPF-II has to accept Basic statements as single-key commands in a similar way to Sinclair Basic. This is done by holding down the Shift and Control keys simultaneously, while pressing the appropriate key — P for print, for example. A template which fits over the keyboard is provided if you prefer to enter programs this way. This is very convenient given the calculator-like nature of the keyboard, but statements are also accepted typed in full in the normal Apple way, so compatibility with Apple programs is fully preserved.

The other interesting feature of the MPF-II keyboard is the graphics character set that can be accessed by pressing Control-B followed by the appropriate character. Another keyboard overlay is provided to define these. The set is similar to the Pet's, with a range of partially blocked-out rectangles for drawing block graphics and a selection of lines, clubs, hearts and so on.

Like the Apple the MPF-II has three graphics modes for text, low-resolution graphics and high-resolution graphics. Text mode gives the user 24 lines of 40 characters in monochrome only. Cursor control uses the familiar VTab and HTab approach of the Apple. Low-resolution graphics allows plotting or line drawing on a 40-by-40 grid in 16 colours, while high-resolution graphics uses a 280-by-192 screen in six colours.

Commands are the same as for the Apple, including the powerful Shape, Draw, Rotate and Scale commands, allowing a shape to be defined and stored on tape and later read in and manipulated. The process involved is rather laborious, but many published Apple programs use the commands, and hence should run on the MPF-II.

The documentation that comes with the MPF-II is not up to the Apple standard. The Basic manual is meant to be both tutorial and reference manual, and takes some time to get started, rambling on in dubious English about generalities. The distinctive features of the MPF-II — the keyboard graphics and single-stoke keyword entry — where it has improved on the Apple, are ignored. The final version may correct this, but it would be worth getting hold of Apple documentation if at all possible.

Starting with a clean slate and today's technology the originators of the Aple II can probably come up with something to grab the consumer's attention. Meanwhile the MPF-II provides a low-cost way for more people to join the world of Apple software. It is not unreasonable to think that eventually many of them will migrate to the real thing.

Conclusions

- **The MPF-II is almost identical to the Apple from the programmer's point of view, but it is in no way a direct copy.**
- **The very limited expansion possibilities of the machine and its small calculator-size keyboard make it a home machine rather than a machine for serious use or program development.**
- **Even so, the provision of a powerful Basic like Applesoft and a good machine-language monitor make it a very suitable machine for the hobbyist or educationalist.**
- **Most cassette-based Applesoft programs should run on the machine, as well as published listings.**
- **Serious users should stick to Apple's own products, or look at machines which go beyond the Apple II specification like the Basis 108 and Country Acclaim.**
- **The MPF-II costs £235 and is available in the U.K. from Flight Electronics Ltd, Flight House, Quayside Road, Southampton, Hampshire SO2 4AD. Telephone: (0703) 34003.**

WALTERS 2000

Could the daisywheel be slipping into obsolescence? After a session with this British-made dot-matrix unit Chris Bidmead thinks that it just might.

NINE HAIR-FINE wires, fired repeatedly against a ribbon in shifting patterns, can hammer out pages of text up to four times as fast as the fastest daisywheel printer. Recent developments have produced "correspondence quality" dot-matrix printers that rival daisies in character definition without losing the ability to run off draft copy at high speed. It is beginning to look as if the days of the daisy are numbered.

Design improvements at the high end of the market filter down the line, and many of the cheaper dot-matrix printers, while still falling short of correspondence quality, have certainly cleaned up their act. The crippled character sets that used to be characteristic of the dot-matrix approach now have a very old-fashioned look. The Walters 2000 is a middle-range, medium-priced, good-quality printer, built like a tank, and just about as noisy.

Noise pollution

Our comments on noisy products in the past have failed to abate the various forms of acoustic pollution that roll into this office, so perhaps our enthusiasm for the quiet life is not shared by the various manufacturers. And as the products sell, it is obviously not particularly shared by the market either. So if you can hear us above the whine let's drop the subject and continue the tour.

The manufacturer claims a print speed for the Walter 2000 of 120 characters per second but, as usual, the conditions of testing are not defined, so the figure is a figment. The benchmark must be based on a single, straight-line burst because we were only able to attain an average speed of 84cps with our continuous-text test, a page of solid prose.

Our speed is exactly 30 percent below specification which, allowing for the turns at the end of lines, is probably about right. To put this in perspective, the Walters performed over 46 percent faster than the comparable Paper Tiger we reviewed in July 1981, and 93 percent faster than the fastest daisy.

Fast mover

The print-head certainly moves nippily, but the real edge comes from intelligent decisions about when not to move and when hopping across columns or down lines is going to be a faster strategy. The unidirectional tractor feed whips paper through pretty quickly, particularly during blank lines. Thanks to "motion minimalisation" rapid partial form feeds hurry the paper along to the next bit of business.

We were disappointed to find that the physical paper transport system was not entirely up to supporting the aspirations of the software. Early trials with the kind of vertically perforated tractor-feed paper where you can tear off the hole-punched edges came to grief when the printer tried doing the job for us, and the trimmings got wrapped round the platen.

Impact Data, the lively new firm marketing the Walters, came to the rescue with non-perforated paper of rather better quality, and the problem never re-appeared. The Walters is fast for a machine of its kind, and the fact that you cannot just bung in any old paper is a small price to pay for the advantage.

The nine-needle print-head produces a very readable basic character set with true descenders. It is expandable through software to double size, and contractable to 130 characters per line in the usual way. The typeface produced as a result of contraction is still pleasantly legible, making this option a very useful way of printing out assembler listings that normally require full-width 13in. paper.

Internal PROMs give the Walters a helpful personality. As well as providing auto-bidirectional printing, the resident software skips the paper over perforations, aligns figures around the decimal point, underlines and boldfaces, and offers a choice of whether over-long lines are to be truncated or wrapped.

Unfortunately this built-in intelligence does not extend to being able to set left-hand margins. If you are working from inside a word processor this will be taken care of by software in the host machine, but we missed being able to print assembler listings with a good margin for binding.

The full character set includes Pet-like graphics, accessible by setting the high bit, or alternatively by bracketing values inside the ASCII Shift In and Shift Out characters. ASCII 23H produces the £ sign instead of the #, which will be good news for the British business community. Computer buffs who find the hash character indispensible will have to down-line the pattern into the Walters. Up to 10 characters can be programmed like this and stored until the power is switched off.

Designing the characters and translating them into language the Walters understands needs some thought, but once that is done the loading process is as easy as printing. The short assembler listing shown here adds a ½ symbol to the character set. New additions are identified with lower-case letters in the lead-in string — "a" in this example — and recalled with



The hardware is robust, but beware — it can hand out brutal treatment too.

```
        .z80
        .comment +
*****************************************************
*  WALTERS, version 0.2: Demonstration of how to set up *
*  special characters on the Walters 2000            *
*                                                    *
*  NB: compile with M80 and run as a .COM program    *
*  before printing.  Or change the JP 0 exit and link *
*  into your printer routine.                        *
*                                                    *
*  Chris Bidmead, 22 July 82                         *
*****************************************************

bdos    equ 5           ;cp/m entry point
lstfn   equ 5           ;cp/m list device function
esc     equ 1bh         ;ascii escape character

start:  ld hl,pattern   ;get the address of our picture
        call lststr     ;and send it to the printer
        jp 0            ;back to cp/m command line

pattern:db esc, 'a'     ;character programming lead-in

        db 0100000B     ;column 1 of the pattern
        db 0000001B     ;column 2 etc
        db 1111000B     ;in fact this is a mirror-
        db 0000010B     ; image of the character laid
        db 0000100B     ; on its side, with the B's at
        db 0001000B     ; the bottom.
        db 0010101B
        db 0101000B
        db 0000011B
        db 1001100B
        db 0000001B
;up to nine other characters can be blocked out here, each
;preceded by esc and an identifier ('b', 'c', etc)

        db '$'          ;marks end of string for lststr

lststr: ld a,(hl)       ;get next char
        inc hl          ;bump the pointer
        cp '$'          ;end of string?
        ret z           ;if so, back to main
        push hl         ;save the pointer
        call lst
        pop hl          ;restore the pointer
        jr lststr       ;round again

lst:    ld c, lstfn     ;cp/m list function
        ld e,a          ;needs the char in e
        call bdos       ;call cp/m
        nop! nop! nop   ;give the usart a breather
        ret             ;and go back for more

        end start
```

an escape sequence that uses the upper-case equivalent. So to print the £ sign as we have designed it you would send Esc "A" to the printer.

As an extension of this idea the Walters 2000 has a dot-graphics mode that allows up to seven of the print-head needles to be addressed directly. The manual gives an example in Basic of how this can be done, and very ugly it is too. The defining bytes have to be translated into decimal and then sent down the LList pipe wrapped in the old Chr$ envelope. The natural expression of these bit-pattern values is binary, and any ordinary assembler is happy to accept them like that, with a B tagged on to the end to define the base as 2. If you need to do programming of this kind it is well worth while learning the necessary simple assembly language. ASC.COM comes free with CP/M.

Uneven margins

Close inspection of the listing as printed shows that the vertical alignment is rather more ragged than we are used to seeing on a properly adjusted dot-matrix printer. In many applications this will not be important, and users will probably be happy to accept the speed of the printer as an adequate trade-off against precision of alignment.

In the RS-232 version we tested, transmission speed rate can be set to match the full range from 50baud to 19,200baud. Handshaking can be hard, through DTR on line 20 or soft XOn/XOff. It is a pity that ETX/ACK handshaking is not supported. Although generally passing out of fashion it is very simple to implement at the computer end and does not need continuous monitoring of the TX line.

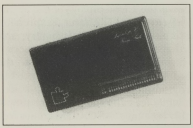
One very nice design touch is the ease of conversion from RS-232 to Centronics or IEEE. The interface is a small printed-circuit board about the size of a cigarette packet, and changing over from one protocol to another is just a matter of pulling out one board and plugging in another.

Conclusions

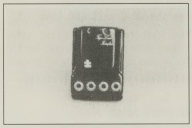
- **For a machine of its price the Walters 2000 is remarkable nippy. Be sceptical about the 120cps in the real world — manufacturers generally parade ideal figures which are hard to match in practice.**
- **The polyurethane case gives the printer a good solid feel, and the internal mechanism seems to be built to take plenty of punishment.**
- **Paper handling at speed can be a touch brutal and good-quality paper is essential.**
- **The ribbon is a standard Diablo dot-matrix type, easily second-sourced.**
- **The documentation is clearly written and well laid out. Surprisingly for a new product, it seems to be accurate too.**
- **Made and supported in the U.K. — High Wycombe, to be precise — the Walters 2000 seems good value at around £400.**

PUZZLE IT OUT WITH

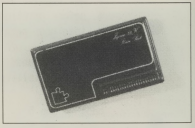
Jigsaw



16K, 32K or 64K RAM packs — plug on module giving memory expansion on your ZX system.



Tape loading Interface giving constant output levels to your ZX, regardless of input levels from your tape cassette.



Unique RAM Pack of 32K allows plug in of your current 16K pack to give total of 48K of memory.

ALL PRICES ARE INCLUSIVE OF VAT, POSTAGE AND PACKING. ALSO INCLUDES FULL YEAR'S GUARANTEE ON ALL PRODUCTS. DELIVERY WITHIN 28 DAYS

DEALER ENQUIRIES WELCOME

Please supply me with the following JIGSAW items:-

Qty.

☐	16K RAM Pack(s) @ £26 each	£.....
☐	32K RAM Pack(s) @ £40 each	£.....
☐	64K RAM Pack(s) @ £65 each	£.....
☐	32K+ RAM Pack(s) @ £46 each	£.....
☐	Tape loading Interface @ £9.50 each	£.....

I enclose my cheque/P.O. for £ ..... Alternatively charge directly to my

ACCESS/BARCLAYCARD ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

NAME: .....

ADDRESS: .....

.....

Send this order with your remittance to:

CAPS LTD, 28 THE SPAIN, PETERSFIELD, HANTS GU32 3LA
TEL: 0730 67221

● **Circle No. 162**

Now a hard disc system for the same price as a floppy



The Shelton signet

It's here! The new hard disc system that really means business.

From the bewildering range of computers, all claiming a technical advantage, Micropute have selected the machine best suited to the needs of small and medium sized businesses. The requirements of such a system were: Integral Hard Disc, Compact Design, Extremely Competitive Price, The CP/M Operating System giving access to a vast range of programmes for data and word processing, and The Capacity For Ease Of Upgrading To Multi-User. Which all adds up to a fully comprehensive and sophisticated computer.

The price?
From an incredible £2,695 (ex V.A.T.)

Micropute Supercover

As an extra bonus to this amazing package Micropute Supercover will provide a 12 month on site maintenance for only £99.00 parts and labour.

Faster Than a 16 BIT

BENCHMARK TIMINGS

	PRODUCT		
	SIG/NET 8 BIT	IBM 16 BIT	SIRIUS 16 BIT
BM. 1.	1.1	1.5	2.0
BM. 2.	3.7	5.2	7.4
BM. 3.	9.9	12.1	17.0
BM. 4.	9.8	12.6	17.5
BM. 5.	10.5	13.6	19.8
BM. 6.	18.7	23.5	35.4
BM. 7.	29.6	37.4	55.9
BM. 8.	5.1	3.5	4.3

These figures are extracted from a recent article in 'Personal Computer World' Publication.

Micropute Ltd Catherine Street, Macclesfield, Cheshire SK1 6QY Tel: (0625) 615384.

Name _____ Position _____

Company Name _____

Company Address _____

_____

_____

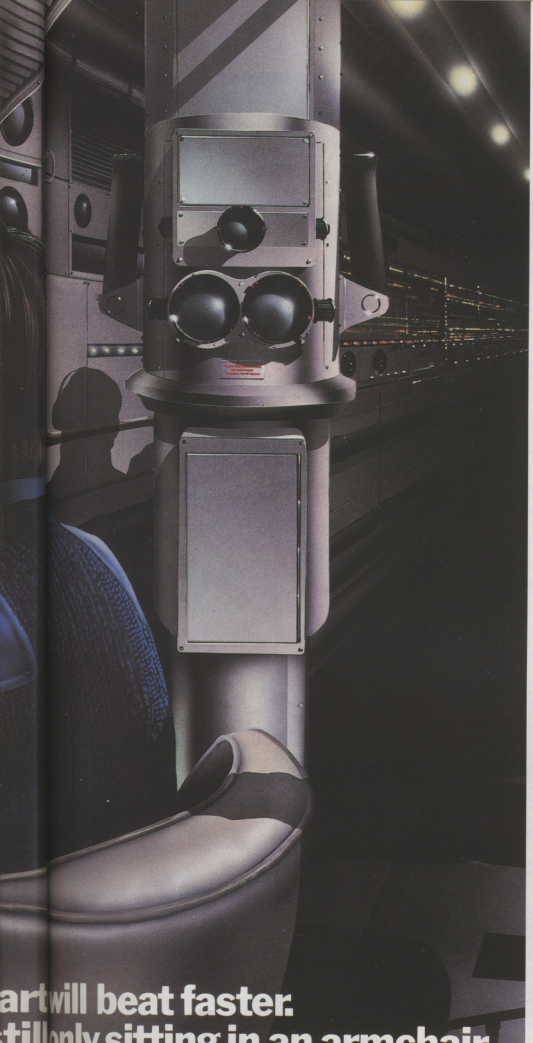
Tel. No. _____

MICROPUTE

Micropute Ltd., Catherine Street, Macclesfield, Cheshire SK1 6QY Tel: (0625) 615384.

● Circle No. 163


Your hands will sweat. Your heavi
Your oxygen might run out. And you're ston



artwill beat faster.
stillonly sitting in an armchair.

At seventy fathoms the only light comes from your Sonar, steadily tracking the advancing enemy fleet.

Suddenly they're above, dropping depth charges. You could dive. But how close is the sea bed? You could attack. But how many torpedos are left? And your oxygen. Isn't it dangerously low?



Submarine Commander. 12 K ROM. Cartridge. 3 screen modes: map, sonar and periscope. 9 skill levels. Controls: Fuel. Damage Indicators. Speed. Compass Bearing. Depth Gauge. Battery Charge. Oxygen. Hydrophone / Engine Noise. Attitude. Clock. Depth below keel. Torpedos. Tonnage Sunk.

'Submarine Commander' is one of 21 challenging new home computer games from THORN EMI, for use with Atari 400/800 or Commodore VIC 20. Like our 'Jumbo Jet Pilot' it's more a real-life simulator than a game.

But our programs aren't all work and no play. 'River Rescue', 'Kickback' and 'Soccer' are all-action games. 'Pool' and 'Darts' will suit armchair sportsmen.

And whilst budding Beethovens play the 'VIC Music Composer,' would-be Chancellors can work on their budgets with 'Home Financial Management.' We also have educational puzzles for children that will puzzle adults at higher skill levels.

But there's one simple idea behind all our titles. They're designed for players who expect more of a challenge from a video game than creatures from outer-space can provide. Now, are you sitting comfortably?

THORN EMI VIDEO

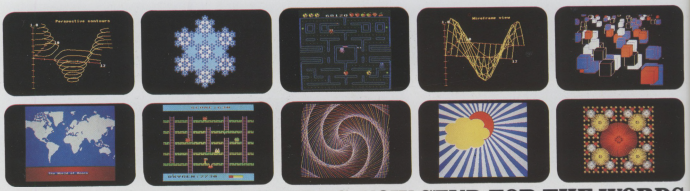
The world's greatest TV games.



PROGRAMS FOR ATARI 400/800 (Trademark of Atari Inc. except where indicated). PROGRAMS FOR COMMODORE VIC 20 (Trademark of Commodore International).

Available from all branches of Laskys (Nationwide), Micro-C at Currys, and all other leading Computer software outlets.

● Circle No. 164



YOU'VE SEEN THE PICTURES, NOW SEND FOR THE WORDS

BBC Microcomputer or Acorn Atom

Acornsoft is the software division of Acorn Computers, designers and manufacturers, of the BBC Micro and Atom. We know better than anyone the capability of the machines, we know how to get the very best from the hardware. And we have produced a range of exciting games, exacting business and useful household software.

The Biggest Range Available

Acornsoft software ranges from authentic arcade games like Snapper to Algebraic Manipulation to Desk Diary to other languages like FORTH and LISP. Striking colour, amazing sound effects and powerful graphics are all used to the full. And it does not stop there. There is a complete range of manuals, accessories and plug-in ROMs.

Free Brochures

Just clip the coupon or write to us and we will rush our catalogue absolutely free. Can't wait for the post ring 01-930 1614 now! Don't delay – do it today. Let Acornsoft help you get the best from our machine and open the doors to your imagination.

Acornsoft and Atom are registered trade marks of Acorn Computers Ltd.

ACORNSOFT

4A Market Hill,
CAMBRIDGE CB2 3NJ.

FREE!



Please rush me my free literature from Acornsoft.
☐ Atom
☐ BBC Please tick
Name
Address
Postcode

● Circle No. 167

DISKTOOLS

Support utilities for CP/M, MP/M and Apple CP/M hard/floppy systems

DISKMANAGER	monitor the integrity of your disks. Informs the user of anything out of order. as well as the usual CP/M type commands the user may look at and restore erased or corrupted files, reclaim faulty disks, change user number of files etc. etc.
DISKED 2	a very powerful currently "idiot-proof" CP/M Disk Editor. Manipulate data by Track/Sector or CP/M records. Use it to learn about CP/M file directories.
DISKORGANISER	Tidy up your disks just as you do your desk or filing system. Save time and money and hard wear if used frequently.
DISKBURS	Back-Up/Restore your hard disk to/from a number of floppy disks. Extensive user transparent error checking.

DISKTOOLS 86

The disktools 80 programs will shortly be available to run on systems using 8088 or 8086 processors and CP/M-86.

Dealer enquiries welcome.

Consultative work undertaken for CP/M systems.

SLOGGER SOFTWARE
215, BEACON ROAD, CHATHAM, KENT. ME5 7BU
Tel. MEDWAY (0634) 811634

● Circle No. 165

ACT Sirius 1 **olivetti Praxis 35**



Beautifully designed, powerful and versatile. 128K RAM. 1.2 Mb capacity Disc Drive. Superb graphics and a great deal.



* Daisywheel Electronic Typewriter Printer
* Centronics Interface
* Friction Feed
* Correction Ribbon £395
* Choice of Typefaces

OLIVETTI ET121 at a SPECIAL PRICE

Latest SEIKOSHA 250X



£240

Can you take a DRAGON home? FREE CASSETTE



GP 100A = £185
VC 100 = £210

This could become your best family pet £173

Add VAT but Free Delivery within 50 miles

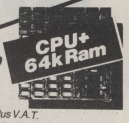
ASCO BUSINESSES

43 Windmill Way, Reigate, Sy RH2 0JB Tel: (07372) 48055

● Circle No. 166

BITS P.C.S

Alive and well and living in LEEDS



CPU £125.00 plus V.A.T.
CPU plus 64k RAM **£225.00** plus V.A.T.
64k RAM £125.00 plus V.A.T.
COMPLETE TWIN DISK SYSTEM £675.00 plus V.A.T.
I/O Card £125.00 plus V.A.T.



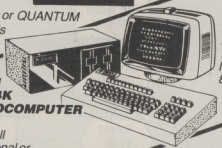
MULTIBOARDS use 80-Bus and are fully Nascom compatible e.g. disks, enhanced video, Input/Output or Ram expansion.



MULTIBOARDS make computers **MULTIBOARDS** enhance:–
GEMINI, Nascom or QUANTUM
Send for full details

The QUANTUM 2000 is ideal for business applications. It can have up to THREE drives giving 2.4 megabytes of disk storage. Its expansion capabilities are almost infinite, thanks to the flexibility of Multiboard plus 80-Bus.





GEMINI GALAXY 64K 2.2 CP/M MICROCOMPUTER
A cost effective solution to the small business, educational or home user requiring a reliable Z80 based CP/M computer
From **£1,450.00** plus V.A.T.

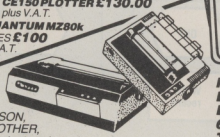
BITS & P.C.S. have been in the MICROCOMPUTER business for several years. We believe in giving good service at competitive prices.
We have never sold anything else but Microcomputers, we believe in giving our customers all the help we can, both before and after sales.
On display and available from our LEEDS showroom are:– GEMINI, NASCOM, QUANTUM, SHARP, TEXAS, DRAGON, SINCLAIR, EPSON, SEIKOSHA, RICOH, etc. Also available is a full range of BOOKS, INTERFACES AND PERIPHERALS.

SHARP **We are an official Sharp computer centre**

As one of **SHARP'S** biggest distributors, we always have stocks. We have the expertise to advise you on interfaces and software. We developed the QUANTUM MZ 80k Hi-Res which gained official SHARP approval.

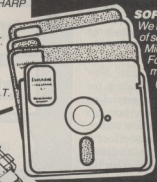
PLEASE CALL FOR LATEST PRICES.
MZ80A with £75.00 free software **£475.00** plus V.A.T.
MZ80B with 64k plus GRAPHICS RAM **£850.00** plus V.A.T.
PC1211 £65.00 plus V.A.T.
CE122 PRINTER £60.00 plus V.A.T.
PC1500 £145.00 plus V.A.T.
CE150 PLOTTER £130.00 plus V.A.T.
QUANTUM MZ80k HI-RES **£100** plus V.A.T.





We stock the following printers:– EPSON, NEC, SEIKOSHA, BROTHER, RICOH, and more important, we know how to interface them to a variety of computers.

SOFTWARE
We have a comprehensive range of software available for all Microcomputers sold by us. For the CP/M based machines we have:–
(a) The full CP/M software suite
(b) All CP/M languages
(c) WORD PROCESSING PACKAGES
(d) AURORA BUSINESS PACKAGES
(e) Data Bases



Please call or write for full details
Bits & P.C.S. Computer Products Ltd., Leeds Computer Centre, The Balcony, 60/62 Merrion Centre, LEEDS.
Tel: 0532-458877

VISA

● **Circle No. 168**

Programming for a purpose

Taking his name-and-address program as a case study, Arnold Maughan offers further hints on writing effective applications software.

NEW PROGRAMMERS should be encouraged to write programs that are easy to understand, easy to debug and easy to maintain. To help achieve all three aims each stage of the program is broken down into modules, blocks or subroutines. Each file-creation section is headed by a meaningful name and is simple to understand, and the whole section can be run and tested even before the rest of the program has been written.

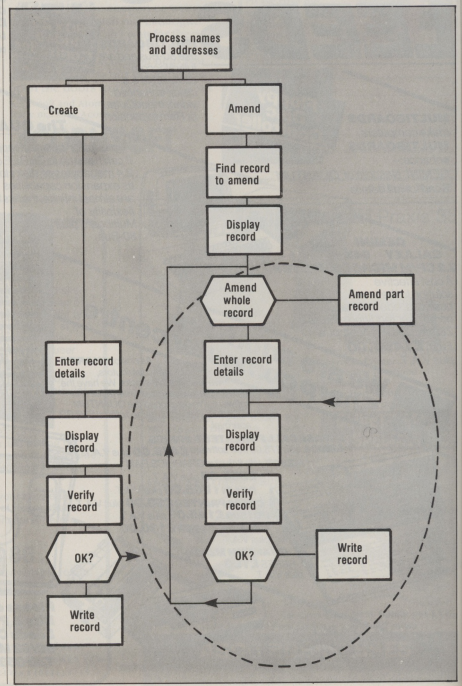
In a previous article in *Practical Computing*, October 1982, page 124, the control section of a name-and-address program called NAMADD was looked at. The next stage is planning and coding the file-creation routines.

Each section of the program has been designed, coded and tested at the same time as the article was written. It means that from time to time changes may be made to earlier sections in the light of new ideas or problems that arise at later stages.

Before starting to code the Create module — line 1000 onwards — consider what the program must do in this section. By planning this stage you can write a number of subroutines which can be used in other parts of the program. On my Comart Communicator with a VC-404 VDU and MBasic a routine is needed to clear the screen. It is written as a subroutine starting at line 60000. If your machine accepts CLS you can replace all the Gosub 60000 lines in the listing with CLS. But if you look at the 60000 subroutine it will be obvious why a simple piece of coding is better as a subroutine. Instead of repeating the three lines of coding it is only necessary to write Gosub 60000.

Obviously the subroutine Create New Records could include all the coding for entering, displaying, verifying, amending and writing away the records, but this would mean a lot of unnecessary coding and a great deal of duplication of effort at the Record section — look at the structure diagram of both sections. Apart from the control subroutines Create and Amend and the Find Record subroutines in the amendment section they share common subroutines. To write these out twice enlarges the program, apart from anything else.

To Create new records you Enter Record Details. The routine which starts at



```
10 PRINT CHR$(24)
20 DIM NA$(8),NB$(8),MX%(8),PR$(8)
30 MR% = 1001
40 FF% = 0
50 OPEN "R",1,"ADDRESS",128
60 OPEN "R",2,"INDEX",27
70 FIELD 1,22 AS NA$(1),3 AS NA$(2),4 AS NA$(3),27 AS NA$(4),
        27 AS NA$(5),27 AS NA$(6),8 AS NA$(7),10 AS NA$(8)
80 FIELD 2,25 AS KY$,2 AS RC$
90 FOR Z% = 1 TO 8
100     READ MX%(Z%)
110 NEXT Z%
120 FOR Z% = 1 TO 8
130     READ PR$(Z%)
140 NEXT Z%
150 DATA 5,4,23,28,28,28,9,11
160 DATA "Title","Initials","Surname","Line 1","Line 2","Line 3",
        "Postcode","Telephone no:"
170 GET 2,1
180 RC% = CVI(RC$)
190 IF (RC% > 0) AND (RC% < MR%) THEN 200 ELSE
    IF RC% = MR% - 1 THEN FF% = 1 ELSE
    RC% = 0
200 PRINT"Name and address program (NAMADD)"
210 PRINT TAB(20):"Select procedure required by number"
220 PRINT TAB(30);"1 to create new records"
260 PRINT TAB(30):
270 INPUT"99 to end run";TY%
280 IF TY% = 99 THEN 330
290 IF (TY% < 1) OR (TY% > 1) THEN 210
300 ON TY% GOSUB 1000
310 IF RC% = MR% - 1 THEN FF% = 1
320 GOTO 210
330 IF FF% THEN 340 ELSE 350
340 PRINT"ADDRESS file full"
350 PRINT CHR$(7):RC%;"records on file - end of NAMADD run"
360 LSET RC$ = MKI$(RC%)
370 PUT 2,1
380 CLOSE
390 END
1000 '
     *
CREATE NEW RECORDS - 1000
1010 IF FF% THEN 1130
1020 GOSUB 10000 'ENTER RECORD DETAILS
1030 IF LEFT$(NB$(1),1) = "*" THEN 1170
1040 GOSUB 12000 'VERIFY DETAILS
1050 IF LEFT$(NB$(1),1) = "*" THEN 1170
1060 RC% = RC% + 1
1070 LSET NA$(1) = NB$(3)
1080 LSET NA$(2) = NB$(2)
1090 LSET NA$(3) = NB$(1)
1100 FOR Z1% = 4 TO 8
1110     LSET NA$(Z1%) = NB$(Z1%)
1120 NEXT Z1%
1130 PUT 1,RC%
1140 IF RC% = MR% - 1 THEN FF% = 1
1150 IF FF% THEN 1130 ELSE 1000
1160 PRINT"ADDRESS file full"
1170 RETURN


10000 '


ENTER RECORD DETAILS - 10000
10010 GOSUB 60000 'CLEAR SCREEN
10020 PRINT"Enter name and address details - or * to end input"
10030 FOR Z4% = 1 TO 8
10040   PRINT PR$(Z4%):
10050   PRINT TAB(20):
10060   LINE INPUT NB$(Z4%)
10070   IF LEFT$(NB$(1),1) = "*" THEN 10120
10080   IF LEN(NB$(Z4%)) < MX%(Z4%) THEN 10110
10090   PRINT CHR$(7);"Too many characters, only";MX%(Z4%) - 1:"allowed"
10100   GOTO 10040
10110 NEXT Z4%
10120 RETURN
11000 '


DISPLAY RECORD - 11000
11010 GOSUB 60000 'CLEAR SCREEN
11020 PRINT TAB(20);"1    2   3"
11030 PRINT TAB(20);NB$(1);TAB(25);NB$(2);TAB(29);NB$(3)
11040 FOR Z8% = 4 TO 8
11050   PRINT Z8%;
11060   PRINT TAB(20);NB$(Z8%)
11070 NEXT Z8%
11080 RETURN
12000 '


VERIFY RECORD - 12000
12010 GOSUB 60000 'CLEAR SCREEN
12020 GOSUB 11000 'DISPLAY RECORD
12030 INPUT"Enter 0 if OK - otherwise any other number";YE%
12040 IF YE% THEN 12050 ELSE 12100
12050 PRINT"Enter 0 to amend the whole record"
12060 INPUT"      or enter the number of the line to be amended";YE%
12070 IF (YE% < 0) OR (YE% > 8) THEN 12050
12080 IF YE% THEN GOSUB 13000 ELSE
    GOSUB 10000 'AMEND PART or ENTER DETAILS
12090 GOTO 12000
12100 RETURN
```

(listing continued on next page)

line 10000 will be used later to amend existing records.

To amend a record or merely to look at the records on file Display Record is needed. This can be done using the subroutine starting at line 11000. Then you will want to Verify each Record. In other words, you want to look at the display of the record just entered, or those you propose to amend, in order to decide what to alter. Another subroutine starting at line 12000 allows that to be done.

If from this Verify Record routine you decide to re-enter the whole record go to line 10000 — Enter Record Details. You may want to amend a line or two, add a post code or telephone number, or correct the spelling of a name. To do this you can utilise a subroutine called Amend Part Record which starts at line 13000.

The description of the program explains the purpose of the coding where necessary. It is easier to follow the program listing by starting each subroutine on a 1,000-line boundary, and by putting two or three line-feeds at the start of the break or heading line after the ' or Rem. If you run under CP/M take a look at the Address file you have created by entering Type Address after the CP/M A> prompt.

Variable names.
FF% — file-full indicator
KY$ — key of records for sorting purposes: NA$(1) + NA$(2)
MR% — maximum number of records allowed in the file
MX% — eight-variable array of maximum size of NB$ fields
NA$ — eight-variable array of fields in the file buffer
NB$ — eight-variable array of name/address fields in this program
PR$ — eight-variable array of prompts for NB$ fields
RC$ — Record Count, also RC%
TY% — procedure type indicator
Z?% — various loop counters

The main features of the program are as follows:

Line 20. Note that NB$(8) has been added to the arrays being dimensioned.

Line 1000 acts as a divider on the program listing. The number at the right is included to make it easier to renumber the program if insertions have been made.

Line 1010 checks the file-full indicator FF% to prevent any attempt to write records to the file when it is full.

Line 1020 calls the Enter Record subroutine.

Line 1030 checks the end-entry indicator *. There is obviously no point in verifying an end-of-entry indicator.

Line 1040 calls the Verify subroutine.

Line 1050 checks the end-entry indicator *. This has to be done after the Verify routine in case you decide not to keep this last record.

Line 1060 increments the record count RC%.

Lines 1070-1090 set the fields in the record buffer to the values in the NB$ array. The

(continued on next page)

(continued from previous page)

sequence is slightly different in order to simplify later routines.

Line 1130 writes the record to the file.

Lines 1140-1160 check the file size and print a warning message if it is full. Otherwise the program branches back to the routine to enter the next record.

The loop counter in this subroutine is Z1%, the "1" standing for the 1000; it is not used outside the 1000 subroutine.

Line 10000 prints heading.

Line 10010 clears screen; replace with CLS if this will work on your equipment.

Line 10030 sets up the count. The counter is ZA%, A being the hex equivalent of 10, and this being subroutine 10000.

Line 10040 prints the prompt message.

Line 10050 insets the input.

Line 10060. Line Input allows commas to be included. Do not use double-quote marks in the address; it would not matter in this program, but you may want to use the names and addresses with a word-processing package. Some of them, such as WordStar, use double quotes as text dividers. Though it is generally a simple matter to reformat the file for use with such packages any double quotes would have to be removed as part of the conversion routine.

Line 10070 checks for end-entry indicator *.

Lines 10080-10100 check the length of the fields, print an error message and branch back if in error. Only 10 characters have been allowed for telephone numbers, which is sufficient for U.K. STD numbers provided spaces and dashes are omitted. Only two initials have been allowed for with one space in between.

Lines 11000-11010 print heading and clear screen.

Lines 11020-11070 print the field number and content of each field of the record. ZB% is the counter in this subroutine, B being hex for 11.

Lines 12000-12010 print heading and clear screen.

Line 12020 calls display routine.

Line 12030. You could use Y and N if you prefer, but the coding of 12040 is simpler and faster using numerals.

Line 12040. The YE% statement tests YE% for a true or false condition — that is, zero or any other number.

Lines 12050-12060 use the same method but now the number entered indicates the field to be amended.

Line 12070 checks that the entry is valid.

Line 12080 selects the appropriate subroutine.

Line 12090 branches back to verify the amendment.

Lines 13000-13010 print heading and clear screen.

Lines 13020 onwards use the value of YE% to pick out the line to be amended. It is used again in lines 13070-13090 to check the length of the field.

Lines 6000-60040 are the clear-screen routine. The count in Z6% is to delay the program while the clear-screen function is being carried out. Without it the start of the next display could be lost. The size of the count must be varied to suit the equipment.

(listing continued from previous page)

```
13000 '

AMEND PART RECORD - 13000
13010 GOSUB 60000 'CLEAR SCREEN
13020 PRINT"Amend line number";YE%
13030 PRINT
13040 PRINT NB$(YE%)
13050 PRINT
13060 LINE INPUT: "should read ";NB$(YE%)
13070 IF LEN(NB$(YE%)) < MX%(YE%) THEN 13100
13080 PRINT CHR$(7):"Too many characters, only";MX%(YE%) - 1;"allowed"
13090 GOTO 13050
13100 RETURN
60000 '


CLEAR SCREEN - 60000
60010 PRINT CHR$(24)
60020 FOR Z6% = 1 TO 500
60030 NEXT Z6%
60040 RETURN
```


A+G COMPUTERWARE

UNBEATABLE PRICES!!

MONITORS
Prince 12" Green Screen **£90**
BMC 1401 14" 40 col. RGB Colour **£230**

TEAC DISC DRIVES
Single Drive 40 Track **£185** Twin Drive **£347**

PRINTERS
Microline-80 **£205** Epson MX80 FT3 **£310**
Microline-82A **£315** Epson MX100-3 **£409**

APPLE II
FULL RANGE OF SOFTWARE & HARDWARE AT LOWEST POSSIBLE PRICES!! SEND FOR LIST AND SAVE MONEY!!

CX80 COLOUR PRINTER
7 Colours * Software Driven * All Interfaces
SPECIAL PRICE £695
Standard Interface

LOTS OF BARGAINS FOR EVERYONE!
FULL PRICE LISTS SENT BY RETURN

Add £8 carriage + 15% VAT for Printers and Monitors
Add £5 carriage + 15% VAT for Dragon
Add £1 carriage + 15% VAT for Apple Software
PAYMENT BY CHEQUE OR ACCESS

P.O. Box 34, Cheadle, Cheshire, SK8 4PT Telephone 061-428 2014

● Circle No. 223

PRINTER BONANZA!

EPSON PRINTERS AT UNBEATABLE PRICES



MX80 FT III **£305** + VAT
MX82 FT III **£315** + VAT
MX100 FT III **£415** + VAT

Interfaces to any machine supplied—please ask for price



All printers carry a 1 Year Guarantee and come with paper. Shipment is by Securicor to your door—Please add **£7** + VAT carriage.

Payment by Cheque, Access, Visa etc.
All prices Apply to 31st Jan. 1983.

IMMEDIATE DELIVERY.

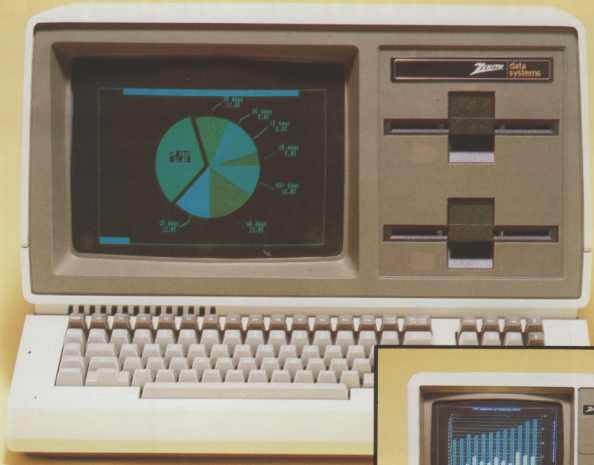
Shipments throughout UK by Securicor.
We can export to most countries in the world.

Micro-Spares

We cannot and will not be beaten on Price!
19 Roseburn Terrace, Edinburgh EH12. 031-337 5611.

● Circle No. 224

The 16-bit Micro



Zenith Z-120 "All in one" monochrome computer.



Zenith Z-110 "Low profile" colour computer and optional monitor.

with 8-bit compatibility and colour graphics

Microprocessors	8088 for 16-bit power 8085 for 8-bit compatibility
Memory	128 Kb expandable to 768 Kb
Storage	320 Kb to 10 Mb (floppy and Winchester disk)
Operating Systems	CP/M-85, CP/M-86, Z-DOS (MS-DOS)
Multi-user	Up to 8/10 terminals
Graphics	High resolution 640 x 500 pixel
Colour	High definition 8 colour pixel
Communications	2 RS 232 ports, expandable to 10, and 1 parallel port. (IEEE 488 available soon) Signetics 3661 chip ensures hardware compatible communications with most mainframes
Expansion	5 slot S-100 bus structure
Power supply	300W switched mode; ensures high stability and regulation

Application Software

Word processing, financial modelling, business management, integrated accounting - all from leading software houses, including PEACHTREE

For further information, contact:

ZENITH data systems

•Circle No. 170

Bristol Road Gloucester GL2 6EE Telephone: (0452) 29451 Telex: 43179

We take all the guessing out of terminal buying



Micropute is a fast developing distributor with the sole aim of guiding you through the systems jungle. We carefully test, evaluate and then select the best product from its own marketplace. We then add our own extensive product knowledge and all the necessary ancillaries related to the main product. All this fully backed and protected by fast, comprehensive nationwide servicing and maintenance coverage.

K9 Terminal

Main features:

- 80 x 25 (including status line)
- Green display
- Seperate keyboard
- Function keys
- Self test
- Reverse video
- Underlining
- Half intensity
- Protected mode
- Line and block graphics
- Televideo compatible
- Baudrates to 9600

The K9 Terminal is undoubtedly one of the most competitively priced terminals available on the market today which can offer so many outstanding features.

The K9 Terminal is supplied to us by I.C.L. and includes the type of back-ups and product development that you would expect from a major manufacturer.

Delivery is ex-stock and this amazing terminal is now available at the incredible price of only: **£525.00** + V.A.T.

Insight Terminal

Main features:

As the K9 Terminal plus,

- Deeper contrast on screen
- Black screen surround (eliminates reflections)
- Deeper recessed screen
- Customised for Wordstar
- Optional 15" screen
- Optional graphic display
- Alternative emulations. VT52, Beehive

The Insight Terminal is again, extremely competitively priced offering an even greater amount of features than the K9.

The latest addition to the already impressive list of this terminals features is the option of full graphic display, which is now available as an ex-stock item.

Delivery on all Insight Terminals is ex-stock and prices start from as little as **£595.00** + V.A.T.

All Micropute products are backed by a nationwide service and maintenance team.

For further technical data and the name of your nearest dealer send the coupon now!

MICROPUTE Catherine Street, Macclesfield, Cheshire SK11 6QY. Tel: (0625) 612759

Name _____ Position _____

Company Name _____

Company Address _____

_____

_____

Tel. No. _____

MICROPUTE

Catherine Street, Macclesfield, Cheshire SK11 6QY. Tel: (0625) 612759

● Circle No. 171

LET YOUR MICRO TAKE OFF WITH GEMINI

USING GEMINI FUNCTIONAL CASSETTE SOFTWARE FOR JUST £19.95

Fully compatible with

TI – 99.4A SHARP MZ – 80K/A/B
VIC 16K BBC Micro
Oric Sinclair Spectrum
Dragon 32 ATARI 400/800

Here's the software to run your budgeting, your business, your stamp collection, your car costs . . . even to plan your next meal and help you choose a wife. Tested programs that come with all the documentation back-up you need from Gemini who are experts in practical software. So mail us the coupon – and put your micro to work . . . fast.

SPECIAL LIMITED OFFER Any 3 programs at £19.95 for the price of two with all orders received before 31st March 1983.

DATABASE The Program that everyone needs. Facilities include sort, search, list, delete, change, totals, save file, line print if required, etc. etc. Can be used in place of any card index application. **£19.95**

STOCK CONTROL All the necessary for keeping a control of stock. Routines include stock set up, user reference no., minimum stock level, financial summary, line print records, quick stock summary, add stock, delete/change record and more. **£19.95**

MAILING LIST A superb dedicated database to allow for manipulation of names & addresses & other data, with selective printing to line printer. Features include the facility to find a name or detail when only part of that detail is known. Will print labels in a variety of user-specified formats. **£19.95**

INVOICES AND STATEMENTS Ideal for the small business. A complete suite of programs together with generated customer file for producing crisp and efficient business invoices and monthly statements on your line printer. All calculations including VAT automatic and provision for your own messages on the form produced. *Not Spectrum **£19.95**

COMMERCIAL ACCOUNTS A gem of a program, all for cassette, with the following features:–
Daily Journal • Credit Sales • Cash Sales • Credit Purchases • Purchases – other • Sales Ledger • Purchase Ledger • Bank Account • Year to Date Summary
A fully interactive program suitable for all businesses. Files can be saved and loaded and totals from one file carried forward to another on cassette. Particularly useful from a cash flow point of view, with an immediate accessibility to totals for debtors and creditors. Bank totally supported with entries for cheque numbers, credits and, of course, running balance. **£19.95**

HOME ACCOUNTS Runs a complete home finance package for you with every facility necessary for keeping a track of regular and other expenses, bank account, mortgage, H.P. etc. etc. etc! You'll wonder how you ever managed without it. **£19.95**

Gemini Marketing Limited.
Functional Software Specialists
9, Salterton Road Exmouth, Devon.
Telephone orders welcome. (03952) 5832
Please quote Access/Diners Card Number

For Functional Software

Dealer Enquiries Welcome

ZX81 16K – Database available – Only £7.50 including FREE Decision Maker Programme.

GEMINI MARKETING LIMITED

Tick the box for Program you require. Prices include V.A.T and Package and Postage.
Please supply the following cassette software.

Database	£19.95 ☐
Stock Control	£19.95 ☐
Mailing List	£19.95 ☐
Invoices and Statements	£19.95 ☐
Commercial Accounts	£19.95 ☐
Home Accounts	£19.95 ☐
ZX81 16K Database	£7.50 ☐

Name_____
Address_____
Machine Type_____ Memory Size_____
I enclose_____
Make cheques and postal orders payable to Gemini Marketing Ltd. All orders despatched within 7 days.
Diners Card Number_____ Access Number_____
Signature:_____

Gemini. Functional Software Specialists 9, Salterton Road, Exmouth, Devon. (03952) 5832
Telephone orders welcome. Please quote Access/Diners Card Number

• Circle No. 172

YOUR DATA LIFELINE



The **DATALIFE** Series of magnetic media from Verbatim, incorporates many advanced data shielding benefits. These ensure a longer, more trouble-free recording, storage and retrieval life – quite simply Datalife is the best range of media available today.

And now BFI, the UK's major distributor of Verbatim products, has introduced a new service – called the Datalife Line. Call us on the Datalife Line and we can offer you fast deliveries, competitive prices on Verbatim products, excellent back-up and technical advice on flexible disks, mini diskettes, data cartridges, digital cassettes, alignment disks, XE disks and Datalife head cleaning kits.

CALL THE Datalife™ LINE NOW:

01-941-4066

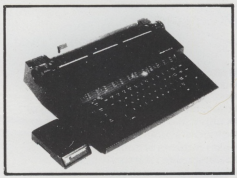
BFI

Scottish Distributor:
Computer Supplies Co.,
8/18 Union Street, Bo'ness,
West Lothian, Scotland.
Tel: 050-682-3393

BFI Electronics Ltd.,
516 Walton Road,
West Molesey,
Surrey. KT8 0QF
Tel: 01-941 4066
Telex: 261395

● **Circle No. 173**

Buy our £475* Daisy Wheel Printer for your computer and you have an Electronic Typewriter absolutely FREE



The T/Printer 35 is the lightest weight and lowest cost daisy wheel printer you can buy for your computer. So it will fit within your budget and you can carry it wherever you take your micro. Yet it is tough enough to give years of reliable service. Interchangeable typefaces (standard Olivetti 100 character daisy wheels), variable pitch, multiple copies—all the features you would expect of more expensive word processing printers.

Yet the T/Printer 35 costs only £475 with parallel interface. Operating speed under computer control is approximately 120 words per minute of letter perfect output. What typist can equal that?

Then when you're finished using it as a computer printer, the T/Printer 35 is ready to go right on working as an electronic typewriter.

That's the dual-purpose T/Printer 35—the versatile computer printer that fits your budget.

Orders are shipped within the UK carriage-free. To order or for more information about the T/Printer 35:

**The T/Printer 35 costs £475 with Centronics compatible parallel interface. With RS-232C interface it costs £535. Prices listed are exclusive of VAT.*

DATARITE

Datarite Terminals Ltd
Caldare House
144-146 High Road
Chadwell Heath, Essex RM6 6NT
Tel: 01-590 1155

● **Circle No. 219**

SNAP

Public-opinion polls collect vast quantities of data. Phil Cole makes public his opinion of a package which ensures that none of it goes to waste.

"EXCUSE ME? Have you got a few moments? Would you mind answering a few simple questions? It won't take very long. Thank you so much." My usual response is to say No, side-step and dart away, but there must be some of us who answer the questions/questionnaires and generate the hundreds of case sheets which in turn provide the sample data from which projections are made and conclusions drawn.

If there are any organisations or people involved with the analysis of market-research surveys who do not know about Snap, then perhaps it is time they undertook some market research on their own behalf. The Survey Analysis Package, alias Snap, by Mercator Ltd does what computers still do best, which is number crunching. Moreover, it does it in a very flexible way. The suite of programs running under the CP/M operating system which make up the package is designed to handle the manipulation of the results in small to medium-sized surveys.

The suite divides neatly into the usual three program areas:

Entry of survey definition — data structuring

Entry and validation of answers — data capture

Analysis of the answers — data manipulation and reporting

with the third part obviously embodying the major function. Considerable trouble has been taken to ensure that getting the data on to file is under very extensive user control.

Bedtime reading

Before using Snap the survey must be designed, though the amendment facilities are very forgiving and allow modifications and rearrangements to be made even after entry of the survey definition. I started using the package after first jotting down on paper the rough outline of a survey, but without having read the user manual in detail. Somehow I can never bring myself to sit and read a manual from cover to cover and past experience has shown that good software generally does not need it. Within a few minutes I was setting up the survey using a question-and-answer routine to enter the questions and their associated answers.

Four possible types of answers to any of the questions are available: precoded, numeric, alphanumeric or multi-punch — the last catering for more than one answer to a single question. A range of possible answers to each question can be entered and there is also provision for routeing within the questionnaire so that certain questions are only asked or others avoided, depending on previous responses.

The system is menu driven and all the screens are clear, uncluttered and give a good indication of what is currently happening. I particularly liked the use of brackets to indicate that certain options were unavailable at certain times, but found the need to initalise repeatedly for certain operations very irritating.

Validation of entry is good, explanatory error messages being displayed when necessary. However in one or two situations after having made an error, the system informed me of the fact, displayed a plausible correct response and passed on to the next entry. I found this "hidden default" disconcerting to begin with, and inconvenient when having to "go round again" to make the correct entry. Of course, if the machine got it right I mentally applauded the presumptuous programming.

The package supports both Interview and Batch modes of operation and for this trial I had elected to go for the former. Once I had set up my survey, printed out the questions and possible responses — see figure 1 — and made a few modifications I moved on to the data-entry section. Again it is simple to use, the survey questions being displayed one at a time, but it needs a

(continued on next page)

Phil Cole is a Microcomputer software consultant with Computercraft Ltd, a software co-operative.

Figure 1.

```
                S N A P   -   SURVEY  ANALYSIS  PACKAGE

SURVEY : DEMONSTRATION SURVEY
-------------------------------------------------------------
 TITLE : DEMO  6.11.82

                        FULL REPORT OF VARIABLES 1 TO 3

Variable no.: 1              Name : REGION
Type :PRECODED

Start column: 1              Field length : 1

                      Val                          Value Name
                        1                          LONDON
                        2                          SOUTH EAST
                        3                          SOUTH
                        4                          SOUTH WEST
                        5                          MIDLANDS
                        6                          NORTH EAST
                        7                          NORTH WEST
                        8                          WALES
                        9                          SCOTLAND
-------------------------------------------------------------
Variable no.: 2              Name : AGE
Type :NUMERIC  RANGE

Start column: 2              Field length : 2

        Val        Value Name          Ranges
          1        YOUTH                0-17
          2        18-25               18-25
          3        26-35               26-35
          4        36-50               36-50
          5        51-60               51-60
          6        > 60                61-99
-------------------------------------------------------------
Variable no.: 3              Name : MALE/FEMALE
Type :PRECODED

Start column: 4              Field length : 1

                      Val                          Value Name
                        1                          MALE
                        2                          FEMALE
-------------------------------------------------------------
```

SNAP

(continued from previous page)

trained user since the possible responses are not displayed with the survey questions and some idea of the expected answers is necessary. All answers are validated against the user-specified criteria and valid replies are displayed alongside a shortened form of the question. It is very easy to recall and amend any response previously given to any of the questions.

Time-consuming

Entering data using this method does take time, even with rapid response, and though this Interview mode was ideal for my small-scale trial it would not suit a larger survey. That is presumably why the Batch mode which works on a slightly different principle has been included. To begin with a similar process of entering questions and response ranges is carried out, but instead of entering the survey data one variable at a time, the data for a complete record is entered as a single string of characters.

There is two-stage validation and both are user definable. The initial stage is superficial but adequate enough to filter out most typing mistakes. The records are then stored in a file until the batch entry is complete. Termed Raw Data, these records are then validated against the more stringent limits of the survey's defined responses and translated into the appropriate variable in an automatic procedure under program control.

This produces a second file of what is referred to as Processed Data. Once again the system allows great flexibility in defining validation criteria and offers facilities to update, change and amend data that has already been entered and validated. All the facilities are easy to use, and there is also provision for double punching as a further safeguard.

Having entered all the data from a survey, output can be divided into four types. It is available either to the screen or printer in predefined formats which are not user amendable. The formats are functional and present the data clearly.

The Hole Counts option displays a table of the number of responses of each answer to each question in the survey — see figure 2. In cases where there are more elements to the table than can be accommodated on the screen a windowing technique is used. The minimum and maximum value of the answers together with the range, mode, mean, standard deviation and variance can be displayed for any of the questions. This applies to both the raw and processed data for Batch mode surveys. Histograms of the number of responses to each answer of individual questions can be generated, with the scales of the axes being adjusted under

Figure 2.

```
S N A P  -  SURVEY  ANALYSIS  PACKAGE
SURVEY : DEMONSTRATION SURVEY
 TITLE : DEMO 6.11.82
              HOLE COUNT ANALYSIS TABLE OF ABSOLUTE VALUES
( PART  1 )
                    1    2    3    4    5    6    7    8 TOTALS
          REGION   96  104   63   76   56   26   50    4   500
             AGE    5  135  179   81   55   45    .    .   500
  MALE/FEMALE     265  235    .    .    .    .    .    .   500
 MARITAL STATUS   113  313   53   21    0    .    .    .   500
        CHILDREN  135  130  135  100    0    0    0    0   500
       S E GROUP   70  230  150   50    .    .    .    .   500
      IRISH P.M   105  155   90   35   90   25    .    .   500
( PART  2 )
                    9   10   11   12   13   14   15   16 TOTALS
          REGION   25    .    .    .    .    .    .    .   500
        CHILDREN    0    .    .    .    .    .    .    .   500
```


SPELLING CHECKER

The features of PROOF include :—

- Large dictionary of 44,711 words.
- Dictionary contains 1,170 proper names and 650 place names.
- British and American spellings included—either can be selected at run time.
- Plurals of nouns, comparatives of adjectives and all tenses of verbs are included.
- PROOF automatically deals with possessives such as table's, compound words and lines which end with hyphens.
- Alternative spellings, such as civilize and civilise, are included in the dictionary.
- Main dictionary can be extended by adding user created dictionaries.
- Comprehensive 120 page manual.
- PROOF is menu driven.
- Fast interaction by single keystrokes.
- 9 different combinations of input and output plus 4 different operating modes.
- Up to 11 lines of the local context of each spelling mistake may be displayed.
- PROOF can provide the line number where spelling mistakes occur.
- PROOF gives a word count.
- PROOF can be used to check individual words typed in at the keyboard.
- Demonstration file included.
- 30 day money back guarantee.

System requirements: 48K Apple][, twin 5¼" drives, video monitor, 16 sector DOS. PROOF can accept input from the keyboard or from standard Apple][text or binary files.

Software (2 disks) and manual : £120 + VAT.

Manual : £12 + VAT (credited on purchase of software).

Cambrian Software, Gwynllys, Groeslon, Caernarfon, Gwynedd, LL54 7ST.
Telephone : 0286-831072 (day or night).

Please send me the indicated items. I enclose £

☐ Software and manual : £120 + VAT. ☐ Manual : £12 + VAT.
☐ Further details.

Name .....

Address .....

Tel. No. .....

Cambrian Software, Gwynllys, Groeslon, Caernarfon, Gwynedd, LL54 7ST.
Telephone : 0286-831072.

● Circle No. 208

STEMMOS LTD.
ANNOUNCE

THE WORLD'S LEADING AUTOMATIC PROGRAM GENERATOR

AUTOCODE I ™

Automatic development of dBase II™ program code without any programming

- ★ Automatic Menus and Sub-Menus
- ★ Automatic Data Entry Screens
- ★ Automatic Data Entry Routines
- ★ Automatic Edit/Validation
- ★ String, Numeric, Data and calculated fields
- ★ Automatic Multiple Reports
- ★ Automatic Programs in dBase code with interactive screens
- ★ No prior knowledge of dBase II is needed.

AUTOCODE I £120
dBASE II & AUTOCODE I ... £450
(Excluding VAT)

STEMMOS LTD.
World leaders in automatic programming

344 Kensington High Street,
London W.14 8NS
Tel. 01 602 6242 Telex 893003 Stemmos G.

(AUTOCADE ITM STEMMOS LTD. dBase II TM Ashton-Tate

● Circle No. 209

Figure 3.

```
                S N A P   -   SURVEY  ANALYSIS  PACKAGE
SURVEY : DEMONSTRATION SURVEY
-----------------------------------------------------------------------------
 TITLE : DEMO 6.11 82

                                  HISTOGRAM ANALYSIS
FOR VARIABLE NO 2 (AGE)

                    0        50       100       150       200       250       300
      VALUE |COUNT+----+----+----+----+----+----+----+----+----+----+----+----+
      YOUTH |    5|*
      18-25 |  135|****************************
      26-35 |  179|*************************************
      36-50 |   81|****************
      51-60 |   55|***********
       > 60 |   45|*********
```

Figure 4.

```
                S N A P   -   SURVEY  ANALYSIS  PACKAGE                    PAGE   1
SURVEY : DEMONSTRATION SURVEY
-----------------------------------------------------------------------------
 TITLE : DEMO 6.11.82

   ROW : REGION ( 1)
COLUMN : AGE ( 2)
```

REGION \ AGE	YOUTH	18-25	26-35	36-50	51-60	> 60	TOTALS
LONDON	0	0	70	20	6	0	96
SOUTH EAST	0	40	25	35	4	0	104
SOUTH	0	40	10	6	7	0	63
SOUTH WEST	5	20	20	5	1	25	76
MIDLANDS	0	35	9	10	2	0	56
NORTH EAST	0	0	20	0	6	0	26
NORTH WEST	0	0	25	5	0	20	50
WALES	0	0	0	0	4	0	4
SCOTLAND	0	0	0	0	25	0	25
TOTALS	5	135	179	81	55	45	500

automatic program or user control — see figure 3.

The most powerful facet of the package is its ability to generate cross-tabulation of the numbers of responses to the different answers to one question against a similar analysis of another question. It does this by displaying the table after first requesting question numbers for row and column — see figure 4.

The table can be built up on screen to provide the satisfying spectacle of seeing the machine at work, but cursor movement slows things down and much more rapid generation is achieved if it is completed before display. This option is under user control as is the windowing of the completed table. More sophisticated manipulations of these cross-tabulations are also possible by invoking the filtering and weighting facilities of the package.

Filtering enables the user to select out certain portions of the data sample based on the answer to specific questions before the cross-tabulation is generated. Similarly it is possible to give certain responses to questions greater value and significance or to extrapolate to a fixed population size. It is in these features that the true worth of the software becomes evident. Since all the data for the analyses and tabulation is retained in memory all the functions are very rapid. A hard copy of any display is available at any time.

Included in Snap's price of £645 is a

(continued on next page)

Combine accurate flight characteristics with the best in animation graphics and you'll have SubLOGIC's

T80-FS1 Flight Simulator

for the TRS-80

SubLOGIC's T80-FS1 is the smooth, realistic simulator that gives you a real-time, 3-D, out-of-the-cockpit view of flight.

Thanks to fast animation and accurate representation of flight, the non-pilot can now learn basic flight control, including take-offs and landings! And experienced pilots will recognize how thoroughly they can explore the aircraft's characteristics.

Once you've acquired flight proficiency, you can engage in the exciting British Ace 3-D Aerial Battle Game included in the package. Destroy the enemy's fuel depot while evading enemy fighters.

Computer and aviation experts call the T80-FS1 a marvel of modern technology. *You'll* simply call it *fantastic!*

MODEL III VERSION ALSO AVAILABLE

Special Features:
- 3 frame-per-second flicker free animation
- Maximum transfer keyboard input
- Constant feedback cassette loader

Hardware Requirements:
- Radio Shack TRS-80, Level 1 or 2
- 16K memory
- *Nothing else!*

Only £20

INCLUDING VAT POST & PACKING OR SEND £1.00 FOR DESCRIPTIVE CATALOGUE OF OVER 200 TRS-80 PROGRAMS. (REFUNDABLE ON FIRST PURCHASE)



MICROCOMPUTER APPLICATIONS
41 QUEEN'S ROAD,
BLANDFORD FORUM,
DORSET DT11 7LA
TEL: (0258) 55100

SNAP

(continued from previous page)

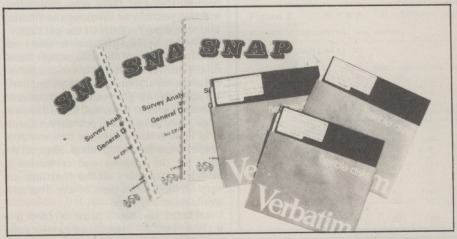
comprehensive user manual which I found a little fragmented although logical in its approach. There is also a year's warranty which includes updates released during that period.

Some of the extensions reportedly in the pipeline are a batch-processing facility for output using an instruction file, display of valid responses for the Interview data-collection mode, and an interpreted Basic program to manipulate the data in the Raw file. Mercator also claims that large parts of the package are being revised to take advantage of the recently available bigger machines in which, among other improvements, the limit on questionnaire size will be raised.

At present the package can handle up to 32,000 case sheets but is more practicable with surveys up to 2,000 on a minimum two-drive system. The maximum record size is 120 characters but the number of questions per questionnaire can be up to 192, with up to 15 multi-punch responses or 30 individual values; in practice only 64 of the questions can be active at the same time.

As an example of disc-storage requirements, 1,000 cases with 50 variables or questions would need 200K in Batch mode or 150K in Interview mode. On a floppy system operational speeds would be:

Validation of Raw data file — 15 minutes
Hold Count table generation — 3 seconds
Cross-tabulation — 40 to 45 seconds depending on filtering and weighting factors.



Conclusions

- **Snap is a very solid piece of software that achieves what it sets out to do.**
- **In addition to its market-research applications, anyone involved in analysing data should have a serious look at Snap.**
- **Whatever data you enter, Snap is unlikely to crash. It is a very robust package.**
- **Screen layout is very consistent throughout the package, which helps make Snap quite easy to use in spite of its powerful features.**
- **Validation of input data is very much under user control, and data input formats can be modified easily.**
- **Snap can generate a wide range of reports, but the user has to live with limited control over print formats.**
- **Documentation is comprehensive and clear but a little fragmented. Mercator promises a quick reference section in the next rewrite.**
- **Snap costs £645 and is available from Mercator Computer Systems, 3 Whiteladies Road, Clifton, Bristol BS8 1NU. Telephone: Bristol (0272) 731079.**

HEWLETT PACKARD 85/125
ADVANTAGE · TRS80 ·
OSBORNE · COMMUNICATOR
· SIRIUS · APPLE · QUME

and we also stock
a unique selection of
low cost systems in our
'budget micro' department

Cambridge Computer Store

1 Emmanuel Street
Cambridge CB1 1NE
Telephone (0223) 65334/5
(closed 12.30 - 1.15 except Saturday)

● Circle No. 175

'Now the world's most ingenious database program writes letters, you've found the ultimate business solution. And the Delta is a true transactional database – this is the biggest breakthrough for microcomputer users to date'

Nick Horgan, Managing Director, Compsoft Ltd.



If part of your microcomputer's job is to store information, you need Compsoft's Delta.

Compsoft DMS is already Britains No. 1 record keeping program. And with 4000 users to our credit, we can honestly say we know more about information storage & retrieval than anyone else. We listen to your comments & requests and now we've produced a world first – the Delta – a true transactional database.

If you'd like to know more, we have general brochures, full technical specifications & free guides to DMS handling a multitude of business situations from order processing, invoicing & stock recording, through to library, personnel & hospital record management.

Find out more about the database revolution. Either telephone the office or clip the coupon now.

Compsofts Delta – taking microcomputers into the third dimension.

Compsoft Limited
Hallams Court
Shamley Green
Nr Guildford, Surrey
England GU4 8QZ
Telephone: Guildford (0483) 898545
Telex: 859210 CMPSFT

● Circle No. 176

COMPSOFT

Please send me further details
Company
Contact
Address

Tel No.

The right software for your application from



Authorised Dealer
Service Centre
System Consultan

COMPUTECH



COMPUTECH FINANCIAL ACCOUNTING PACKAGES
Payroll $3
Invoicing and Stock Recording $2
Sales, Purchases and General Ledgers each $2
Also costing and group consolidation

COMPUTECH UTILITIES DISK
for reliable error checking copying, diskette scan, interpret and patch, etc $
VisiCalc, Applewriter and other Apple software (Prices on request)

COMPUTECH CHAIN MAIL
A mailing merging document processor which may be used with text files, including random files and Applewriter 1.1 binary files $

COMPUTECH GRAPHICS DISK
for printing Apple pictures and graphs on Epson and Microline (free with printers purchased from Computech) $

COMPUTECH TERMINAL UTILITIES
Apple to Apple and Apple to mainframe from $1

COMPUTECH hardware...just plug it in and go!

switches and jumpers provide hardwa options without soldering



DIPLOMAT VIDEO DIGITISER
store a frame from video camera in a fiftieth of a second, process and print $
DIPLOMAT PARALLEL Interface $
DIPLOMAT SERIAL COMMUNICATIONS Interface $
DIPLOMAT RAM 16 Memory Expansion $
DIPLOMAT CLOCK/CALENDAR $
LOWER CASE Character Generator with Applewriter 1.1 enhancements $
MICROMUX Data Exchange (Max 16 Ports) from $
MATRIX PRINTERS, Microline and Epson with graphics and up to 200 cps from $
MICROLINE Optional Character Generator $
DAISY WHEEL PRINTERS, Olympia, Qume, Ricoh from under $1,

Prices exclude VAT, Carriage and Packing

For full details phone for data sheets and a FREE demonstration

COMPUTECH SYSTEMS

168 Finchley Road, London NW3 6HP. Tel: 01-794 0202

Circle No. 177

The Apple logo is a trade mark of Apple Computer Inc. VisiCalc is a trade mark of VisiC

What's portable?

Ian Stobie outlines the essentials of portable computing.

A PORTABLE COMPUTER can be conveniently lugged around without falling apart. It can be taken from room to room or from work to home in a civilised way without damage to machine or human, and then plugged in and used.

Included within the category of portable computers are a whole new wave of much lighter devices that are battery powered. These can be used out of doors and generally fit easily in a briefcase.

There is a problem of definition at both the top and bottom of the portable range. The limits are not arbitrary as they reflect judgements about the fitness of a particular expensive piece of hardware for a specific practical use.

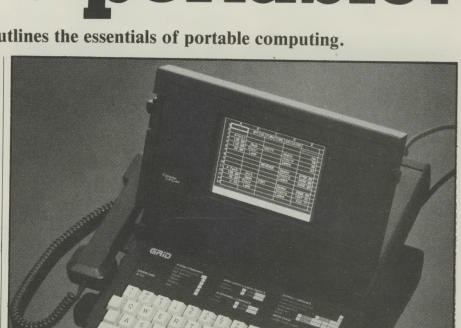
The top limit is fairly simply set by what is easily carried — weight in other words. A machine like the Superbrain is portable in that discs, screen and keyboard are all in one unit with just one power cable coming out the back, but at 45lb. a short trip to the car would involve both hands and some staggering.

The 24lb. Osborne 1 represents a major gain in portability, which given the way it has sold has been recognised by users. It becomes possible for one person to carry the machine through doors and down long corridors in large buildings. A package of this size can accommodate a full-function CP/M computer; with portable hard-disc systems like the Zita becoming available the only compromise necessary is over the display.

By using completely different display and storage technology weight can be reduced dramatically. The 4lb. Epson has no heavy cathode-ray tube or discs, using LCDs and a micro-cassette drive instead. At the moment this does mean compromising a little on performance. The Sord M-23P is pretty much on the limit of present-day technology, with the largest commercially available LCD display and Sony 3.5in. microfloppy discs.

An irreducible weight at the moment is the keyboard. We were thinking of excluding from this survey all machines without a normal typewriter keyboard layout and spacing, but this would have meant leaving out machines that are being widely used in the field for a range of true computing tasks.

The NewBrain keyboard is very close to the typewriter standard, only being let down by its small-sized space bar. Its smaller keys but normal spacing may make it more practical to use outdoors with gloves on. The Husky keyboard is not at all standard, but is well adapted to its specific role as a rugged, outdoor data-collecting device; the membrane-covered flat, waterproof keys are normally in numeric mode; you push Shift for alphabet characters. Hewlett-Packard claims you can touch-type on the HP-75C keyboard but we found this impossible; the spacing is slightly too close although the keys click nicely.



Already available in the U.S., the 10lb. Compass has a 16-bit CPU and built-in Modem.

The Sharp keyboard is very much smaller. This is really the odd machine out in our survey, raising the question of where computers stop and pocket calculators begin. It is included because it has a full Microsoft-style Basic, a very neat printer, and it has been around for some time. It is just the thing for a heating engineer to take out to sites to prepare estimates.

Many new, calculator-style computers will be launched over the next few months. New machines are on the way from Sharp, Casio and Sanyo. Compared to a true portable computer they have a small keyboard, a small display often of one line only, limited memory, often a limited Basic or less adequate machine-oriented programming language, and a much smaller range of add-on devices. So Casio calls its new FX-801P a calculator, even though it has Basic. It looks very similar to an Epson but is smaller, has a one-line 20-character LCD display, a built-in printer, a micro-cassette drive and a scaled-down QWERTY keyboard.

Clearly there is no hard-and-fast dividing line. What matters is what applications a machine is fit for. It is a similar distinction to that between a Kodak instant camera and a versatile system camera like a Nikon or Pentax SLR. A calculator is used for immediate-mode computations, or repetitive computations if it is programmable. A computer can also be used for data logging, process control, word processing, graphic display, financial planning and entertainment. Not all the machines in our survey are suited to all these roles, but each one could sensibly be used for at least some of them.

In the United States the market is extremely active and some interesting portables are on sale. We have restricted ourselves in this survey to machines you can go out and buy now in the U.K., but it is likely that the machines that do best in the U.S. will make it here some time in 1983.

Starting with the obvious market slot, there are plenty of direct competitors to the Osborne 1. The Kaypro II, for instance, is a Z-80 based machine with a bigger, 9in. screen, larger-capactiy discs and a similar

(continued on next page)

(continued from previous page)

software deal: CP/M, MBasic, Select and Microplan are thrown in. In its attempt to put right the obvious weak points of the Osborne it is the U.S. equivalent of the Zita, and there are several more machines like it, such as the Extec 1000 and the Courier.

More innovative is the Teleram 3000, a Z-80 based machine featuring 128K or 256K of non-volatile bubble memory instead of discs, and a four-line by 80-character LCD display. It is light, under 10lb., and can run off batteries. It is aimed for use as a portable word processor, especially as it can be linked up via its RS-232 interface to a large office-based machine for detailed editing. Like many other machines, there is a strong emphasis in the promotional literature on communications. In a country with several time zones, getting hold of the person you want by phone may not be so easy, so electronic mail takes on more significance. And public-access databases like the Dow Jones Financial database and the Source are well established.

Another machine using bubble memory is the more up-market Compass manufactured by Grid Systems and designed by U.K.-based Moggridge Associates. Weighing 9.25lb. the Compass has a true 16-bit 8086 processor, 256K or 512K of RAM and a built-in Modem. The 6in. electro-luminescent high-resolution screen displays 24 lines of 53 characters and folds down to make the Compass into a neat briefcase-like package. Software for word processing, database, spreadsheet analysis, business graphics and communications is included in the price of just over £8,000.

Several U.S. manufacturers have decided that the IBM PC is the machine of the future, and have decided to go one better by offering a portable equivalent. The Compaq computer weighs 28lb. and contains an 8088 eight/16-bit processor — like the IBM machine — as well as 128K RAM, a detachable keyboard and a 9in. display. At around $3,000 it costs slightly less than the non-portable IBM.

The Dot from Computer Devices Inc. weighs 26lb., has a 9in. screen, an optional built-in Modem and uses 3.5in. microfloppies from Sony. As well as an 8088 for running MSDos it also has a Z-80 for running CP/M. But it costs more — over $4,000 for the configuration described here.

None of these machines is officially available in the U.K. Dealers over here are evaluating some models, but resistance to selling in Europe seems to be coming from the manufacturers themselves. U.S. companies are concentrating on building up production and do not appear to want the distraction of setting up a European operation when they can get rid of all they can make in their home market.

Benchmarks

A benchmark is a short Basic routine which performs a common task a convenient number of times. The routines used here first appeared in *Kilobaud Microcomputing* magazine, and we are indebted to Transam Microsystems for providing timings for the machines shown here. Transam has just refitted its London shop, turning it into a portable computer centre.

	1	2	3	4	5	6	7	8	9
PC-1500 CMOS CPU	15	70	121	122	178	293	383	51	211
HP-75C CMOS CPU	2.5	4.4	21	21	23	39	56	13	37.1
NewBrain Z-80	2.0	5.8	19.2	17.5	19.2	32.0	48.8	7.0	26.8
Epson HX-20 6301	2.6	15.2	33.4	33.2	35.2	59.6	101	13.2	51.5
Osborne 1	1.4	4.4	11.7	11.6	12.3	21.9	34.9	6.1	19.9
Sirius 8088 5MHz	2.0	7.4	17.0	17.5	19.8	35.4	55.9	4.3	24.7
IBM 8088 4.8MHz	1.5	5.2	12.1	12.6	13.6	23.5	37.4	3.5	17.6
HP-86	3.0	5.2	19.4	18.8	20.4	36.5	56.5	13.4	36.7
Olivetti M-20 Z-8001	1.3	4.0	8.1	8.5	9.6	17.4	26.7	1.6	11.5

Benchmark timings in seconds for a number of portable and non-portable micros. Timings are for standard benchmarks using default variable type.



Until I discovered Euribon, I was just a girl around the office.

So when I told him about their incredible range of computer and office supplies (all covered by guarantee) our computers, word processors and typewriters suddenly came to life. So did I. Now we have lunch together.

Euribon cannot be beaten for quality, customer service or price over their comprehensive range of products.

A single source of supply whatever the hardware.

euribon

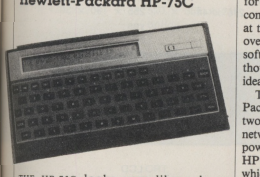
Customer Service Dept., The Euribon Organisation, Barker Gate House, Barker Gate, Nottingham NG1 1JY
Tel: Nottingham 0602 57676 Telex 377510

● Circle No. 178

What's available?

Portable computers are highly competitive: we compare the market leaders.

Hewlett-Packard HP-75C



THE HP-75C looks very like a large calculator, but inside is an eight-bit custom-made HP processor, 16K of CMOS RAM expandable to 24K, and 48K of ROM containing a very full Basic and an extensive operating system. It is probably no accident that from the outside, with the single-line 32-character LCD display and the slightly scaled down QWERTY keyboard as the main visible features, none of this power is apparent. Unobtrusive design is a Hewlett-Packard hallmark, as is the substantial price: at nearly £700 for the lowest-cost configuration the HP-75C is by no means cheap.

The HP-75C weighs under 2lb. (0.7kg.) and at 10in. by 5in. is about the size of a notebook. In maximum power-drain mode it can run off its own internal batteries for around 30 hours, which means in normal use data can be retained in memory for three or four weeks without having to recharge.

Backing storage is provided by hand-pulled cards, each holding 1.3K using both sides of the card. Reading or writing involves pulling the thin magnetic strip rapidly through the small slot to the right of the space bar.

For mass storage a highly reliable battery-powered digital cassette drive holding 128K per cassette is available for £393. With the addition of the HP battery-powered 24-column thermal printer costing £354 the HP-75C becomes a complete portable system. HP does not itself provide a Modem for use in Europe but is collaborating with independent suppliers to bring one out.

The built-in calendar/clock is well supported by the operating system, allowing you to enter appointments so that the machine beeps and displays reminders when they are due. More impressively, named programs can be auotmatically set running at scheduled days and times.

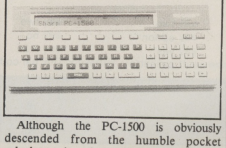
Data, programs and appointment details are all treated as named files by the HP-75C operating system, and share the same space, so there is no arbitrary limit on the number of programs or other files that can be concurrently in memory. Programs can also be stored permanently in ROM. Three slots for 16K plug-in modules are located very compactly beneath the keyboard. Tiny slots at the side of the keyboard allow keyboard overlays to be clipped in place, all keys being software redefinable. A lot of detailed thought has gone into making the machine ideal for turnkey applications.

The HP-75C is fitted with the Hewlett-Packard Interface Loop, accessible through two small sockets at the back. This is a network interface specially designed for low-power consumption devices, introduced by HP with the HP-41C calculator/computer, which has sold over 500,000 units. HP is the world's seventh-largest computer manufacturer and a huge supplier of specialist scientific and engineering instruments. So in addition to full-size monitors, plotters and printers, the HP-75C can be linked to a full range of HP instrumentation and larger HP computers.

Although the HP-75C is expensive, it is likely to appeal to people who have already come across the HP name in their work and who are prepared to pay for the reputation and flexibility it appears to offer.

For more information contact Hewlett-Packard Ltd, King Street Lane, Winnersh, Wokingham, Berkshire. Telephone: Reading (0734) 784774.

Sharp PC-1500



Although the PC-1500 is obviously descended from the humble pocket calculator its size and portability are desceptive. The slim box is smaller than a paperback and will fit in a jacket pocket, but inside is a fairly substantial Basic computer.

The Sharp is likely to inherit the pocket calculator's user base: it will be used mainly by scientists and engineers, as well as a number of businessmen. Unlike the calculator, the PC-1500 can be programmed in Basic and programs can be kept in the non-volatile RAM. The basic machine has 3.5K of user RAM which, thanks to the peculiar way the Sharp stores programs and data, can be designated as either variable-storage space or as program storage space.

High arithmetic precision is often called for in this kind of product; divide 22 by 7 and π is approximated to 10 significant digits, more than enough for most people.

The most significant feature of the Sharp pocket-computer system lies not in the computer itself but in the CE-150 expansion pack. This costs another £150 and provides the user with a surprisingly high-resolution four-colour graphics printer. Up to 220 plotting points across the width of the tally-roll printer paper are allowed. The paper is only about 2in. wide but some sophisticated graphics can be generated.

The CE-150 also provides an interface which allows two cassette recorders to be connected to the computer for file handling. There is some software available on cassette for the PC-1500, both from Sharp and from Microl. The use of the interface tends to give the batteries a bit of a hammering, especially when the printer/plotter is being used a lot.

The Sharp PC-1500 was reviewed in the August 1982 *Practical Computing*. For more information contact Sharp Electronics, Sharp House, Thorpe Road, Newton Heath, Manchester M10 9BE. Telephone: 061-205 2333.

Sord M-23P



The Sord M-23P is the most technically advanced of the portable computers covered in this survey, with two Sony 3.5in. microfloppy disc drives giving a total capacity of 580K, a Z-80 addressing 128K of RAM, a full keyboard and a very large LCD display. The display is over a foot long and can show eight lines of 80 characters.

CP/M is available now for £50, so the Sord is a full-feature machine like the Osborne or Zita, although it weighs a good deal less at 18.5lb. (8.5kg.). The only qualification to be made is that Sord is, at the moment, offering just the Lifeboat Associates version of CP/M, which opens up the Lifeboat range of software to users but is not compatible with all CP/M programs on sale.

Sord specialises in making computers, and holds the number-one slot in the Japanese

(continued on page 104)

The table on the following page is virtually self-explanatory. The figure given for the number of hours a machine can be run from its own batteries should be taken with a pinch of salt — it depends on what assumptions are made about the use of peripherals.

MACHINE	PC-1500	NewBrain AD	Epson HX-20	HP-75C	Zi
manufacturer	Sharp	Grundy	Epson	Hewlett-Packard	IT
where made	Japan	U.K.	Japan	U.S.	U
PORTABILITY					
weight	0.38kg.	1.5kg.	1.75kg.	0.7kg	1
dimensions (mm.)	195 × 86 × 26	275 × 155 × 49	289 × 216 × 44	255 × 130 × 30	5
battery?	yes	option	yes	yes	n
hours at max. power	50	1.25	50	30	–
PROCESSOR/MEMORY					
CPU	custom eight-bit CMOS	Z-80A, 4MHz	twin eight-bit CMOS	custom eight-bit CMOS	Z
standard RAM	3.5K	32K	16K	16K	6
maximum RAM	7.5K	2Mbyte	32K	24K	5
standard ROM	16K	29K	32K	48K	8
maximum ROM	16K	2Mbyte	64K	96K	1
DISPLAY					
type	LCD	vacuum fluorescent	LCD	LCD	C
size (mm.)	113 × 11	115 × 12	90 × 25	138 × 15	1
lines, characters	1, 26	1, 16	4, 20	1, 32	2
graphics	156 × 7 dots	optional	120 × 32 dots	graphics characters	y
KEYBOARD					
detachable?	no	no	no	no	x
layout and spacing	QWERTY, but close-spaced	almost QWERTY	QWERTY	QWERTY, but closer spaced click keys	C
numeric keypad?	yes	no	via shift lock	no	x
BUILT-IN FEATURES					
printer?	option	no	24 characters wide	no	n
calendar/clock?	no	no	yes	comprehensive	x
speaker?	yes	no	yes	yes	–
MASS STORAGE					
type	none	RAM	microcassette option	magnetic-card reader	u
capacity	—	as above	—	1.3K per card	1
hard disc?	—	no, but announced	no	no	6
INTERFACES					
RS-232	option	two	two	no	x
parallel	yes	option	no	no	c
networking facility?	no	yes	X-25	yes	n
other	cassette option	cassette	bar-code reader	HP-IL	–
ADD-ON PERIPHERALS					
large screen	no	yes	yes	yes	x
Modem?	no	yes	matching CX-20 Modem	not get in U.K.	x
other	—	floppy drive	floppy drive	all HP-IL instruments	–
SOFTWARE					
operating system	PC-1500 OS	NewBrain OS	Epson OS	HP-75 OS	
standard language	Basic	Basic	Basic	Basic	
special features	graphics facilities	compiled, 10 sig. digits	Microsoft, 16 sig. digits	12 sig. digits, E ± 499	
other software in system price	—	—	—	Money Manager and Nam List	
PRICE					
minimum configuration	3.5K RAM, 2.6K user RAM	32K RAM, 29K ROM with LCD	16K RAM, 32K ROM	16K RAM with card reade	
price	£169	£263	£402	£694	
other prices	printer & cassette I/F £149	battery unit £59, 256K RAM £285	microcassette drive £75	digital cassette drive £394	
COMMENTS	Calculator size and limited memory. Will appeal to scientists and engineers for its full Basic and optional clip-on printer — really a four-colour plotter.	Can be expanded to run CP/M with floppy drive for about £450, but not then portable. Memory expansion up to 4Mbyte possible. Likely to appeal to educationalists.	Aimed at business use in the field, will also appeal to enthusiasts. Light A4-size package, printer can do graphics. Basic fast for CMOS machine.	Powerful timing functions, file handling and extended Basic. HP-IL allows networking and connection to battery-driven peripherals and instruments.	

Zita	Osborne 1	Husky	M-23P	Scorpion
ITCS U.K.	Osborne U.S.	DVW Microelectronics U.K.	Sord Computer Systems Ireland	MicroAPL U.K.
13.2kg. 510 × 434 × 204 no —	10.7kg. 520 × 355 × 215 option 2	2kg. 241 × 203 × 44 yes 20	7.5-8.5kg. 438 × 392 × 131 no, but announced —	13.2kg. 510 × 408 × 204 12V DC option —
Z-80A 64K 512K 8K 128K	Z-80A 64K 64K 4K 4K	NSC-800 32K 144K 32K 64K	Z-80A, 4MHz 128K 128K 4K 4K	Motorola 68000, 16-bit 256K 1Mbyte — —
CRT 10in. diagonally 25, 80 yes	CRT 5in. diagonally 24, 52 32 graphics characters	LCD 141 × 41 4, 32 no	LCD 305 × 40 8, 80 64 × 640 dots	CRT 9in. diagonally 24, 80 option; 512 × 480 dots
yes QWERTY yes	yes QWERTY yes	no QWERTY, flat keyboard yes	no QWERTY yes	hinged QWERTY, ASCII and APL sets yes
no yes —	no — —	no yes yes	no no yes	no option —
up to three 5.25in.floppies 125K to 1Mbyte per drive 8 to 12 Mbyte	dual 5.25in. floppy 92K or 184K per drive no	CMOS RAM as above no	dual 3.5in. microfloppy 580K no	one or two 5.25in. floppie 720K or 1.2Mbyte per driv 10Mbyte
yes option no, but announced —	yes yes yes —	yes yes yes A-D converted	two yes yes three expansion slots	option option yes S-100 bus, four slots free
yes yes —	yes yes 80-column upgrade card	no yes bar-code wand	mono or colour monitor yes —	yes yes Ethernet option
CP/M Basic — Lexicom WP, Mars, Trendisc database, etc.	CP/M Basic CBasic and MBasic WordStar, Mailmerge, SuperCalc	Husky OS Basic — —	Sord OS Basic Pips spreadsheet database package	Mirage OS APL, costs extra 140K workspace 68000 macro-assembler, editor
64K, 125K floppy, software	64K, two 92K floppies, software	32K RAM	128K plus dual microfloppies	256K RAM, one 720K floppy
£995	£1,250	£1,983	£2,060	£5,950
with two 1Mbyte floppies £2,895	with two 184K floppies £1,375	£3,423 with 144K CMOS RAM	without LCD £1,560	APL plus training £1,200
Strong competitor to Osborne. ITSC prefers to sell you software from an approved list and loan you the machine free, but will sell. Maintenance included.	The machine that started it all for portables. Still inexpensive compared to other CP/M systems. Battery option weighs 1.8kg. and costs £175.	Rugged machine intended for harsh environments. Waterproof keyboard is software redefinable for turnkey applications. Large, protected CMOS memory.	Very modern hardware approach gives large memory and disc capacity in light package. Good graphics with Sord-supplied colour monitor.	Primarily intended to run APL, which requires a lot of memory, hence the 16-bit processor. Hard-disc version with tape streamer costs £9,950.

(continued from page 101)

microcomputer market, where the M-23P has sold very well. Much of this success the company attributes to Pips, which comes free with the machine along with a Sord-supplied Basic.

Sord promotes Pips as a high-level language to rival Basic, but Pips is better understood by comparing it to VisiCalc. In addition to manipulating rows and columns like the spreadsheet program, Pips can handle records of plain text. It has good sorting and searching facilities and can do simple graphs.

Sord software is very well integrated with the hardware. Strings of Pips commands can be associated with one of the M-23P's seven function keys and then executed as a batch job or program with a single keystroke. Files of Pips commands can also be built up, and in this respect Pips really is like a programming language. But unlike most programming languages routines can be developed interactively by watching what happens to data on the screen when a sequence of commands is entered from the keyboard.

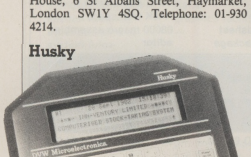
With a colour monitor the M-23P becomes an eight-colour machine. Pips turns out to produce colourful screens of data, which certainly gives it the edge over most spreadsheet programs. Unfortunately most colour monitors will not, at the moment, work with the M-23P, and the Sord-supplied one costs £500.

Other options available are a matching acoustic coupler and several Sord-supplied languages including Pascal, Fortran and Z-80 assembler. The word-processing program is well integrated with the hardware, using the function keys very effectively.

The Sord M-23P, like the other new Japanese machine the Epson HX-20, looks like a winner in its class. At £2,060 with the LCD it is reasonably expensive, but this is unlikely to deter people who require the features it offers. Pips is a very good package, and it is likely to become better known in February with the appearance of Sord's £99 home micro the M-5, which also offers both Pips and Basic.

For more information contact Socius Computer Systems U.K. Ltd, Samuel House, 6 St Albans Street, Haymarket, London SW1Y 4SQ. Telephone: 01-930 4214.

Husky



The Husky is substantially different from other portable microcomputers, mainly because of its application. It is a powerful Basic computer housed in a tough, metal, waterproof case. It can be supplied in a number of different ways, usually as a special dedicated machine with software in a protected area of RAM and a keypad specific to that function.

The Basic and operating system will often be opaque to the end-user, though this need not be the case. Its hefty construction makes it ideal for work in the harshest of environments, and it is even used by the services in battlefield conditions.

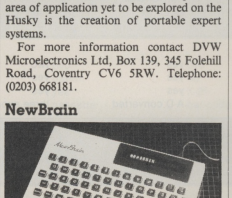
The Husky can be supplied in a leather case which can be slung over the shoulder. Its potentially very large internal memory of 144K means that large quantities of data can be stored in the computer at any moment. Data can be downloaded via the port on the end of the machine, and can be transferred to another computer. This can be done remotely using an optional acoustic coupler.

There are three levels of battery protection in the micro, making the data inside impossible to tinker with. The port means that it can be connected to items of equipment like meters, tills or data-loggers and read-in data. There is an internal clock, so software can be configured to make a note of what time a reading is made.

Current applications for the Husky mainly involve forms of data collection, from stock-taking in hotel bars to reading water meters and logging the movement of vehicles. The machine is equally at home on the high seas or in the middle of a desert. One possible area of application yet to be explored on the Husky is the creation of portable expert systems.

For more information contact DVW Microelectronics Ltd, Box 139, 345 Folehill Road, Coventry CV6 5RW. Telephone: (0203) 668181.

NewBrain



The NewBrain is a well-built micro, with a lot of components packed into a very small space. It comes in a number of versions all based on the same design, but adding LCD displays, battery packs and extra memory. The standard version has 32K of RAM and 29K of ROM.

The NewBrain has a real keyboard which is only slightly marred by the absence of a full-length space bar and the profusion of extra keys in that area. It is easy to type using the NewBrain, and the inclusion of batteries means that letters could be typed in on a train journey. One feature that is particularly good is the ability to use the NewBrain in conjunction with a monitor or TV.

Screen display formats allow 40 or 80 characters. The graphics package is impressive and allows high-resolution plotting with 640 by 250 pixels. Data and programs can be saved to tape at 1,200baud and standard cassette recorders can be used.

In addition to an extended version of the Basic language there is some optional ROM-based software. This will soon include CP/M, text processing, Comal, a Z-80 assembler and a statistical package. Memory can be added up to a total of 2 Mbyte.

The Grundy Newbrain was reviewed in the September 1982 *Practical Computing*. For more information contact Grundy Business Systems Ltd, Grundy House, Somerset Road, Teddington, Middlesex TW11 8TD. Telephone: 01-493 1901.

Epson HX-20



The introduction of the Epson HX-20 in 1982, a machine with a radically different specification to the Osborne 1 style of portable, has opened up a whole new sector of the portable-computer market with a different range of potential applications. The machine is only the size of three or four copies of *Practical Computing* stacked together, and weighs just under 4lb. It easily fits in a briefcase.

Into this small space Epson has managed to fit a full-size QWERTY keyboard with a good typing feel, a four line by 20 column LCD display, a 24-column plain-paper printer and an optional microcassette drive. Internally the system has twin eight-bit CMOS processors, 16K RAM expandable to 32K, and 32K of ROM containing a full high-precision Basic written by Microsoft and an extensive operating system. It also has a fully supported calandar/clock and a progammable speaker.

The machine is battery powered and can run for 50 hours without recharging in normal use. It looks substantial and could not possibly be confused with a calculator. Epson is unambiguous about aiming it at business use, but the price of £402 — £477 with the microcassette drive included — is bound to bring it to the attention of home users.

The operating system allows up to 10 programs to be simultaneously in memory. With both CMOS memory and the microcassette drive the machine is ideal for portable data capture and Epson is going for high-volume sales to field sales forces. Other obvious business applications make use of the built-in printer: Transam for instance has developed a payroll program for firms with

up to 50 employees, which prints out payslips and reports. The 16 significant-digit numeric precision of the Basic is very high, ensuring that the machine will also be looked at closely by scientific and engineering users.

The machine really comes into its own with the matching battery-powered CX-20 acoustic coupling Modem. Together with a fully expanded Epson it will fit into a neat briefcase, and allows field staff to transmit data back to base from any telephone. The Epson HX-20 is a potential job destroyer, for unlike a hobby machine or the executive's planning tool, a machine used in this way can eliminate jobs back at headquarters. Orders or meter readings can be typed by field staff directly into the machine and then transferred by phone or magnetic media to a larger machine. The paper stage is eliminated and with it, potentially, the jobs of the people employed to deal with it.

Epson has very rapidly established itself as the number-one supplier of dot-matrix printers worldwide, with around 60 percent of the U.S. market. A major supplier of LCD and print mechanisms to other suppliers — the Amber uses the same mechanism as the HX-20 — the ability of Epson to produce reliable equipment in high volumes is not in doubt. It looks as though 1983 will see a repetition of the Osborne 1 success story, with the Epson HX-20 getting a similar response in its own particular sector of the market.

For more information contact Epson U.K. Ltd, Dorland House, 388 High Road, Wembley, Middlesex HA9 5UM. Telephone: 01-900 0466.

Zita



Zita is a new name on the microcomputer scene. It is not so much a single machine as a range of portable microcomputers. The models in the range go from a £995 entry-level Zita-P system to a 13Mbyte portable with Winchester hard discs costing £2,895 and known as the Zita-PW.

Purchasers do not actually buy the Zita; it is "given away free". What they actually pay for is the software, and they are given the hardware to run it on. A number of interesting marketing ploys separate the Zita from other microcomputers. For example, heavy emphasis is placed on the "loan plan" designed to attract the business purchaser who might not want to tie up large amounts of capital in computers.

Other advantages of the loan plan — and incidently it is is the software that is on loan, not the hardware — include quarterly preventive maintenance and a nationwide servicing arrangement with a four-hour response. Software is updated regularly on such a scheme. The software that the user purchases or loans is chosen from a relatively long list, is all-British and runs under CP/M.

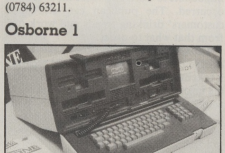
Comparisons with the Osborne micro are obvious, especially with the way the competing systems are being sold. Both companies are obviously aiming at the "fleet micro" market: large companies wishing to give every one of their managers a personal micro will buy either a Zita or an Osborne. The Osborne is sold with a standard set of software packages, while with the Zita you have a choice; the Osborne is but one machine, Zita is a range which can be upgraded.

The basic machine in the range is the Zita-P. It has an integral 10in. monitor, a QWERTY keyboard and a single 125K disc drive. Zita-P's extend right up to a three-floppy, 3Mbyte system at £2,095 and there are nine Zita-P models in all.

Software piracy is combatted through an identifying code embedded in the ROM of each machine. It is compared with a code on the disc and will only load into the right machine. To add a greater degree of protection — or interference, depending on how you view these matters — the Zita micros will only be able to use blank discs which have been formatted with this security code. If you want to buy non-British software to run on the Zita you have to pay the full cost of the software.

For more information contact Information and Technology Computer Services, 2 Kingston Road, Staines, Middlesex TW18 4PA. Telephone: Staines (0784) 63211.

Osborne 1



The machine that started it all: other computers might have been as portable earlier, but the Osborne was the machine that captured people's imagination and was, from the outset, sold as a portable. The Osborne 1 is a Z-80 based CP/M machine with screen, two floppy discs and a full-size keyboard, all in one box weighing under 24lb. All you need to add is a printer and you have a working data-processing centre for about £1,500.

Adam Osborne's other innovation was to include popular CP/M software in the price. With WordStar, Mailmerge, SuperCalc and two versions of Basic included in the price the machine is, in effect, almost free. To keep weight down some compromises have been made. The small screen has been much criticised, but we have never heard much complaint from anyone who actually owns an Osborne. Nevertheless 5in. diagonally translates into 3.75in. by 2.75in., which is not very big.

The 24 lines of 52 characters which can be shown on the screen can be used as a window on to a larger 32-line by 128 notional display area, but many people find it simpler when using WordStar to set the right margin to the 52nd character position while editing, and then reformat to the full width required before printing. The narrow screen is more of a limitation with the Spreadsheet program SuperCalc.

The version of the Osborne currently being shipped has been upgraded in subtle but useful ways. The case is now vacuum formed so the system looks neater, and ventilation has been improved so the Osborne will perform more reliably in hot climates. New double-density discs are available, giving 184K per drive instead of 92K. The original Osborne discs were incompatible with almost all other popular CP/M systems; the new double-density ones can read data discs from other systems, including the IBM PC, the Xerox 820 and some Cromenco machines.

The cost of the new Osborne, with two 184K discs, is £1,375; a disc-upgrade kit for existing Osborne users is available for £125. After December 1982 the cheaper single-density version ceases to be available in the U.K., but to sweeten the pill further Osborne is offering dBase II free until mid-February 1983, along with the usual software. The other major enhancement to the Osborne 1 is the 80-column screen-upgrade card, available from early 1983 for approximately £150.

One day a completely new Osborne II will probably come along. Whatever it will look like, Osborne is doing a lot to correct the early difficiencies of the Osborne 1 and extend its life. As the best-selling portable in the CP/M class it will certainly be a hard act to follow.

For more information contact Osborne Computer Corporation U.K. Ltd, 38 Tanners Drive, Blakelands North, Milton Keynes, Buckinghamshire MK14 5BW. Telephone: (0908) 615274.

Scorpion



The Scorpion offers enormous power — at a starting price of around £6,000. It runs APL on the 16-bit 68000, and can support five users. For further information contact MicroAPL Ltd at 19 Catherine Place, Victoria, London SW1E 6DX. Telephone: 01-834 2687.

Stock answers

In the pub and hotel trade keeping track of valuable stock is vital. Della Bradshaw has been down in the cellars to see how a portable micro can help the publican.

ONE OF THE MANY complaints launched against software packages is that they are written by programmers and not by people who know about the job involved. No such accusation could be levelled against the Inn-Ventory package, designed to do stock-takes in bars, clubs, hotels and even greyhound tracks.

Inn-Ventory is the brainchild of Dennis Clifford who has a long history of hotel management behind him. In 1977 he gave up managing a four-star establishment in Bristol to open his own hotel, and in 1979 he opened up a second one. Up to that point, he claims, his only dealings with computers were through staff in his hotels who used them for doing things like accounts. One headache he found when he started running his own businesses was bar stock-taking.

Clifford's main gripe about manual stock-taking was the time it consumed. He was using a national firm of stock-takers, but as a general rule they took 10 days to pass the required information to him. The stock-takers also dealt with some of the big breweries and if they called them out at short notice Clifford's hotel had to wait two weeks for its information.

So Clifford decided he would be better off with a computer. He looked at micros like Apple, Pet and TRS-80, but preferred the Husky, a portable made by DVW Microelectronics.

Built for outdoors

The Husky is a hand-held computer which, if you did not know better, you would swear was Japanese. It was originally developed for the Severn-Trent Water Authority for use outdoors collecting data to track down the huge quantities of water that get lost somewhere between the resevoir and the household tap. Not surprisingly, it is completely waterproof.

The Husky seemed just what was needed in the bar stock-control line. If someone spills a pint of beer over it or if you fall down in a dark cellar the Husky is durable enough to take it.

Clifford set about specifying what he wanted the program to do. He based it on the manual stock-taking system, which means you can flick through from the bottles of lemonade to the barrels of real ale, updating stock where necessary. It is done by keying in the code number for each different kind of drink, like 100 for Bell's whisky or 129 for Gordon's gin. The machine does the rest.

Clifford was so impressed with the market potential for this kind of service that he set up his own stock-taking business, Inn-Ventory, as well as continuing to use the Husky in his own hotel. He now has 54 clients, including hotels, clubs, free houses and even a dog track, and employs four stock-takers.

He claims the benefits of a computer stock-take are numerous both for the stock-taker and the client. Firstly the stock-take can be completed on site by attaching a printer to the Husky. The publican then receives the information immediately rather than having to wait the customary 10 days or a fortnight. If anything has been left out of the stock-take, like two barrels of beer in the corner of a very dark cellar, the discrepancy will be immediately apparent and the stock can be rechecked. If the information does not arrive for another 10 days or so the stock will have changed and it will be well nigh impossible to work out where the oversight occurred. The publican can also spot customers' drinking trends and work out from that what to order.

The speed at which the stock-take can be carried out is surprising. Clifford reckons it takes only 45 seconds from the moment the information is keyed in to the moment when the Husky is ready to print out. With the manual system it takes about 2½ hours, so more stock-takes can be fitted in. Costs can be cut by about 15 percent.

The client is also left with an accurate stock record listing what is in stock down to the last 1/10 of a bottle. The stock value of it, an account in quantity and the value of what has been sold since the last stock-take, intakes, percentages and portable stock life can all be established within a morning.

Legal requirements

The only legal requirements for this kind of information are in the annual accounts: "The printout for my hotel is for my eyes only," says Clifford. "I let the tax people see as little as possible." But it is invaluable for keeping tabs on what is in stock. As Clifford says, "With a manual system we always used to take short cuts but not with the computer. It is all so quick and easy."

Clifford is confident he has made the right decision in opting for the Husky. It is easy to operate and can be used by non-computer buffs: "When I employed stock-takers I wanted people experienced in the hotel trade, not programmers. When I say the hotel trade I don't mean experienced stock-takers. The problem with them is they know all the tricks of the trade and can do deals with the clients."

The program runs on two main menus, the first for existing clients, the second for new clients. When dealing with a new client the stock-taker has to create codes first for the client and then for all the different types of drinks in stock. The stock codes are different from customer to customer. Once this is done, all the stock-taker has to do is key in how much of each of the coded beverages is in stock.

Tax wrangles

The information is also recorded on to an ordinary cassette, which is duplicated. One copy stays with the stock-taker and one copy goes into the main office. Each month's stock-take is recorded on one side of the cassette, so the firm keeps two months' information on every client at any one time. Clifford says he wants to keep it at that, "We don't want to get involved in any sort of legal or tax wrangles."

At the next stock-take the information is transferred back on to the Husky from the cassette, so that the closing figures for the last stock-take become the opening ones for the new stock-take. Anything the bar owner or publican has bought in since the last stock-take is keyed in using the agreed codes, and the stock on the shelves and in the cellar is typed in. With the two months' information plus the purchases keyed in, the machine can speed through the calculations and tell the client how much should have been taken in, what they need to buy, and whether things have gone missing or if someone has had their fingers in the till or the cellar.

Clifford appreciates the Husky's portability. It weighs less than 2kg. and after you have been round a greyhound stadium three or four times and in and out of all the various bars you begin to appreciate how light the machine is. It can be carried on the back or over one shoulder in the Irish leather shoulder bag which bears a remarkable resemblance to a lady's handbag.

The Husky runs on three sets of batteries. The main set are the alkaline type — much advertised by Duracell — which can be removed when the Husky is not in use. The second set are the mercury back-up batteries and the third set are the lithium batteries which are attached to the chip.

s from a Husky

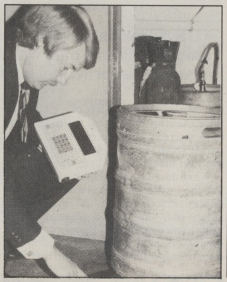
Clifford claims it is almost impossible for one of his stock-takers to erase any of the information by mistake, even when removing the main batteries.

Clifford is now thinking of buying an Osborne computer for use in the office — to complement the Huskies, not to replace them. "The Osborne still has to be plugged into the mains, not like the Husky which runs on batteries," he explains. "You have to leave it in the office — you cannot take it down into the cellars with you. If you wanted to use it for a stock-take you would have to write it all on a piece of paper and then go back up to the office and type it all in again.

Up to 144K memory

The Husky comes in anything from 32K to 144K versions. It can be plugged in to any kind of printer, and there are three options available for storing information picked up on site. The first of these is the cassette back-up as used by Inn-Ventory, the second is via a Modem down a telephone line to another computer, and the third is to dedicate the Husky to one site only and keep the information permanently in the machine's memory. This is the way the Husky is used by the Inn on the Park in London. It has a 144K version that keeps all the data from eight bars and a cellar, 893 stock items in all.

The Husky costs between £1,000 and £3,000 depending on the configuration, with the average sort of model costing around £2,000. The stock-taking software is additional to that. Inn-Ventory's stock-taking services come somewhat cheaper. A small bar, which takes about an hour to do, costs about £30 per stock-take, which is usually done once a month. Sales from a 40oz. bottle of whisky would bring in about the same, so if a member of your bar staff happens to be in the habit of expropriating the odd bottle of whisky the computerised stock-take really pays for itself. A two-bar pub costs about £50, a club £40 to £45 and hotels between £100 and £120, on average. Inn-Ventory also does the stock-take for a hotel with seven bars, and that costs a couple of hundred pounds.



Ballroom dancer

Having owned and managed hotels and started his own stock-taking company Clifford has now launched into the computer sales field, selling Huskies with the stock-taking program through his newest company, Inn-Ventory Computers. His clients range from Park Lane's Inn on the Park to Sid's Bar near Manchester, which was one of his first customers. Sid and his wife — who used to ballroom dance for Britain — use the Husky to keep track of things in their bar, wine bar and dance school.

The Husky's manufacturer is quick to point out that stock-taking is not its only use. So far over 70 applications have been developed for it, including several for the RAF. One of them tests airmen's reflex reactions under pressure: the Husky is programmed with several random multiple-choice questions and the unfortunate trainee is then sent off round an assault course clutching his computer. Every time the machine bleeps he has to answer one of the questions — a long-division sum, or something like that — as quickly as he can. The RAF's machines are housed in special khaki-coloured cases. If you happen to see one of these poor chaps dashing across a muddy field, responding to strange bleeps from a camouflaged box, then at least you will know what he is doing.



The Husky's rugged, go-anywhere capability was a key factor in Inn-Ventory's choice of machine.

They all laughed, but ...

The idea of a portable computer was dismissed by the industry. Who would want such a thing? Ian Stobie talks to Adam Osborne, the man who proved them wrong.

OSBORNE COMPUTER COROPRATION is one of the few new start-up companies to succeed in breaking through into the microcomputer big league. Apple, Tandy, Commodore and the other big-name companies have all been around since the earliest days of the microcomputer, and are only now being seriously challenged by the established giants of the large computer world, like IBM and DEC. As a new start-up company the scale and rapidity of Osborne's success is unique.

Only selling its first machine in June 1981, Osborne now claims 50,000 systems out with users, and a target turnover of one billion dollars by 1984 looks increasingly attainable: 1982 turnover will be around $100 million. The company is shipping 500 units a day from its two U.S. plants.

All this has been achieved on the back of a single product, the Osborne 1 portable computer. Weighing 24lb. including screen and twin disc drives, this mains-powered CP/M system costs £1,250 in the U.K. The price includes software, such as WordStar and SuperCalc, and a manual which rewrites in one compact volume all the necessary documentation.

When Adam Osborne announced his plans to set up a company to bring out the Osborne 1 he was greeted with much scepticism within the industry. Would people really want such a machine, even allowing for the low price and free software? Its runaway success in the U.S. demonstrated that they did and clearly Adam Osborne is the right person to talk to about what makes the portable computer market tick: "Portability is extremely important. Not so much because people want to hike across the country with a computer or fly around with it, but just to carry it from one room to another without having it all fall apart with wires and cables tangling up all over the place.

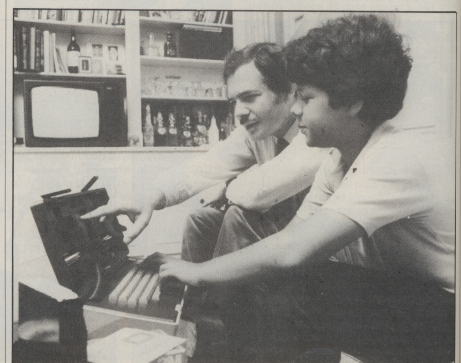
"We are going after a consumer market right now and there never really has been a consumer computer. Computers are still designed by people who are computer people. Now that can't go on for ever. If you want to sell microcomputers in the volumes that we are talking about you have got to start selling to Mr Joe in the street, who has absolutely no desire to own a computer but is buying the device for what it can do for him. They are buying a solution, they are buying a computer the way they might a typewriter, or a vacuum cleaner. That means it has got to have the level of reliability, be that easy to use, and be that easy to learn to use. They are never going to program the thing. It has got to be just solid, rugged and self-evident. We have come a long way but we have a way to go yet."

The Osborne is not everyone's idea of a portable computer: "as portable as a suitcase full of bricks" is one description. "The thing you've got to look at right now is not getting the weight of the machine down to one pound but the fact that the keyboard has to be large enough for normal fingers. And that sets one limit right there. Another limit is that you have got to have a screen that you can look at, and ours is about the bottom limit of that, you can't get much smaller than we have."

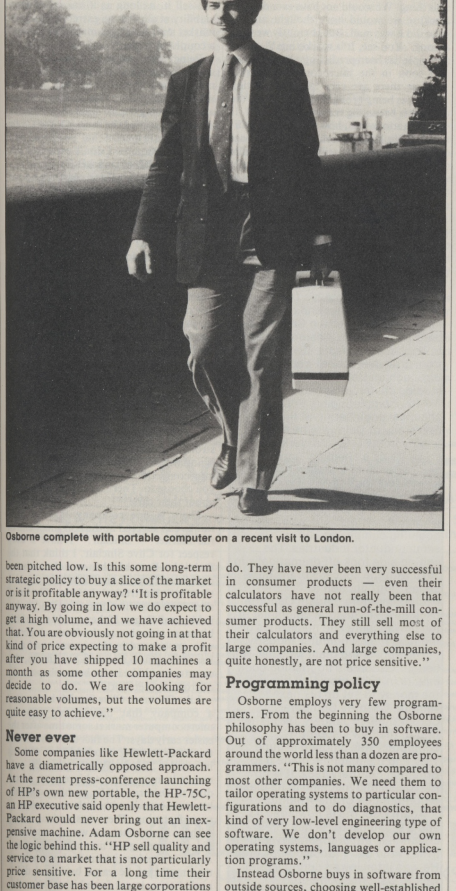
What does Osborne think of machines like the Epson, which has a liquid-crystal display of four rows of 20 columns and weighs only 4lb. "It is a different market again. You could not hope to do word processing on it or reasonably expect to do electronic spreadsheet work with that. But you could very reasonably expect to do scientific calculations — something that is computational intensive. In the days when I was a chemical engineer I would have had no trouble with a thing like that. I would have done nice little programs and watched them churn away.

"I had a Radio Shack pocket computer with a single-line display I ended up giving to a friend of mine, a civil engineer, he loves it."

Osborne prices have from the outset



Adam Osborne, son Paul and the Osborne 1.



Osborne complete with portable computer on a recent visit to London.

been pitched low. Is this some long-term strategic policy to buy a slice of the market or is it profitable anyway? "It is profitable anyway. By going in low we do expect to get a high volume, and we have achieved that. You are obviously not going in at that kind of price expecting to make a profit after you have shipped 10 machines a month as some other companies may decide to do. We are looking for reasonable volumes, but the volumes are quite easy to achieve."

Never ever

Some companies like Hewlett-Packard have a diametrically opposed approach. At the recent press-conference launching of HP's own new portable, the HP-75C, an HP executive said openly that Hewlett-Packard would never bring out an inexpensive machine. Adam Osborne can see the logic behind this. "HP sell quality and service to a market that is not particularly price sensitive. For a long time their customer base has been large corporations who want to make sure that the thing is reliable and does the job it is supposed to do. They have never been very successful in consumer products — even their calculators have not really been that successful as general run-of-the-mill consumer products. They still sell most of their calculators and everything else to large companies. And large companies, quite honestly, are not price sensitive."

Programming policy

Osborne employs very few programmers. From the beginning the Osborne philosophy has been to buy in software. Out of approximately 350 employees around the world less than a dozen are programmers. "This is not many compared to most other companies. We need them to tailor operating systems to particular configurations and to do diagnostics, that kind of very low-level engineering type of software. We don't develop our own operating systems, languages or application programs."

Instead Osborne buys in software from outside sources, choosing well-established standard software. "Occasionally where we knew that the software we needed didn't exist we went out and instigated it. SuperCalc was our invention. We went to Sorcim and said do this program for us and they did. But in most cases the software does already exist."

But will it continue to exist as the market grows? Will there ever be a software crisis? "No. I'm quite certain it will continue to exist in excess because everybody is busy writing programs, and even though most of it is junk it doesn't take but two or three percent of the people writing programs to produce something useful, and we are all in good shape."

But do they produce things that can be picked up and used readily by people new to computers? "That is the difference between the one that succeeds and the one that does not."

Obsolescence

CP/M is now getting to be an old operating system, and might be seen to be coming to the end of its life. Osborne does not think so. "I argue it is not coming to the end of its life, and the reason it is not is that it is still perfectly adequate for everything people try to do with it. The end-user can frankly see little or no difference between a program written under CP/M and a program written under a far more efficient operating system. This is the big difference from having an obsolete machine, like the Apple II, where the user will see very definitely the price/performance difference, and won't continue to put up with 40-column displays, wires all over the place or boards for this, that and the other. These are perceived differences. You can say that CP/M is an obsolete operating system but there is no perceived difference. And as for the programmers, they don't care, they are interested in what can sell. They might yell and bitch but then take Basic, which was an obsolete language in 1969, but it is adequate. The end-user doesn't see the difference so it survives."

Where does Unix fit in? "Unix is significant because in the 16-bit world there is no leader. CP/M-86 is around but it certainly hasn't dominated the 16-bit world, nor has any other operating system done so yet, and one of them is going to. Unix stands a damn good chance.

"In fact in many ways once you start getting down to these consumer computers, once you start loading it up with features you hurt yourself, you don't help yourself. I've got a couple of favourite sayings with regard to software. One of them is 'Better is the enemy of good'; the other one 'Adequacy is sufficient, everything else is irrelevant'."

The Osborne approach is to satisfy 90 percent of the users' needs rather than come unstuck trying to attain 100 percent. "Far the most important thing is making the product something the user is not intimidated by. You start telling the user to buy this machine because you can be run-

(continued on next page)

They all laughed, but ...

(continued from previous page)

ning three programs at once and you will lose the user. He doesn't want that. He is confused, he wonders if he will ever learn to use the son-of-a-bitch. He will go and get something nice and simple instead."

Adam Osborne derives his certainty about what the user wants from his experience as a journalist. His syndicated column "From the Fountainhead" appeared in many of the new magazines appearing in the United States as the micro boom began. He was widely read by people in the semiconductor and computer business as well as new users. He exposed widespread fraud in the computer-kit business, where customers were sold dud components which they would assume they themselves had damaged while assembling the kit. Osborne stopped writing the column in 1980 when he set up Osborne Computers.

How does Adam Osborne go about deciding what the user now wants from his company. "I would say it is the obvious filtered through my feel for the way the industry is going. A lot of it is obvious — I mean we want more capacity on the diskettes, we want bigger screens with larger displays, we want lower cost, we want lower weight. A lot of this stuff is very straightforward."

Osborne is not very worried by the competition the Osborne 1 is beginning to run into. "As they are following us they have to find a different niche on one side or the other, or else try to beat us on price. Beating us on price has got to be a losing proposition. In order to beat us on price they have got to be able to come in and hit the high volumes as quickly as we did or bankroll, with the assumption that they are going to have significant losses for some time."

But some companies might indeed be prepared to bankroll a new product, particularly the large Japanese companies. Is Osborne impressed with the Japanese performance so far? "Not right now. Give them time, when the new-product cycle slows down sufficiently so that if it takes you three years to develop a product and you still have a winner, then the Japanese are going to be formidable. We have that much time.

"The point is that the Japanese are as perplexed and bewildered by us in America as we are by them. We have been approached by some of the major manufacturers in Japan, wondering if there was a possibility of some kind of joint venture, because they have looked at our product and said 'My God, we are sure we can build this thing. We would not have ever done so because we would have thought anyone who did it was mad. But obviously we were wrong.' You see, it is marketing."

Apple has been predicting a major shake out soon in the microcomputer market because there are very large production capacities being brought into play, and the market is becoming reasonably defined. If this scenario is true, how will Osborne survive? "We have to achieve a large base now. The market is still in a transitional phase for a few more years. Now I am not particularly concerned about shake outs at the moment, the reason being that however large the microcomputer market may appear right now I doubt if it's 10 percent of what it potentially will be. So again for a few more years if you can build it you can sell it, as long as it has any form of viability at all. It is an extremely forgiving market still. It will get much less so within a couple of years."

Being first into a new market carries with it some risks. But Adam Osborne is not worried about pioneering a concept which other people then exploit. "I have and I am being copied and I should be. The more I am copied the more people say this is a legitimate market that we should pay a lot of attention to. I don't expect to keep 100 percent of this market."

When in two or three years time a very large base of Osborne products has been established, what is to prevent pirated copies or look-alike machines of a legitimate nature coming along and taking that user base? This is already happening with Apple to some extent. "The point is that they are always going to be somewhat behind us. If they actually directly copy our boards we can get them because the law does protect us there, but if they come up with something that is functionally equivalent we can't. It is just up to us to market better, distribute better, and manufacture more cheaply, which I think we can do."

Organisation not innovation

Osborne is not putting his trust in technical innovation, but in building up a strong organisation. "That's right. There is nothing to stop you or anyone else going into competition with General Motors if you choose to. There is nothing innovative about their cars."

There is one company that Osborne thinks can succeed at the consumer end of the market — Sinclair. "I have a deep respect for Clive Sinclair. I think that the British Establishment has been unbelievably naive and incredibly stupid in the way it has treated the man. The lot of them have less sense than Clive Sinclair has in his small finger. If they would pay a little bit more attention to the few such people who are around in this country and a lot less attention to disasters like Inmos, this country would be in far better shape in the microcomputer world."

Like Osborne, Clive Sinclair has created a company that has broken into the microcomputer market some time after the easier early days. The fact that Sinclair did this after running into problems with his innovative Black Watch product only makes it more of an achievement, according to Osborne. "His problem was that he went into it with little experience of manufacturing. There was nothing wrong with his ideas, what was wrong was that he did not have a good manufacturing team. And it is a real testimony to the tenacity of that man that he came back and did it again having learnt from his mistakes, this time letting Timex build for him."

Osborne cannot understand why

Since Osborne was born

Adam Osborne was born in Bangkok of British parents. He spent his early childhood in India and Thailand, where his father was a journalist, teacher and counter-missionary, converting Christians back to Hinduism. Adam was sent to England to be educated, and from grammar school went to Birmingham University where he studied chemical engineering.

After completing his PhD in chemical engineering at the University of Delaware he decided to stay in the U.S. and worked for six years as a chemical engineer before deciding to commit himself fully to computing.

He set up Osborne Associates in 1970 to provide programming and technical writing services to the booming computing and semiconductor industries. The writing side took off dramatically in 1975 with the success of his book series "Introduction to Microcomputers". Adam Osborne became an influential columnist in the newspapers and magazines of the new microcomputer industry.

The publishing giant McGraw-Hill bought Osborne's flourishing book empire in 1979, providing him with the money to set up his next venture, Osborne Computer Corporation, in January 1981. The first of the new Osborne 1 computers was shipped in June 1981 and the machine made it to Britain in February 1982. It is now the top-selling machine in its class on both sides of the Atlantic.

Adam Osborne is now aged 43 and a U.S. citizen. He has three children, is about to remarry and lives in the San Francisco Bay area. He was interviewed during a brief visit to Osborne Computer Corporation's U.K. base at Milton Keynes.

Sinclair has so little recognition in his own country. "I was just reading over the weekend an interview that Prince Charles gave. He was talking about how he wants to be able to instigate innovation. Prince Charles should just go and look at Clive Sinclair and see what that guy is doing. It is going on over here right under the man's nose. But because he doesn't fit the exact model — I don't know what he has done — but for some reason the British Establishment has decided that he doesn't know what he is doing. The man is going to sell half a million computers this year. And this is a guy who they wrote off a few years ago because he had a good idea but no one would give him the manufacturing backing to finish it off. As far as I am concerned the man is brilliant."

A bunch of whores

At the opposite end of the market what does Adam Osborne think is going to happen with the very large computer companies. Some, like NCR and Burroughs, have not yet established a strong base in the micro market.

"I think all of those companies are ultimately going to look for their own entry into the personal computer market, in one form or another. The market for very big computers is obviously going to be quite stagnant in comparison to the market for very small computers. These guys have a lot of cash. And it's a question of them figuring out what they want to do. A lot of us in the microcomputer world are a bunch of whores, we all have our price."

Does this mean that an offer to buy Osborne would be accepted? "We all have our price. If they came along and offered me two billion dollars for it right now — where's the contract? I think the chances are more likely that we would go public first."

Stocks and shares

Osborne is not yet a quoted company. This means that whether or not the company is bought out now, once Osborne Computer Corporation goes public Adam Osborne as a major shareholder stands to become very rich. And not just Osborne himself, some 200 out of the 350 or so employees have stock options, which would probably net them tidy sums as well. "You normally have to be in the company six months before you have a stake in it so the international employees, apart from some of the senior managers, are not very well represented as stockholders.

"The way a stock option works — it is something that has been established under American law as an incentive program — is that you are given the right at any time in the future to buy shares at some fixed price, and in a rapidly growing company by the time you get to execute that option usually the fixed price is negligable compared to the current market value. In that way you in effect get the shares free.

"Some of the kids who came in really way up at the beginning can finish up with substantial sums of money. By American law stock options have to be limited to somewhere in the region of 15 percent, and that is around where we will be by the time we go public."

McGraw-Hill bought Adam Osborne's previous company Osborne Associates which published books mainly by Osborne himself, such as the bestselling series "An Introduction to Microcomputers" and "Running Wild". Osborne now has no involvement in publishing, but is writing a novel. "I'm just proofing the manuscript. I haven't got a title for the book yet. I have a theory that history has cycles, and that we are on the way out of the present cycle of democracy into a new autocratic era of stability where nothing changes. And this will happen because, given the changes we have seen through technology in the past two decades, people are going to come to the point where they are willing to trade in their expectations and hopes for something better, in exchange for a guarantee of what they have got.

"People will rebel against technology. They will accept what exists but they will except nothing new, and there will be no more technical innovation. People will shun democracy for autocracy. They will once again accept Lords, Barons in some countries, and corporate dictators in others because that is the price of stability.

"I think the world is completely out of control now."

SOFTWARE FOR CP/M®

HIGH QUALITY SOFTWARE – WITH HIGH QUALITY SERVICE

★ **NEW THE FORMULA £300. Application Builder and Reporter. SPELL STAR £125. Option for Wordstar. SUPER CALC £165. Spread Sheet financial planning.**

WORDSTAR - Professional word processing software. On-screen formatting, wordwrap, pagination, line and character count on view. Micro-justification on daisy-wheel printer. Search and replace. Block/paragraph manipulation. External file read/write. Background printing during editing etc.	£250
MAIL-MERGE - Powerful Wordstar enhancement for file merging and document personalisation.	£65
DATASTAR Screen orientated system for Data Entry, Retrieval and Updating.	£175
SUPERSORT - Sort, merge and selection program.	£125
CONFIGURABLE BUSINESS SYSTEM (CBS) - Unique information management system with user definable files, powerful report generator, menu-driven for ease of use. No programming experience necessary!	£225
ACCOUNTING PACKAGES by Median - Tec: PAYROLL, SALES, PURCHASE, NOMINAL Specially developed by UK software house to exacting specifications. Written in Microsoft Basic each package may be customised by end user, all are widely used. Ledgers are open item. Payroll caters for weekly and monthly pay.	£300 each
PROJECT COST CONTROL/JOB ACCOUNTING - A comprehensive set of programs to monitor budgets, account for expenditure and project completion etc. Ideally suited for contractors. Written in CBASIC-2.	£150
STATISTICS PACKAGE - Over 25 routines including Regression & ANOVA	£100
MATHS PACKAGE - Over 40 easily used routines.	£100
IBM - CP/M COMPATIBILITY - Powerful utility to transfer data to/from IBM machines in standard disk format.	£110
MICROSOFT BASIC INTERPRETER	£155
MICROSOFT BASIC COMPILER	£205
MICROSOFT FORTRAN COMPILER	£205
MICROSOFT COBOL	£310
MAGSAM - Versatile easy to use Keyed File Management System for Microsoft Basic or CBASIC.	£130
CIS - COBOL - ANSI '74 implementation to full level 1 standard. Supports random, indexed and sequential files, features for conversational working, screen control, interactive debugging, program segmentation etc.	£425
FORMS-2 - Automatic COBOL code generator for screen formats.	£100
PASCAL-2	£255
STRUCTURED BASIC - Relocatable compiler	£160
CBASIC-2 - Extended Disk Basic pseudo compiler and run-time interpreter.	£75
SELECTOR III - C2 - Information management system written in CBASIC-2	£185
SELECTOR IV - Upward compatible version of III with enhanced reporting.	£300
BSTAM - Telecomms facility for exchanging files between CP/M computers.	£110
ASCOM - Facility for communicating with other computers.	£95
TRANSFER - CP/M to CP/M file exchange - telecomms source code	£9
MACRO 80 - Macro Assembler	£99
CP/M 2.2 - Standard Version 8" Single Density.	£99

Please contact us for availability of other products
All orders must be PREPAID. Add £1 per item P & P (Minimum £2.00) and VAT
CP/M is trade mark of Digital Research

TELESYSTEMS LTD

P.O. Box 12, GREAT MISSENDEN, BUCKS, HP16 9DD

Telephone (02406) 5314

● Circle No. 180

Diamonds are

As the rain pattered fitfully against the window of my den I decided I couldn't add any further improvements that evening to the longest program I had attempted so far. The clock insisted the time was after midnight, unaware of the passing hours since seven o'clock I had spent testing and debugging. Tomorrow, Sunday, I would run through it once more with a fresh mind. I gave my head a quick shake and sampled the coffee Dee had brought in. She had just returned home, having spent the evening with friends. For the first time I realised she had recently been out more often than usual, and getting back later.

Sipping the coffee, one of those decaffeinated brands by the taste of it, I reflected on the superb service I had received from my micro supplier. When I had decided finally to go ahead and buy a system, justifying the expense on the grounds of business, I had shopped around extensively. I must present a somewhat vague profile to a retailer, maybe because I am one myself. I did not seem to be able to impress on the people I spoke to that I really wanted more than just a good package for my trade as a jeweller. After some weeks of looking without success I went along one evening to a small exhibition held at a glossy, plasticky motel on the outskirts of town. There I met Harry.

He struck up a casual conversation as I was trying my uncertain hand at a long-established model. At first I thought he was one of the team responsible for the show, but then I noticed he had no name card pinned to his lapel. Nevertheless, within minutes he was showing me what the machine could and couldn't do. When an official demonstrator approached, Harry deftly offered to buy me a drink. Intrigued by his manner and his obviously extensive knowledge of the micro world, I agreed.

Harry Vesey operated his own little microware outfit. He openly admitted that since he was not big enough to organise a demonstration evening of his own he simply invited himself to other people's and sold from there. We both laughed. The machine I had been looking at was, Harry advised, excellent for my purposes.

During our second round of drinks Harry tactfully suggested I should take some tuition if I was to get the best out of my purchase. Not only could he supply the equipment at a good discount he could, for a reasonable fee, provide an at-home tuition package lasting for a month. Nothing would be left out.

"How can you offer both a strong discount and low-fee instruction?" I asked him. It was the first time anyone had offered me such a service.

"Because I want you to be a satisfied customer," he replied. "By pleasing retailers like yourself I am getting free advertising. Retailers see many different customers daily, and some of these customers will also be looking for a computer. You mention my name — *et voilà*!" A boyish grin spread over Harry's face. His explanation seemed plausible enough to me, and anyway I had decided I liked the man. I wrote him a cheque for the deposit while he ordered a third round.

by Brian Williams

Harry was true to his word almost to the point of being overwhelming. There was so much to work through each evening — such exciting, rewarding programs and games. Harry came three evenings a week to put me right on any difficulties and to leave a fresh batch of material for me to have a go at. He paid particular attention to my business routines and stock control but advised me to relax more with games.

I had attended evening courses at the local college so I wasn't completely computer illiterate before I met Harry, yet these classes had not shown me anything like the work he brought. Some of it he had written himself — it had a refreshing sparkle to it and a difficult-to-describe depth, a sort of extra dimension. Harry was destined to go places.

Fortunately Dee was very understanding about my new interest and she either went out or was content to watch television in the lounge at the rear of the flat. My only misgivings arose from the fact that it was the busy season, December, and I ought to be concentrating more on the business with its influx of extra stock and special orders.

I had inherited the jeweller's shop from my uncle after having worked for him since leaving school. It was an old-established business in a prime trading position and it had weathered recession well. All the same, there were times during the slack periods of the year when I had to admit to boredom. At least my new computer provided plenty of mental exercise, often until the small hours — I hated a program to get the better of me.

Earlier in the week I had been to collect some digital watches from an out-of-town wholesaler who had let me down on delivery. Next to his warehouse there was a computer-software mart, and as I had been driving for two hours on the morotway in freezing rain I felt a quick browse round was forgivable.

It was a curious place, which gave the impression that micro software had been around since the turn of the century. I was faintly reminded of those quaint little shops selling old books you sometimes squeezed into odd corners of market towns. A dusty cassette almost hidden at the back of a clutter shelf of "clearance-offers" caught my eye, mainly because of its title. It was a game called "Diamonds are for ... ". The label on the plastic cover promised the game would run on my machine so I bought it, before steeling myself for the journey home through the winter gloom.

I had completely forgotten about the cassette until a query on a customer's ring had meant a frantic search for the alterations note. Hunting through the glove compartment of the car I found the cassette. Now, as I drank Dee's awful coffee, I was giving the game a swift run through. At first I found the idea novel; a ture-to-life game — or so it said on the clever graphics — offering all the excitement of being a baddy.

"Plan your very own jeweller's raid," it announced, before a flashing display recorded that the program had been written by HVC Realware some two years previously. I duly entered the required information concerning the type of place I wished to raid. Being a little tired I simply typed in the details of my own premises, then sat back and played.

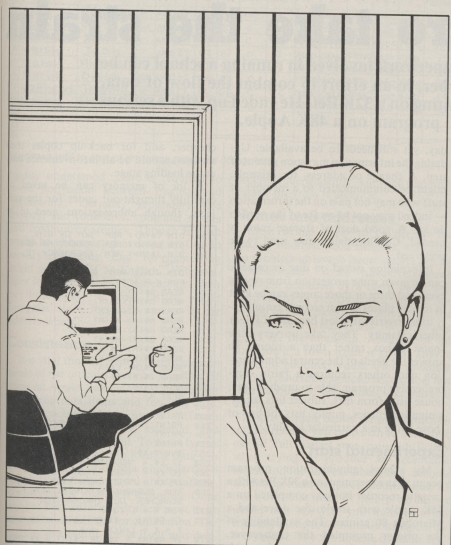
As the game proceeded I experienced an attack of *déjà vu* — paramnesia I believe it's called — or perhaps it was just too many late nights. Anyhow, I had the sensation that I'd seen it all before. Then I became distinctly uneasy and ill. Suddenly I was exhausted, my eyelids were heavy and my breathing grew laboured.

Somewhere in my intestines an oxy-acetylene cutter began to work away. Everything was at an exaggerated distance but larger than life. This was something more than too many late nights. I tried to play on. The cutter was now working its way down through my body, and I knew if I tried to stand I would collapse. The screen flashed the next question for me to answer, though I could barely make out the green text.

Then, without warning, a crystal-clear image leapt out of the increasing darkness of my brain. The shock of it provided me with a few extra moments of meagre

efor...

"Plan your very own jeweller's raid," announced the display. Being a little tired I duly entered the required information, basing the details on my own shop.



strength. I had to write a message, even with arms of lead and a telegraph pole for a pen. Write before the lights went out.

Dee cautiously returned to the den half an hour after she had brought the coffee. Quietly she approached the desk where her husband lay slumped next to his keyboard. Good, the potion had had its effect. In fact the whole scheme had worked beautifully right from the start. Harry had said it would.

Harry certainly knew what he was talking about and he knew how to treat a girl. The charm behind that boyish grin. A tingle of nervous excitement passed through her. Tomorrow Harry would be seeing a man who was going to give them a good price for the contents of the jeweller's shop — and then, zoom! Out of the country, lost in the Christmas holiday bookings. New Year in the sunshine.

An unconscious habit of always switching off electrical equipment made her lean over the computer. On the desk she spotted an almost unreadable message written in felt- tip pen: Dee, for God's sake press Return. She was startled. Obviously she had not appreciated the full extend of her husband's obsession with the damn thing. All the same, she reflected, maybe she owed him this much. And anyhow, what was there to lose?

She found the Return key and jabbed at it. The screen filled up with flashy patterns. Another futile computer game, she thought impatiently, but as the title came up her interest grew. "Come away with a fortune," the screen tempted. Make all the correct decisions and give all the right reasons. One incorrect decision and you are out."

The machine told Dee that all the necessary data had already been entered, what she was watching was a summary of play so far: successful decisions accompanied by the right choices in reasoning. The questions and their responses rolled over on the screen, the first ones under a heading Method Outline.

Q: direct break-in?
R: no, security too good.
CORRECT DECISION
Q: manager manipulation?
R: no, business managed by owner.
CORRECT DECISION
Q: direct proposal to owner to falsify insurance claim?
R: no, owner honest.

Then the next question.

Q: access through owner's wife?
R: yes, bored and flirtatious.

Dee's eyes narrowed as the text continued.

Befriending the owner gaining his confidence and knowledge about the business had been covered, so had saturating him with his hobby during a trading peak. Even the early parts of the actual haul had had successful passes awarded, as had the immobilisation of the owner by the accomplice, in this case the owner's wife.

The screen then announced the conclusion of the summary and the resumption of the game proper. A flood of graphics followed. Dee felt like shaking the VDU to hurry it along.

When the new question finally arrived, Dee caught her breath.

Q: dispose of accomplice now? Type Y/N

After staring at the screen and its flashing prompt for many minutes Dee, hand trembling, gingerly pressed the N key. There was an agony of delay, followed by the blunt reply

INCORRECT DECISION — LOSE GAME

By way of consolation the machine confided that the end score suggested a well above average power of reasoning but insufficient criminal cunning. It went on to mention there would be no explanation of the incorrect decision judgement as this might spoil the player's next attempt. But Dee hardly noticed. Just at that moment she didn't need explanations.

The sun was warm , the Bacardi cool, the beach even better in reality than the brochures depicted. She decided she rather liked being alone. There were always plenty of young men falling over themselves to pay for the night life, but during the day it was far more pleasant to laze around near the swimming pool or on the beach without having to fall in with someone else's plans. Ah, the freedom.

Momentarily she recalled the look of astonishment and sheer disbelief on Harry's face as the potion took hold. Dee wondered what the early January weather was like back home, though not for very long.

School admin:
let a micro take the strain

The volume of paperwork involved in running a school can be endless. T A Forber, in an effort to combat the flow of data, started experimenting on a 32K Pet. He ended up with a serious program on a 48K Apple.

IN THE LARGE secondary schools a considerable amount of information is held by people such as central administration, heads of house, year tutors and form tutors. Much of it is duplicated and a good deal of it rarely or never sees the light of day, yet still needs to be available. Updating the information may soon get out of step. A change of address, for example, might be communicated to a member of staff who may not pass on the information — indeed may not be aware of the need to do so. A good deal of storage room is needed. Confidentiality may need to be preserved.

Information stored on disc or cassette can be given some protection from prying eyes, and three or more copies can be kept in remote places so that records are unlikely to be irretrievably lost because of fire or other calamity. They take up very little space: a box rather than a room. To answer the needs of the central administration and others requires a fairly comprehensive program able to produce, say, house lists, form lists, subject lists for examination entries, pupils' lists, or lists of those living in a particular locality.

School administration.

```
 20  PRINT "THIS IS CODE CONTROLLE
     D"
 23  PRINT "TO CONTINUE ENTER THE
     "
 26  PRINT "CORRECT CODE"
 29  INPUT CD$
 32  GOTO 791
 35  PRINT "DOYOU WANT ANY INSTRUC
     TIONS ?"
 38  PRINT "ANSWER  Y  OR  N
                "
 41  INPUT Z$
 44  IF Z$ = "Y" THEN 65
 47 D = 1
 50 M = 2
 53 Y = 67
 56 I = Y * 10000 + M * 100 + D
 59 O = D + 10000 + M * 100 + Y
 62  GOTO 122
 65  PRINT "IF A CERTAIN DATE IS"
 68  PRINT "OF INTEREST RELATIVE"
 71  PRINT "TO THE AGES OF THE  "
 74  PRINT "PUPILS  ENTER  THAT  "
 77  PRINT "DATE.(E.G.01,02,67) "
 80  PRINT
 83  PRINT "OTHERWISE TYPE IN   "
 86  PRINT "   ANY  DATE        "
 89  PRINT "EXACTLY AS ABOVE    "
 92  PRINT
 95  PRINT "   ALWAYS PRESS     "
 98  PRINT "      (RETURN)      "
101  PRINT "  AFTER ANY ENTRY "
104  PRINT "      YOU MAKE     "
107  PRINT
110  PRINT "TYPE 'END' TO CLOSE D
     OWN"
113  INPUT D,M,Y
116 I = Y * 10000 + M * 100 + D
119 O = D + 10000 + M * 100 + Y
122  PRINT "I = "I
125  PRINT "O = "O
128  PRINT
131  REM  CLASSLIST
134 N = 81
140  DIM S$(N): REM  SURNAME
143  DIM C$(N): REM  FORENAME
146  DIM O$(N): REM  OTHER INITIA
     LS
149  DIM F$(N): REM  YEAR FORM
152  DIM D$(N): REM  DAY OF BIRTH
155  DIM M$(N): REM  MONTH
158  DIM Y$(N): REM  YEAR
161  DIM A$(N): REM  ENGLISH
164  DIM B$(N): REM  MATHS
167  DIM G$(N): REM  OPTION 1
170  DIM H$(N): REM  OPTION 2
173  DIM P$(N): REM  OPTION 3
176  DIM Q$(N): REM  OPTION 4
179  DIM R$(N): REM  OPTION 5
182  DIM V$(N): REM  HOUSE NAME/N
     O.
185  DIM U$(N): REM  STREET
188  DIM L$(N): REM  DISTHICT(LOC
     ALE)
191  DIM T$(N): REM  BOY OR GIRL
194  DIM N$(N): REM  PARENT MR MS
197  DIM J$(N): REM  EMERGENCY TE
     L.NO.
200  DIM W(N): REM  RETRIEVAL
203  FOR K = 1 TO N
206  READ S$(K)
209  READ C$(K),O$(K)
212  READ F$(K),D$(K)
215  READ M$(K),Y$(K)
218  READ A$(K),B$(K)
221  READ G$(K),H$(K)
224  READ P$(K),Q$(K)
227  READ R$(K),V$(K)
230  READ U$(K),L$(K)
233  READ T$(K),N$(K)
236  READ J$(K)
239  NEXT K
242 X = 0
245  PRINT
248  PRINT "WHAT ITEM OF DATA ?"
251  PRINT
254  PRINT
257  INPUT X$
260  IF X$ = "ADDRESSES" THEN 671
263  IF X$ = "AGES" THEN 530
266  IF X$ = "END" THEN 9999
269  REM  SURNAME OR STREET NAME
     SEARCHES  OUT INFORMATION
272  FOR K = 1 TO N
275  IF S$(K) = X$ OR U$(K) = X$ THEN
     X = X + 1:W(X) = K
278  IF N$(K) = X$ OR C$(K) = X$ THEN
     X = X + 1:W(X) = K
280  IF L$(K) = "NLW" THEN L$(K) =
     "NEWTON-LE-WILLOWS"
281  NEXT K
284  IF X ( ) 0 THEN 290
287  GOTO 359
290  PRINT "IS PRINTOUT WANTED?"
293  PRINT "ANSWER  Y  OR  N   "
296  INPUT PR$
299  IF PR$ = "Y" THEN 308
302  IF PR$ = "N" THEN 311
305  GOTO 242
308  PR# 1
311  PRINT
314  PRINT X$
317  PRINT
320  FOR K = 1 TO X
323 L = W(K)
326  PRINT
329  PRINT S$(L);: TAB( 13)C$(L);"
     ";: TAB( 28)O$(L);" ";
     M$(L);" ";Y$(L);: TAB( 37)F$(
     L)
330  PRINT : PRINT : PRINT
332  PRINT A$(L);: TAB( 8)B$(L);: TAB(
     16)N$(L);" ";S$(L)
335  PRINT G$(L);: TAB( 8)H$(L);: TAB(
     16)V$(L);" ";U$(L)
338  PRINT P$(L);: TAB( 8)Q$(L);: TAB(
     16)L$(L)
341  PRINT R$(L);: TAB( 16)J$(L)
344  PRINT
```

Experimental start

My school administration program began as an experiment on a 32K Pet with a cassette recorder but was completed on a 48K Apple with single disc drive and a Microline 80 printer. The availability of the printer prompted the changeover, though additional memory was also vital.

Different schools have different needs, and this program can be modified to suit them and the needs of a particular school or a particular microprocessor.

Unaltered the program will deal with about 160 pupils with 20 items of information per pupil. A school with more than this number in a year would probably be organised in, say, four houses and each house could be programmed separately. To do this it may be possible to use an append technique to attach each data list to the working part of the program which would thus have to be written only once. However, appending can itself require more memory than would be needed for an individual listing. The processor gives no indication when it has insufficient memory to merge two programs or data.

The program can, in principle, cope with a school of five years organised in four houses of 160 pupils making a total of over 3,000. With triplicate copies, up to 30 discs might be needed. Cassettes would be cheaper, and for back-up copies their slowness would be an inconvenience only at the loading stage.

A lot of memory can be saved by carefully thought-out codes for the subjects, though abbreviations need to be

(continued on page 117)

S	SURNAME	FORENAME	Other Initial	Year/House Form	BIRTH D	BIRTH M	BIRTH Y	English O, C, OC, N	Maths O, C, OC, N	OPTION SUBJECTS 1	2	3	4	5	Number or House Name	Road Street Lane etc	Locale District or Town	Boy or Girl	Mr, Mrs or Ms + Forename	Emergency Phone OR Contact
	Jan 1981																			
1	Lyon	James	P	AL2	02	11	66	OC	OC	ARTO	DOMC	CMPO	MISC	BLOG	18	VISTA AVE	NEWTON	BO	Mr PETER	64392
2	Lyon	June	GA	AN3	14	03	67	O	O	HBLO	TYPO	COMO	MISO	BLO	2	ACORN ST	NEWTON	GI	Mr William	64278
3	Makinson	Kevin	-	AN2	09	06	67	C	OC	POMC	TYPC	COMC	ENDC	PHYC	144	BARTON AVE	NEWTON	BO	Mr. Enid	Home
4	Marsh	Jean	-	AN2	27	02	67	O	O	BLLO	CHMO	FRNO	GEOG	PHYO	79	BARTON AVE	"	GI	Mr PETER	64295
5	Marsh	Michael	W	AL1	24	02	67	O	O	ARTO	FRNC	SOLO	GEOG	ECNO	23	Sheffield Rd	Nettlingham	BO	Mr. James	64721
6	Martin	David	B.	AN2	03	06	67	O	O	FRNO	GRMO	LATO	GEOG	HBLO	36	Liverpool Rd	Newton	BO	Ms Elizabeth	69334
7	Mathews	Timothy	G	AN2	17	12	66	C	OC	DOMC	CHMC	COMC	MISC	BLO	14	Walton Dr	"	BO	Mr William	64196
8	Melling	Elizabeth	-	AL1	12	12	66	C	C	FRNC	GRMC	LATC	BLLC	CHMC	13	Newton Rd	Melling	GI	Mr Ernest	Home
9																				
10																				
11																				

Specimen infil to part of proforma ready for computer.

readily understood. Care is required to avoid confusion between English and engineering; German, geography and geology; and commerce, computer studies and community studies. Though English might be abbreviated at Lang or Lit, an unwary user seeing "Eng" for engineering might still read it as English. Abbreviations for Street, Road, Crescent, etc. must be those that the Post Office would recognise since they will appear in the address labels.

Consistency

It is vital that data entry is consistent in terms of the order of entry and spelling. If using an Apple, commas must be used for separating data items and for that only. Other machines may use a different delimiter. Consistency is essential, and correct spelling is helpful. To assist typists who may be involved in loading data it is useful to have a proforma which carries a key showing the permitted abbreviations, not necessarily with their meanings. Once one has been carefully drafted most large schools have facilities for duplication. The exercise is a useful one in itself and decisions made may be absolutely final. A change of mind will be very unpopular after a large amount of data has been entered.

During the long process of preparing the program and in the much longer one of loading data on a total of 286 pupils I learnt that a lone operator works much less efficiently than a pair working together. Apart from taking longer for initial entries, errors more readily creep in causing possibly huge time wastage in the ensuing search. Worse still, errors may remain hidden while users think they are being provided with correct listings. The program carries a useful protection against this possibility: the tally given at the end of each list can be used to check that a combination of lists has the correct grand total. For example, a list of those born in each month should list everyone in 12 runs. Before attaching any data to the working part of the program several copies of it should be stored so that each may be dedicated to a year or house who may then proceed independently, knowing that each master program is identical.

Names and addresses

Most strings likely to be needed for names, addresses and subjects will cause no problem although house names can be cumbersome: some have telephone numbers preceded by a town name and followed by an extension. A string like this should be entered as a continuum with the single letter E to signify that the remaining digits are the extension. Always look up the code if a town name is given. That is what an enquirer would want to know anyway, and the telephone system does not take account of any pauses you make in dialling.

Pupils' middle names are only shown as initials though you may wish to alter this; use of full names may cause difficulty when trying to produce an acceptable tabulation for address labels, and accommodating them requires modification of the workhorse part of this program. It would also apply if you want to avoid entering a long town name in string L$ for every pupil. The town name could be coded and a short subroutine inserted to modify the labelling carried out by lines 740 to 773.

Input is incorrect

Running the program causes a request for a code to be entered. Input of an incorrect code stops the program. Any string of letters can be your code. It must be fed in at line 791 to replace Tmol. If you do not wish to use this simple access protection simply delete lines 20 to 32.

Lines 47 to 53 input the default date February 1, 1967. If instructions have been asked for at the program's request, line 44, the user is asked to insert any date. The format of the response is important, and is shown on the screen. Should you renumber this program using Apple's renumber this date will be dealt with as well as the line numbers. It would be necessary to adjust lines 56, 59, 116, 119, 587 and 590 to enable the program to deal correctly with listing pupils over a certain age.

Lines 122 and 125 are not vital to the program but cause the numbers to appear on the monitor screen. The numbers should show the date as day, month, year and year, month, day. This shows that it is running and allows you to check that the date has been correctly dealt with. Even if the date is not correct the program will continue unless you key in

```
END
```

At line 134 you must have the correct value for N, which must be the number of pupils whose data has been entered. The computer uses this as a partial check that data has been entered completely. When I was building up the data file I repeatedly updated this so that I could run the program every so often to test that all was well.

Remember the day

Lines 140 to 200 allocate space in memory for the 20 pieces of information, and of course the order is important. Day, month and year must be separate strings for the Ages routine to work. In line 182 a number is preferable to a house name. In any case, do not use both for fear of producing extra commas.

Seven subjects are allowed for but this could be modified provided other consequential adjustments are made at lines 206 to 236, 275, 278, 329 to 341, 362 to 377, 437, 440, 452, 455, 509, 659, 725, and 755 to 761.

While the processor is reading in data from the disc or tape it will appear to do nothing for a minute or so and will then prompt with:

```
WHAT ITEM OF DATA?
```

The user must then key in one of the following:

Addresses — which is followed by a prompt for each form name as required. The response None closes this down and returns to What Item . . .

Ages — which is followed by a prompt to accept the data already there or to substitute another before the list of all born before the chosen date is produced

End — closes down completely.

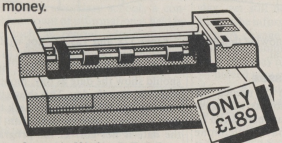
A pupil's surname — to list all pupils of that name.

(listing continued on page 117)

Follow us to MICROAGE ELECTRONICS for printer value



At Microage you can now get the very best value in microcomputer printers. We've selected only the best printers available so you can choose confidently, knowing you're getting the best value for money.



The Incredible AP80

The AP80 is probably the world's LOWEST COST, compact 80-column graphic dot-matrix printer available.

It can produce single and double width characters and has the ability to produce any pattern through its dot-matrix capability.

The AP80's robust construction and its unique "unihammer" make it an extremely cost effective and efficient printer.

Its features include

80 Cols 30 cps ● Dot Matrix Unihammer action ● 96 ASCII standard characters ● Up to 8" paper width ● Upper and lower case ● Double width printing ● Standard interface: Centronics

The Amazing AP100

Big brother to the AP80 the AP100 is a wider more sophisticated version of the AP80 with a full graphics capability and the ability to take standard width computer stationery, the AP100 is an ideal choice for anyone with a microcomputer.

Its features include:

80 cols 30 cps ● Dot Matrix Unihammer action ● 116 ASCII standard characters ● Full graphics capability ● Up to 10" paper width ● Upper and lower case ● Double width printing ● Centronics interface: ● Friction feed. Only £215.



The Outstanding MX80 FT Type 3

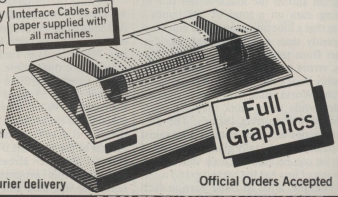
The MX80 is a flexible, high quality and extremely reliable graphic, dot matrix printer.

Its superb performance is due to a number of outstanding features. High resolution graphics, a wide range of type sizes, a quality 9 x 9 dot matrix head and up to 132 chars per line are just some of the exceptional features on this ideal printer for microcomputers. Only £390.

Specifications

132 cols 80 ● Logic-seeking, Bi-directional printing ● 9 x 9 Dot matrix printhead ● 96 ASCII standard chars with descenders ● Full graphics capability ● Several type sizes ● Automatic underlining ● Standard interface Centronics ●

Interface Cables and paper supplied with all machines.



Free courier delivery **Official Orders Accepted**

MICROAGE ELECTRONICS
135 HALE LANE EDGWARE MIDDLESEX HA8 9QP TEL: 01 959 7119 TELEX 881 3241

DEALER ENQUIRIES WELCOME
CALL 01-959 7119
FOR TRADE PRICES

● Circle No. 181

(listing continued from page 115)

```
347  PRINT
350  NEXT K
353  PRINT X" IN THE LIST "
356  GOTO 242
359  FOR K = 1 TO N
362  IF A$(K) = X$ OR B$(K) = X$ THEN
       X = X + 1:W(X) = K
365  IF C$(K) = X$ OR M$(K) = X$ THEN
       X = X + 1:W(X) = K
368  IF M$(K) = X$ OR F$(K) = X$ THEN
       X = X + 1:W(X) = K
371  IF L$(K) = X$ OR P$(K) = X$ THEN
       X = X + 1:W(X) = K
374  IF Q$(K) = X$ OR R$(K) = X$ THEN
       X = X + 1:W(X) = K
377  IF T$(K) = X$ THEN X = X + 1
       :W(X) = K
380  NEXT K
383  IF X ( ) 0 THEN 389
386  GOTO 242
389  PRINT "DO YOU WANT PARENT'S#"

392  PRINT "NAME OR TEL. NUMBER?"

395  PRINT "ANSWER  Y  OR  N    "

398  INPUT TL$
401  IF TL$ = "N" THEN 473
404  IF TL$ = "Y" THEN 413
407  GOTO 242
410  PRINT
413  PRINT "IS PRINTOUT WANTED?"
416  PRINT
419  PRINT "ANSWER  Y  OR  N    "
422  INPUT PR$
425  IF PR$ = "Y" THEN 434
428  IF PR$ = "N" THEN 437
431  GOTO 242
434  PR# 1
437  PRINT X$; TAB( 18)"EMERGENCY
       "
440  PRINT  TAB( 18)"TEL.NUMBER"
443  PRINT
446  FOR K = 1 TO X
449  L = W(K)
452  PRINT  TAB( 5)N$(L); TAB( 18
       )J$(L)
455  PRINT F$(L);" "1S$(L); TAB(
       18)C$(L);" "1D$(L); TAB( 32)
       D$(L);" "1M$(L);" "1Y$(L)
458  PRINT
461  NEXT K
462  PRINT
463  PRINT
464  PRINT X" IN THE LIST "
467  GOTO 242
470  PRINT
473  PRINT "IS PRINTOUT WANTED?"
476  PRINT
479  PRINT "ANSWER  Y  OR  N    "
482  INPUT PR$
485  IF PR$ = "Y" THEN 494
488  IF PR$ = "N" THEN 500
491  GOTO 242
494  PR# 1
497  PRINT
500  PRINT X$
501  PRINT
502  PRINT
503  FOR K = 1 TO X
506  L = W(K)
509  PRINT F$(L);" "1 TAB( 5)S$(L); TAB(
       15)C$(L);" "1D$(L);" "1 TAB( 32)
       D$(L);" "1M$(L);" "1Y$(L)
512  NEXT K
515  PRINT
518  PRINT X" IN THE LIST "
521  PRINT
524  GOTO 242
527  - 700
530  PRINT "AT PRESENT A LIST IS"

533  PRINT "READY LISTING PEOPLE"

536  PRINT "BORN BEFORE "Q
539  PRINT
542  PRINT "DO YOU WISH TO      "
545  PRINT "GO ON, USING THIS DAT
       E ? "
548  PRINT
551  PRINT " ANSWER   YES OR NO
       "
554  PRINT
557  PRINT
560  INPUT W$
563  IF W$ = "YES" THEN 605
566  PRINT "WHAT DATE DO YOU     "
569  PRINT "WISH TO USE ? *NOTE!*
```

(continued from page 115)

A street name — to list all living in a particular street.

A parent's forename, — including Mr or Ms — to list those of same forename, along with other information.

A subject code — to list all taking that subject in whatever option

A pupil's forename — to list those with that forename.

A telephone number — to locate the person having that number.

Home — to list those having no telephone; I inserted the word "home" where no telephone number had been supplied.

Bo or Gi — to list boys or girls in alphabetical order for any particular house or year.

Declaration needed

The program will again show no signs of anything happening as it sorts out your request. It may then proceed by asking if you want printed lists. In each case it will wait for you to key in Y or N. Each listing should end with a declaration of how many are in it.

Data must be entered precisely. The exact number of items including blanks — for example, no middle name and 19 commas must be entered following the line number and the word Data not followed by a comma. No abbreviation should be less than two letters. So use Bo for boy and Gi for girl.

Asking for addresses when these are to be printed straight on to the commercially available sticky labels may need closer examination for spacing. Any necessary increase in spacing can be achieved by the adding of extra Print statements between lines 761 and 773.

Another possible snag is that some parents have different surnames from their children. In such cases courtesy demands that labels be written separately and for wrong ones which the stupid computer has printed to be removed.

This program has some advantages over bought ones. It can be stored on either tape or disc and it can be modified. The disc drive is not required after the program and data have been loaded; in any case only one disc drive is required.

Loading data

The working part of the program must be keyed in with some care, but whatever program you use and whatever its cost you still have the much bigger task of loading all the data for each pupil.

To avoid the need to update everything at the end of each school year string F$ should use a letter for the year rather than a number: this year's fourths in my listing have labels such as AN1, AL2, etc, the letter A signifying fourth year. Next year they will be fifths, but still carry the label A on the computer.

If the program is also to be used for sixth forms the number of subjects listed for each pupil may be reduced. If so it would be necessary to remove some of the Dim

(continued on page 119)

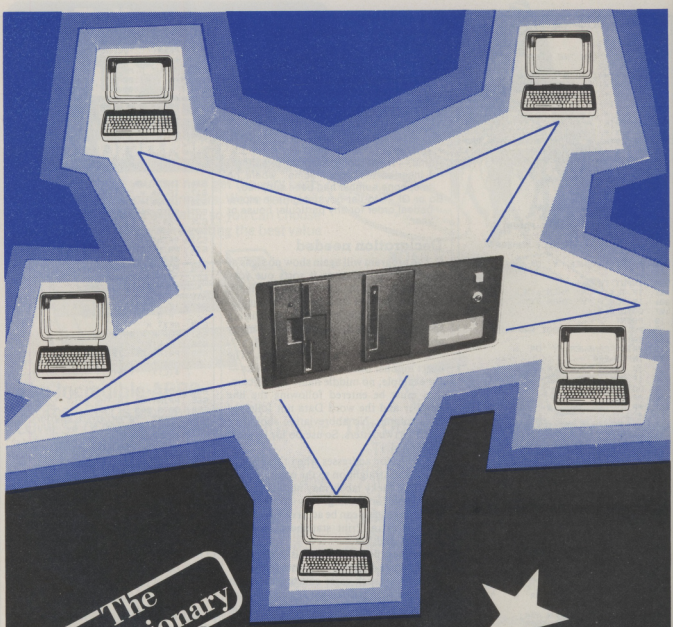
```
572  PRINT "4TH MAY 1968          "
575  PRINT "MUST BE ENTERED AS!--
578  PRINT "  04.05.68            "
581  PRINT
584  INPUT D.M.Y
587  I = Y * 10000 + M * 100 + D
590  Q = D + 10000 + M * 100 + Y
593  PRINT " I = "I
596  PRINT " Q = "Q
599  GOTO 605
602  PRINT
605  PRINT "IS PRINTOUT WANTED? "

608  PRINT
611  PRINT "ANSWER  Y  OR  N     "

614  INPUT W$
617  IF W$ = "Y" THEN 626
620  IF W$ = "N" THEN 635
623  GOTO 242
626  PR# 1
629  X = Ø
632  PRINT
635  PRINT "THESE HAVE BIRTHDAYS
       BEFORE "Q
638  FOR K = 1 TO N
641  J = VAL (Y$(K) + M$(K) + D$(
       K))
644  A = I - J
647  IF A ) Ø THEN X = X + 1:W(X)
       = K
650  NEXT K
653  FOR K = Ø TO X
656  L = W(K)
659  PRINT S$(L)! TAB( 14)D$(L)!"
       "1D$(L)! TAB( 27)D$(L)!" "M
       $(L)!" "1Y$(L)! TAB( 38)F$(.
       )
662  NEXT K
665  PRINT X" IN THE LIST "
668  GOTO 242
671  PRINT "IS PRINTOUT WANTED?"
674  PRINT "ANSWER  Y  OR  N     "
677  INPUT PR$
680  PRINT
683  PRINT
686  PRINT "TYPE IN A FORM NAME "

689  PRINT
692  PRINT "WHEN THE FORM HAS BEE
       N"
695  PRINT "LISTED THEN NAME AND#
       HER"
698  PRINT "ONE.  WHEN ALL YOU WA
       NT"
701  PRINT "HAVE BEEN DONE TYPE '
       NONE'"
704  INPUT K$: IF K$ = "NONE" THEN
       242
707  IF PR$ = "Y" THEN 716
710  IF PR$ = "N" THEN 719
713  GOTO 242
716  PR# 1
719  X = Ø
722  FOR K = 1 TO N
725  IF F$(K) = K$ THEN X = X - 1
       :W(X) = K
727  IF L$(K) = "NLW" THEN L$(K) =
       "NEWTON-LE-WILLOWS"
728  NEXT K
731  IF X ( ) Ø THEN 740
734  PRINT "NO DATA FOUND!#E-ENTE
       R OR NONE TO LEAVE THIS SEQU
       ENCE & END TO START OVER"
737  GOTO 704
740  PRINT "--------------------
       --------------------"
743  FOR K = 1 TO X
746  L = W(K)
749  PRINT
752  PRINT
755  PRINT N$(L)!" "1S$(L)
758  PRINT V$(L)!" "1U$(L)
761  PRINT L$(L)! TAB( 26)F$(L)
762  PRINT "MERSEYSIDE"
764  PRINT
767  PRINT
770  PRINT
773  PRINT "--------------------
       --------------------"
776  NEXT K
779  PRINT
782  PRINT X" IN THE LIST "
785  PRINT
788  GOTO 704
791  IF CD$ = "TMO-" THEN 35
794  GOTO 9999

*9999 END
```



The revolutionary

SuperStar system

From

Bromley COMPUTER CONSULTANCY

MULTI-USER, MULTI-PROCESSOR SYSTEM with choice of 8 bit or 16 bit processors intermixed

- CP/M 2.2 or CP/M 86 Operating System.
- S100, modular, flexible and proven hardware expandible to 16 users.
- Each user has Z80A or 8086 processor, RAM and 2 i/o ports.
- Disk storage capacity from 10 to 80 M Byte with tape backup.
- File/record locking printer spooling supported.
- Full range of application software available e.g. WP, Accounts, Stock etc.

For further details please contact:-

Bromley Computer Consultancy, 417-421 Bromley Road, Downham, Bromley, Kent BR1 4PJ
Tel: 01-697 8933 Telex: 896691 TLXIRG.

OEM DEALERS ENQUIRIES AND OVERSEAS ENQUIRIES WELCOME

SuperStar is a trademark of Bromley Computer Consultancy. CP/M is a trademark of Digital Research.

● Circle No. 182

Make up.

```
100  REM :MAKEUP
110  LET N = 40
120  LET EE$ =  CHR$ (4): REM  CTRL-D
130  DIM S$(N): REM SURNAME
140  DIM C$(N): REM FIRST NAME
150  DIM Z$(4): REM FOR SORT
160  INPUT "NAME THE FILE";FD$
170  CALL  - 936: VTAB 8: PRINT "IF CLOSEDOWN WANTED ANSWER 999"
180  INPUT "HOW MANY ON FILE ?";Q2
190  IF Q2 = 999 THEN  END
200  INPUT "HOW MANY TO BE ADDED?";L2
210  LET M = Q2 + 1: V = Q2 + L2
220  IF V ) 40 THEN 730
230  FOR K = M TO V
240  INPUT "SURNAME     ";S$(K)
250  INPUT "FIRST NAME ";C$(K)
260  PRINT
270  NEXT K
280  CALL  - 936: VTAB 8: PRINT "HERE IS A SUMMARY OF YOUR ENTRIES
     "
290  FOR I = M TO V
300  PRINT S$(I); TAB( 12)C$(I)
310  NEXT I
320  INPUT "ARE THEY TO BE FILED";YN$
330  IF  LEFT$ (YN$,1) = "Y" THEN 360
340  CALL  - 936: VTAB 9: INPUT "THEY ARE WIPED OUT";RY$
350  GOTO 170
360  PRINT EE$;"OPEN D";FD$;",L3"
370  PRINT EE$;"WRITE D";FD$;",R1"
380  PRINT V
390  PRINT EE$;"CLOSE D";FD$
400  PRINT EE$;"OPEN";FD$;",L40"
410  FOR K = M TO V
420  PRINT EE$;"WRITE";FD$;",R";K
430  PRINT S$(K): PRINT C$(K)
440  NEXT K
450  PRINT EE$;"CLOSE";FD$
460  PRINT EE$;"OPEN";FD$;",L40"
470  FOR K = 1 TO V
480  PRINT EE$;"READ";FD$;",R";K
490  INPUT S$(K): INPUT C$(K)
500  NEXT K
510  PRINT EE$;"CLOSE";FD$
520  CALL  - 936: VTAB 8: PRINT "FILE ";FD$;"CONTAINS"
530  VTAB 12: HTAB 20: PRINT V
540  VTAB 14: HTAB 16: INPUT "RECORDS";RY$
550  LET X = 0
560  CALL  - 936: VTAB 9: HTAB 16: PRINT "SORTING"
570  FOR I = 1 TO (V - 1)
580  LET J = I + 1
590  IF S$(I) + " " + C$(I) ) S$(J) + " " + C$(J) THEN X = X + 1: GOTO
     610
600  GOTO 640
610  LET Z$(1) = S$(J):Z$(2) = C$(J)
620  LET S$(J) = S$(I):C$(J) = C$(I)
630  LET S$(I) = Z$(1):C$(I) = Z$(2)
640  NEXT I
650  IF X ) 0 THEN X = X - 1: GOTO 570
660  PRINT EE$;"OPEN";FD$;",L40"
670  FOR K = 1 TO V
680  PRINT EE$;"WRITE";FD$;",R";K
690  PRINT S$(K): PRINT C$(K)
700  NEXT K
710  PRINT EE$;"CLOSE";FD$
720  CALL  - 936: GOTO 740
730  CALL  - 936: VTAB 9: PRINT "TOO MANY"
740  INPUT "START AGAIN. PRESS (RETURN) ";RY$: GOTO 170
```

Pick up.

```
100  REM  PICKUP
110  LET EE$ =  CHR$ (4)
120  LET N = 40
130  DIM S$(N): REM  SURNAME
140  DIM C$(N): REM  FIRST NAME
150  DIM W(N): REM   RETRIEVAL
160  CALL  - 936: VTAB 8: INPUT "WHAT FILE DO YOU WANT ?";FD$
170  PRINT EE$;"OPEN D";FD$;",L3"
180  PRINT EE$;"READ D";FD$;",R1"
190  INPUT V
200  PRINT EE$;"CLOSE D";FD$
210  PRINT EE$;"OPEN";FD$;",L40"
220  FOR K = 1 TO V
230  PRINT EE$;"READ";FD$;",R";K
240  INPUT S$(K): INPUT C$(K)
250  NEXT K
260  PRINT EE$;"CLOSE";FD$
270  CALL  - 936: VTAB 9: PRINT "HERE ARE THE RECORDS"
280  FOR J = 1 TO V
290  PRINT S$(J); TAB( 12);C$(J)
300  NEXT J
310  END
```

(continued from page 117)

and corresponding Read statements along with some of the Print instructions. A simpler way is to feed blanks into the Data statements, not forgetting the comma after each blank.

The line numbers are close together to keep the working part below 1000 so that each year may have a block with an identifiable first digit. The line numbers associated with pupils are also close together for the same reason. There is still room for the insertion of data relating to any new arrival, but use a renumber routine if the gap closes.

Proforma error

The partly completed proforma shown on page 115 includes an item which is out of order. The operator entering it would enter the wrong one with a line number that would be put in correct alphabetical order, as would a new arrival. Again use renumber and start any renumber only where needed.

Where address labels are produced at lines 740 to 773 it will be necessary to put in the county name. It is presumed to be the same for everyone and is not included in the data. It appears in the program at line 762 — Merseyside in this case.

Lines 280 and 727 are important in this instance since the address of my school, is a long name which is abbreviated in the data to NLW. The program picks this out of the Data and corrects it. The position of the line within the loop is important but the technique is simple and can be used to cope with other long items in the data.

The next step in developing the program will be to add in a checking subroutine after line 800 with access available from a point early in the program to provide a high degree of self checking. It will be necessary to feed in the permitted abbreviations associated with each string to be read, and to test for oddities which would include mis-spelling or typing errors. Because the data entries under subjects will consist of three-letter codes with O,C,N or OC attached, testing will done best by extracting only the first three characters using the micro's Left string extraction technique followed by a similar If-Then statements as is used to print out an abbreviation in full.

The abbreviations used represent, in order, the following subjects: art, biology, business studies, chemistry, computer studies, commerce, cookery, domestic science, design, economics, environmental biology, environmental studies, engineering science, French, geometrical engineering drawing, geography, geology, German, history, home and child care, human biology, language (English), Latin, literature (English), metalwork, music, non-examination, needlework, physical education, physics, religious knowledge, shorthand, technical drawing, typing, woodwork. The standard abbreviations St, Rd, etc. are self-evident.

Sinclair Spectrum analogue/digital interface

Connect your micro to the real world with a build-it-yourself package, designed by Lyndsay Robinson.

THE MANY analogue/digital interfaces published for personal computers all seem to concentrate on the hardware side with no associated software. This design fills the gap by including, in addition to a comprehensive hardware specification, the following features: a slow data logger for data rates of less than 20Hz; a fast data logger for rates up to 35kHz; a music synthesiser sequencer; a logic monitor; and a frequency meter.

The circuit is a comprehensive design for interfacing the Spectrum to the outside world, and is based on the Intel 8255 Programmable Peripheral Interface chip. It incorporates the following: a 100kHz A-D converter; a D-A converter; a digital output interface for controlling LEDs, etc.; a digital output interface for switches, etc.; a temperature sensor; and a music synthesiser interface.

The 8255 has 24 programmable I/O lines: for example, the user can program one port of eight bits to be an input and the other two eight-bit ports to be outputs. The three ports A, B and C can all be inputs or outputs: the port configurations are shown in figure 2. Mode 0 only is used in this interface and is simply input/output.

Two 8255s are used in this design and are configured as shown in table 1, but can be changed by software. The 8255 is set up by a control word — see figure 2 — and then ports A, B and C can be controlled by the Basic program. This can be shown more clearly by looking at the data-display program. The line

```
20 OUT 127, 139
```

sets up the 8255: 127 is the address of the control port of IC1, and 139 is the control word which sets port A to output and ports B and C to input. The line

```
170 Let a = IN 63
```

reads the A-D convertor, where 63 is the address of the convertor. Lines

```
150 OUT 31, 0
160 OUT 31, 128
```

are used to send a Start conversion pulse to the A-D convertor.

The addresses of the ports are shown in table 3, and the control words for all the simple configurations of the ports are shown in table 4. Note that port C can be used in a split mode, that is one half of the port in and the other half out.

Circuit details for connections of LEDs and switches as examples of typical digital interfacing connections are shown in figure 1. The ADC Start conversion pulse is as shown. Masking of bits D0 to D7 will be required if these bits are not to be changed when a Start conversion pulse is output. Test programs for a switch on D0, port C and LEDs on D0, D1, port A of IC1 are shown in listing 1.

A D-A converter IC7 is included. The

(continued on page 123)

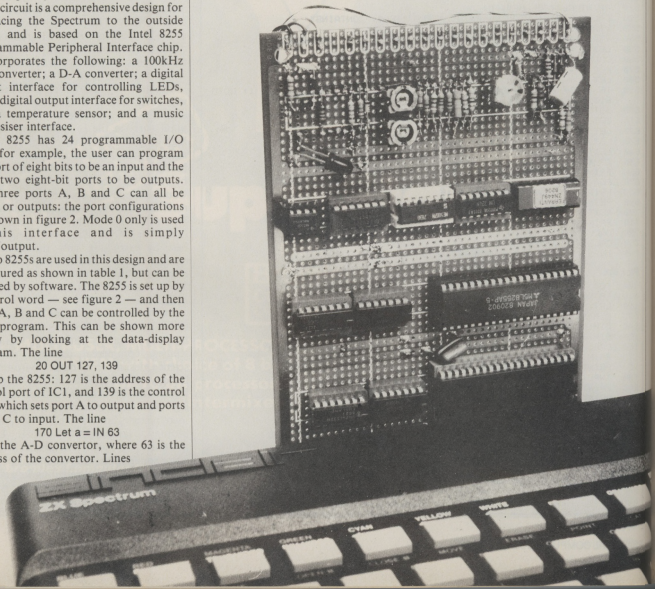


Figure 1a.

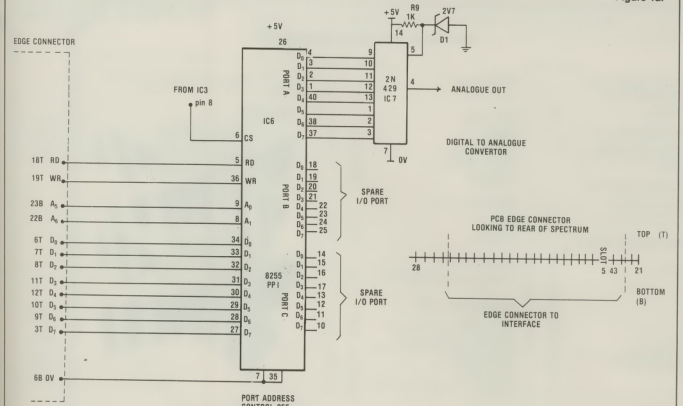
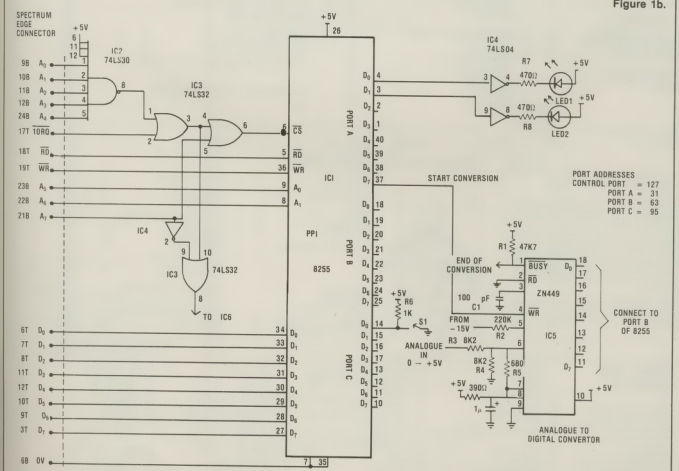


Figure 1b.



MICROCOMPUTER PRODUCTS MPI

INTERNATIONAL LTD.

ROOM PC . 11 CAMBRIDGE HOUSE, CAMBRIDGE ROAD, BARKING, ESSEX IG11 8NT, ENGLAND
Telephone: 01-591 6511 Telex: 892395

SOFTWARE FOR CP/M COMPUTERS

ANTHONY ASHPITEL TYPING MASTERS

	Software & Manual	Manual Only
BASIC VERSION	50	
BUSINESS VERSION	125	25

BYROM SOFTWARE

BSTAM—Utility to link one micro-computer to another also using BSTAM	112	7
BSTMS—Utility to link a micro to a mini or mainframe	112	13

CP/M USER LIBRARY

51 Volumes—Price per volume
8" disc (one volume per disc) 5
5" disc (one volume per 2 discs) 10
Index 2

DIGITAL RESEARCH

BT-80	165	24
CBASIC v 2.08	76	16
CB-80 1.3	312	21
CP/M86	171	32
CP/M 2.2	103	24
CP/NET	126	16
DESPOOL	31	7
MAC	62	16
MP/M 1.1	138	21
MP/M 2.0	288	35
PASCAL MT+	206	24
PASCAL MT+ WITH SPP	297	35
PASCAL MT+ LIB SOURCES	129	
PASCAL MT+ SPP ONLY	147	12
PL/1-80	315	32
SID 1.4	50	16
TEX3.0	65	16
XLT86	94	8
ZSID 1.4	65	16

ELECTRONIC ACCOUNTING SERVICES

LINEAR & GOAL PROGRAMMING	200	10

FOX & GELLER

QUICKSCREEN FOR DBASE-II	103	14
QUICKSCREEN FOR CBASIC/CB-80	103	14
QUICKSCREEN FOR MBASIC	103	14
QUICKCODE FOR DBASE-II	182	21

GRAM BUSINESS SYSTEMS LTD.

DISKREV	65	13
DISKLENE	40	6
DISKORG	50	6
DISKED-2	65	13
DISKTOOLS-1 (DISKREV-DISKORG)	90	15
DISKTOOLS-2 (DISKTOOLS-1-DISKED-2)	145	19

MICRO-AP

SELECTOR-V 1.6	324	29

MPI LTD.

FORTH	85	23
PAYROLL	500	15
SALES LEDGER	200	15
PURCHASE LEDGER	200	15
NOMINAL LEDGER	200	15
INCOMPLETE RECORDS	1200	20
MATHSPACK	120	
STATSPACK	120	

MICROFOCUS

CIS COBOL v 4.5	425	25
FORMS 2	110	10
ANIMATOR	225	25
FILESHARE	250	20

MICROLOGY

FTNUMB (FORTRAN-80 RENUMBER & REFORMATTER)	50	

MICROPRO INC.

WORDSTAR 3.0	294	45
MAIL MERGE 3.0 (requires Wordstar)	88	12
SPELLSTAR 1.2 (requires Wordstar)	147	12
WORDSTAR TRAINING MANUAL		21
WORDSTAR CUSTOMIZATION NOTES	59	
WORD-MASTER 1.7A	88	26
TEX-WRITER 2.5	44	20
SUPER-SORT 1.6	147	26
DATASTAR 1.101	206	29
DATASTAR CUSTOMIZATION NOTES	59	
CALCSTAR 1.2	176	29

APPLE VERSIONS

WORDSTAR 3.0	221	44
MAILMERGE 3.0 (requires Wordstar)	74	12
SPELLSTAR 1.2 (requires Wordstar)	115	12
DATASTAR 1.101	176	29
SUPERSORT 1.6	118	26
CALCSTAR 1.2	115	29

MICROSOFT INC.

BASIC-80 5.21	218
BASIC Compiler 5.3	241
FORTRAN-80 3.44	306
COBOL-80 4.60	447
M/SORT 1.012	88
EDIT-80 2.02	76
MACRO-80 3.43	124
MULISP 2.12	124
MUMATH 2.12	153

SAVE OVER **20%!** WHEN YOU ORDER ONE OF THESE SUPER ALL STAR PACKS



	Software & Manual	Manual Only
WORDSTAR, MAILMERGE, SPELLSTAR, DATASTAR, CALCSTAR, SUPERSORT	1000	200
WORDSTAR, MAILMERGE, SPELLSTAR, DATASTAR, CALCSTAR	800	150
WORDSTAR, MAILMERGE, SPELLSTAR, DATASTAR	600	100
WORDSTAR, MAILMERGE, SPELLSTAR	400	75

MICROTECH EXPORTS

REFORMATTER CPM=>IBM	147	20
REFORMATTER CPM=>DEC	147	20

PHOENIX SOFTWARE ASSOCIATES

PLINK—Disc to disc link loader	85	18
PASM—Macro Assembler	85	18
PEDIT—Line editor with Macros	85	18
BUG—Very powerful debug	85	18
PDEVELOP Package with all the above	227	39
PLINK—2 Overlay Link Loader	218	18

SAPPHIRE SYSTEMS LTD.

MARS	295	25

Retailer and OEM terms available

MAIL ORDER
TELE-PHONE
CREDIT CARD ORDER
• VISIT •

FREE Full descriptive Catalogue available

Trade Enquiries Welcome

NEW PRODUCTS

CP/M - 86

ANTHONY ASHPITEL TYPING MASTERS

BASIC VERSION	50	
BUSINESS VERSION	125	25

MICROFOCUS

CIS COBOL	425	25
FORMS 2	110	10
ANIMATOR	225	25
LEVEL-2 COBOL	110	10
LEVEL-2 FORMS-2	110	10
LEVEL-2 ANIMATOR	475	25

SAPPHIRE SYSTEMS

MARS	295	25

IBM PC-DOS

MICROPRO INC.

WORDSTAR	294	
MAILMERGE (Requires WORDSTAR)	88	
SPELLSTAR (Requires WORDSTAR)	147	

CP/M - 80

ASHTON-TATE

d BASE-II v 2.20	457

MICROFOCUS

COBAL-80	625	25
LEVEL-2 COBOL	425	25
LEVEL-2 FORMS-2	110	10
LEVEL-2 ANIMATOR	475	25

MICRO INTEGRATION

BISYNC 80/3780	525	
BISYNC 80/3780 (ASCII)	525	
BISYNC 80/3270 (BSC)	525	
BISYNC 80/HASP	975	

MICROPRO INC.

ALL-STAR WORD PACK	423	
ALL-STAR DATA PACK	423	

ORGANIC SOFTWARE

MILESTONE	283

PEARL INTERNATIONAL

PERSONAL PEARL	180
PEARL-3	275

ORDER INFORMATION

When ordering CP/M software please specify the format you require. All software items are subject to VAT. Manuals, when purchased separately, are not subject to VAT. Please add £3.75 (plus VAT) for postage and packing for the first item purchased, and then £1.00 for each extra item. For overseas please add £6.50 per item and then £1.50 for each extra item required. Most software in this advertisement is available from stock and a 72 hour return service is thereby offered on most prepaid orders. These details and prices are all current as of November 1982. Our prices reflect an exchange rate of U.S. $1.7 to £1.00. (Telephone at time of purchase to confirm latest prices.) All payments must be in Sterling and drawn against a U.K. bank.

MAIL ORDER - TELEPHONE ORDER - VISIT - Send Cash, Cheque, Postal Order, IMO, Access or Barclaycard/Visa number to Microcomputer Products International Ltd., Room PC, 11 Cambridge House, Cambridge Road, Barking, Essex IG11 8NT.

● Circle No. 183

MEDIA AND FORMATS

Altos	A1
APPLE CP/M-80 13 Sector	RG
APPLE CP/M-80 16 Sector	RR
Blackhawk Micropolis Mod II	Q2
British Micros Mimi	RX
California Computer Sys 8 in	A1
CDS Versatile 4	Q2
Columbia Data Products 8 in	A1
Comart Communicator CP50	P2
Comart Communicator CP100	P2
Comart Communicator CP200	P2
Comart Communicator CP500	P2
Compal-80	Q2
CPT 8000	A1
Cromemco System 3	A1
Cromemco System 2 SD/SS	R6
Cromemco System 2 DD/SS	RX
CSSN Backup	T1
Cyfer 8"	A1
Datapoint 1550/2150	A1
Dec VT 180 SSDD	RV
Delta Systems	A1
Dynabyte DB8/4	A1
Exidy Sorcerer - CP/M-80	Q2
Exidy Sorcerer - Exidy CP/M-80 8"	Q2
EXO	A1
Gemini Galaxy I	NI
Heath H8 - H47	A1
Hewlett-Packard 125.8in	A1
IBM PC-DOS SSDD	C1
IBM PC-DOS DSDD	C2
IBM CP/M-86 SSDD	C3
IBM CP/M-86 DSDD	C4
ICL-PC	RE
ICL ORX Series	A1
ICOM 3712	A1
IMSAI VDP-80	A1
Industrial Microsystems 5000	RA
Industrial Microsystems 8000	A1
Intel MDS SD	A1
Intertec Superbrain SSDD	RV
Intertec Superbrain QD	RS
ISC Intercolor 8063/8360/8963	A1
ITT 3030 DSDD	R1
Micromation	A1
Micropolis Mod II	Q2
Morrow Discus	NI
Mostek	A1
Multi-Tech 1	A1
Multi-Tech 2	Q2
Micromation	A1
Micropolis Mod II	Q2
Morrow Discus	NI
Mostek	A1
Nascom (Gemini Drives SSDD)	R3
Nascom (Gemini Drives DSSD)	R7
Nascom/Lucas	N1
NCR 8140/9010	RA
NNC-80	A1
NNC-80W	A1
North Star Advantage	P2
North Star Horizon SSSD	P1
North Star Horizon DSDD	P2
North Star Horizon QD (MPI CP/M)	P3
North Star Horizon QD (Other CP/M)	P2
Nytac Micropolis Mod II	Q2
Osborne-1	RP
Pertec PCC 2000	A1
Rair 1000 SSDD	RL
Rair 1000 DSDD	RM
Rair Black Box	RE
Research Machines 5.25in	RN
Research Machines 8in	A1
Robotron 5"	R3
Robotron 8"	A1
SD Systems 5.25in	R3
SD Systems 8in	A1
Sharp MZ-80B	R7
Sharp PC-3201	R8
Shelton Signet	RK
Spacebyte	A1
Tarbell 8in	A1
TEI 8in	A1
Televideo DSDD	S5
Torch	N2
Toshiba T200 DSDD	SF
TRS-80 Model - Shuffle-board 8in	A1
TRS-80 Model II	A1
Vector MZ	Q2
Vector Systems 2800	A1
Vector Systems B	Q2
Vector VIP	Q2
Xerox 820 5.25in	S6
Xerox 820 8in	A1

Interface

(continued from page 120)

test program in listing 1 will output a ramp waveform. A typical use is as a control voltage for the VCO of a music synthesiser. A simple sequencer could be achieved by using the circuit as shown for this interface, with one of the output ports of the 8255 used to trigger the envelope shapers in the synthesiser and the DAC controlling the pitch of the VCO.

A circuit for an A-D convertor is included, with a conversion time of 9μs. However, when using Basic the data transfer rate — from ADC to being plotted by the Spectrum, in this case — is only about 20 samples per second. It could be used to record the keyboard-control voltage output of the synthesiser as part of the sequencer program.

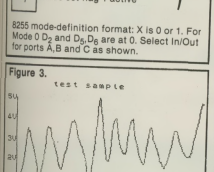
Listing 2 describes a program for the display of data from the ADC. An amplitude/time plot can be done — a plot of an instrument amplitude decay with time, for example — with the output being able to be plotted on the printer — see figure 3. Note the Beep in line 198, which outputs a sound pulse proportional to the voltage input, thought it will make the sample rate less accurate. Lines 192 to 196 draw lines between the plotted samples. The maximum time between samples is 21 minutes.

Figure 2.

D_0	Port C (lower): 1 in, 0 out	GROUP A
D_1	Port B: 1 in, 0 out	
D_2	Mode selection: 0 Mode 0, 1 Mode 1	
D_3	Port C upper: 1 in, 0 out	
D_4	Port A: 1 in, 0 out	
D_5	Mode selection: 00 Mode 0, 01 Mode 1, 1X Mode 2	GROUP B
D_6		
D_7	Mode set flag 1 active	

8255 mode-definition format: X is 0 or 1. For Mode 0 D_2 and D_5,D_6 are at 0. Select In/Out for ports A,B and C as shown.

Figure 3.



The prototype interface was constructed on Veroboard with wire-wrapped connections. If the printer is not to be plugged in at the same time as the interface, ensure that enough room is left on the Veroboard to allow the edge connector to fit into the rear of the Spectrum. The edge connector plug is the same type as used for the ZX-81, but the wiring connections are different. On the Spectrum connectors 1, 2 and 25 to 28 are not connected to this interface.

A power supply will be required of +5V at about 400mA and −15V at about 10mA. The circuit for the power supply used on the prototype is shown in figure 4.

The eight-channel colour-logic monitor and analyser in listing 3 is used to monitor an eight-bit input port on the Sinclair Spectrum, for example from the analogue/digital interface circuit. The input is read in from the port and displayed as a continuously scrolling binary table. It is useful for fault finding, monitoring a port with switches on, etc. One use is for monitoring the jitter that occurs on the LSB of an A-D converter.

The program can be used with the analogue/digital interface circuit. As shown it was monitoring the digital output from the A/D convertor. Line 50 sets up the Programmable Peripheral Interface. The digital input is converted to binary and displayed, along with the decimal value and the count N which is the number of times that the port has been read. If the value just read in has changed from the previous value, a Beep from the Spectrum will notify the operator of this.

There is also a flashing * that identifies the changed value: it is useful for continuously monitoring a port where a change might only occur occasionally. Binary 0 is yellow and binary 1 is red, so pattern changes can be easily recognised. D0 to D7 is the number of the bit from the port.

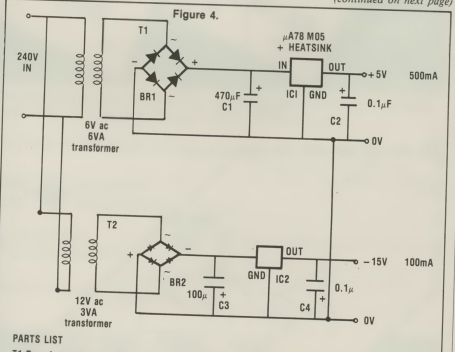
A program for a music synthesiser is shown in listing 4. It enables a sequence of musical notes to be stored by the computer and then played back. The pitch and note length stored and used to control the synthesiser VCO and envelope generator, etc. Up to 10,000 notes can be stored on a 48K Spectrum. Repeating or single sequences can be played: for example, a repeating sequence can control the synthesiser voltage-controlled filter, and with white noise as the sound it can be used as a programmable drum synthesiser. The tune can be stored digitally on cassette and loaded at a later date.

The modifications to the interface circuits in figure 1 are shown in figure 5, an amplifier for the digital-to-analogue convertor output. A Korg MS-20 music synthesiser was used with the prototype sequencer. Line 170 of the program produces the required exponential voltage output for the linear VCOs of the synthesiser.

The MS-20 has a three-octave keyboard and in this program the keys are numbered from 1 to 37 so that the programming is easy. The output from the DAC amplifier in figure 5 is scaled 1V to 8V, with a 1V offset added by R2 and the DAC output voltage amplified by 2.6. This scaling will obviously have to be changed to suit different synthesisers. The trigger for the envelope shaper is taken away from any bit

(continued on next page)

Figure 4.



PARTS LIST

T1 Transformer 240V ac/6V ac 6VA
T2 Transformer 240V ac/12V ac 3VA
C1 470$_\mu$ elect 16V
C2, 4 0.1$_\mu$F
C3 100$_\mu$ elect 25V
IC1 μA79M05
IC2 μA79L15
BR1, 2 W01

Interface

(continued from previous page)

from port 31, IC1 port A; the output can be buffered by one of the inverters of IC4. On the MS-20 the trigger signal is from 0V to 5V, active 0V. Even though the program is in Basic, an output of up to 12 notes per second is available.

To load a sound that has been previously Saved by line 450, first load the sequencer program as normal then enter

Load "tune1"CODE

No editing facilities have been provided on this simple sequencer, but to modify just one stored note line 460 can be used to examine the stored sound — frequency value, time — and the new value Poked in. The speed of the sequence can be changed in line 270: the larger this value the slower the sequence.

The fast data logger program in listing 5 includes machine code providing a 35kHz transient recorder facility for the A-D convertor. It enables audio signals, etc. to be recorded by the interface circuit board and then displayed graphically by the Spectrum. The ZN-449 ADC can be used at up to 100kHz sampling rate, but in this case the machine code limits the frequency to about 36kHz in order that the existing hardware can be used. To speed up the data-transfer rate from the ADC to the Spectrum memory an external timer could be used instead of a software timer and a Start Conversion Signal could be decoded from A6, A7 and CS of IC1.

The program initially loads the machine code into memory — see the Z-80 assembly-language version in listing 6 which was produced with the help of the monitor program by Picturesque and Tandy's assembler-editor. It then asks the user the sampling rate — values from 2kHz to 35kHz can be selected — the trigger level for the start of conversion, and finally the name of the sound. The trigger level is set to the positive edge of the waveform.

The 239 samples of the sound are then recorded, equivalent to the number of horizontal plot positions used. The Beep indicates when the recording process has finished, which is useful for long recordings, and the waveform is then plotted. The plot points are joined up in lines 240 to 320. The circuit in figure 1 is arranged for the ADC input to be between 0V and 5V; for a bipolar input of ±2.5V, simply change R5 from 680K to 8K2. A preamplifier circuit for low-level signals can be provided by using one of the opamps — see figure 6.

A disassembled version of the transient recorder is shown in listing 7 and the corresponding flow diagram is given in figure 7. The Spectrum interrupts are first disabled so that a continuous data transfer rate of up to 35kHz can be obtained. The Spectrum interrupts 50 times per second so that the Frame count can be updated. The PPI is initialised and the ADC then has a pulse output to the WR pin to start the conversion. When the ADC has finished conversion the data is read in. This value is then compared to a trigger value that has been Poked in from the Basic program, and if the trigger threshold has been exceeded then the program will progress to

(continued on page 127)

Figure 5.

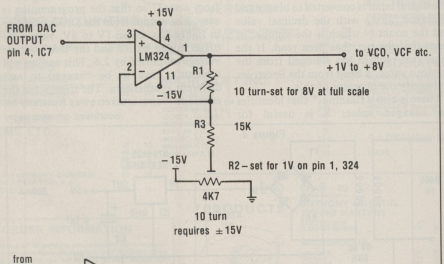


Figure 6.

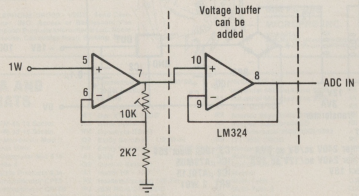
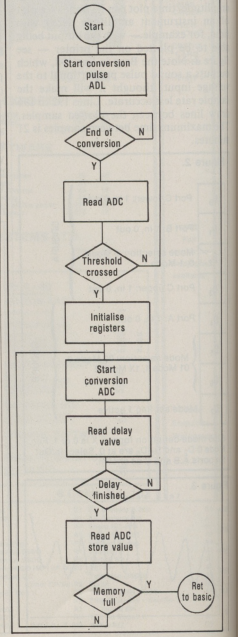


Figure 7.



Dysan

The Highest Quality Diskettes For Your System.



Dysan diskettes, acknowledged to be the industry leader in quality and data integrity available for all these and other systems from HAL Computers, Dysan's key U.K. distributor.

- DISC PACKS AND CARTRIDGES ALSO AVAILABLE
- TECHNICAL SUPPORT FROM HAL'S ENGINEERING TEAM
- QUANTITY DISCOUNTS
- FOUR HOUR ORDER TURNROUND
- EX STOCK AVAILABILITY

Ring the Dysan hot line now on Farnborough 517171 or complete the coupon.

Please tell me more about the range of Dysan Media for my system. PC1

Name

Address

Computer System

(Telephone No.)

HAL Computers Limited
Invincible Road, Farnborough
Hants. GU14 7QU
Telephone (0252) 517171

HAL

● Circle No. 184

DATALINK

MICROCOMPUTER SYSTEMS (U.K.) LIMITED

Microcomputer hardware and software for business, educational, industrial and scientific application.

APPLE

WE ARE THE BIGGEST SUPPLIER IN THE WEST COUNTRY

Why? — We're the longest established, the friendliest, the most experienced *AND* we give superlative service and advice.
This adds up to the best deal in Apples you'll find at the most sensible prices.
Give us a call for ***all*** Apple requirements.

OSBORNE 1

THE MOST EXCITING PRODUCT TO HIT THE MICRO MARKET FOR YEARS!

The fully portable 64K microcomputer, VDU, disks, mains/batteries together with a tremendous software package worth £800 alone!

— ONLY £1250! **(Ex VAT)**

AND LOOK AT OUR SPECIAL BONUS OFFER!
— A FREE 12" Green Monitor and A Box of Top Quality BASF DISKS in a Library Case — WORTH £200!

— ALL FREE WITH EACH OSBORNE!

BASF DISKETTES

Genuine German made First Quality — *FULLY GUARANTEED*

5¼" Single sided, single density, soft sectored £13.50 (Box of 10)
5¼" Single sided, double density, soft sectored £17.50 (Box of 10)
5¼" Double sided, double density, soft sectored £23.00 (Box of 10)

Postage & Packing 50p. Prices Ex. VAT
WE STOCK THE FULL BASF RANGE

STOP PRESS

OSBORNE 1 DOUBLE DENSITY VERSION
Now available £1375 (Ex. VAT)

New Extras Included in Price — UCSD P-System, Read other CP/M Disks including IBM PC & SIRIUS

DATALINKS EXISTING OFFER APPLIES

DATALINK

CRA

MICROCOMPUTER SYSTEMS (U.K.) LIMITED
10, Waring House, Redcliffe Hill,
Bristol BS1 6TB.
Tel: Bristol (0272) 213427

Authorised Dealer and Service Centre for
apple computer commodore COMPUTER

24hr answering service

To: **DATALINK MICROCOMPUTER SYSTEMS (U.K.) LIMITED**
Please send: ☐ Full Price List
☐ Quotations for (please attach details)
☐ Items listed (cheque enclosed)

Name .....
Address .....
.....
Tel No. .....

● **Circle No. 185**

Interface

(continued from page 124)

the data-acquisition section. If not, the ADC is read again and the threshold checked again until the threshold is crossed.

The memory poiner, register pair HL, is loaded with the start of memory for the waveform storage. A software timer is used to set the sample rate for the ADC, and a 16-bit number Poked from Basic is read and converted to a time between appropriately 10μs. and 0.3s. At the end of the time delay the data from the ADC is read into memory, and after another time delay the next data byte is read in until the entire Spectrum screen width has been stored. The interrupts are enabled and a Ret instructions returns to the Basic part of the program, ready for the screen plot.

The Spectrum interface circuit board can be used with the temperature logging program of listing 8 to record temperature variations between 0°C and 100°C. The program is similar to listing 2 but scaled for temperaure. An LM-335Z is used as the temperature sensor and a basic circuit is shown in figure 8. This circuit outputs 10mV per °K, so an offset will be required for scaling to be 0V at 0°C. The amplifier in figure 6 is used for the ADC so that the full scale of the ADC range can be used. The ADC is used in the range 0V to 5V, that is as in figure 1b with R5 at 680K.

The program can be used for logging any temperature variations from 0°C to 100°C. The measured value is plotted on the graph when it is measured. If the data is to be saved it could be Poked into memory locations, so as not to be lost at the end of the program.

The graph can be Copied. Figure 9a illustrates the sensor being heated up by a 100W bulb and then cooled in free air: the exponential rise and fall can be clearly seen. Figure 9b plots the cooling of a cup of water, and figure 9c shows the heating up of the Spectrum's heat sink from approximately five minutes after powering up. The ambient temperature was 16°C so the Spectrum had already heated up by 9°C before logging the program commenced. The limit for the operating temperature for the Spectrum's voltage regulator is 70°C — it was running close to the limit even on a cool day.

The National Semiconductor LM-335Z can be used with a heat-sink clip to increase its heat conductivity, and hence speed of response. It can be calibrated against a thermometer or, alternatively, against steam and melting ice. It was found to be accurate to ±1°C. The AD-590 temperature sensor manufactured by Analog Devices and Intersil can be used over the range −55°C to +150°C.

Many additions can be made to the program shown. For example, it could Beep when certain thresholds have been crossed, or switch on or off devices connected to the rest of the PPI, such as the LEDs shown in figure 1.

The maskable interrupt is used to update the counter — see page 129 of Spectrum's manual. This three-byte value is incremented every 20ms. from when the Spectrum is powered up and is the TV frame counter. It can be used for real-time clocks, for example, as described in the Spectrum manual. The routine must be disabled for such programs as the Fast Data Logger; the ADC timing would be made inaccurate since the routine itself takes time. DI can be used to disable the interrupt the EI to encable it in time-critical applications as shown in assembly listing 6.

Listing 9 shows the disassembled Spectrum ROM from 0038H to 0072H. The address 0038H is the branch address for the MI and address 0066H the branch address for the NMI. For the MI routine, 5C78H is the address of the first byte of the Frame counter.

It appears that the NMI is available for Spectrum owners to use as required for their own purpose. Address 5CB0H, 23728 decimal, is not used and address 23728 can be loaded with the start address of the user's program. The routines after address 66 only save registers AF, HL, so if other registers will be used when the program returns these too must be saved.

A possible application for using an interrupt is wiring the End of Conversion from an A-D converter to the NMI pin on the Spectrum edge connector. The program can do other functions while the ADC is converting without continuously polling the EOC bit, listing 6, which wastes time.

The program in listings 10 and 11 is for measuing an external frequency. No hardware alteration is required to the circuit in figure 1. A TTL-compatible signal is connected to pint 15 of IC1 and its frequency can be measured up to about 20kHz with approximately 0.5 percent accuracy. The Frames counter is used as the clock reference; after every 50 increments of this counter then one second has elapsed.

The counter is used by the frequency-measurement program as the timing reference. Since the Spectrum interrupts every 20ms. the frequency program will miss some pulses from the port while the interrupt program is serviced. This can be compensated for by scaling the value k in the Basic program to account for the missing pulses; some experimentation with k will be required. With no adjustment, frequencies up to 2kHz will be accurate to about 0.1 percent. The alternative to use the Frame counter is to use an external clock to the Spectrum to provide the timing, while disabling the maskable interrupts so that time is not spent in servicing the Frame routine.

Periods other than one second can be used as the time base. Just change the value of the constant in line 180 of the assembly listing from 50 to 5, say, for 100ms. The

(continued on next page)

Figure 8.

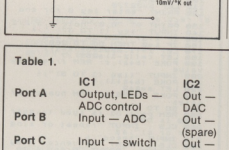


Table 1.

	IC1	IC2
Port A	Output, LEDs — ADC control	Out — DAC
Port B	Input — ADC	Out — (spare)
Port C	Input — switch	Out — (spare)

Table 3.

	IC1	IC2
port A	31	159
port B	63	191
port C	95	223
control	127	255

Table 4.

Control word	A	B	C
155	in	in	in
146	in	in	out
153	in	out	in
144	in	out	out
139	out	in	in
130	out	in	out
137	out	out	in
128	out	out	out

Table 2. Spectrum analogue/digital interface parts list

INTEGRATED CIRCUITS

IC1, 6	8255 Programmable Peripheral Interface
IC2	74LS30
IC3	74LS32
IC4	74 LS 04
IC5	ZN449 analogue-to-digital convertor
IC7	ZN429 digital-to-analogue convertor

DIODES

LED 1,2	Red LED
D1	2V7 Zener

RESISTORS

R1 4K7; R2 220K; R3, 4 8K2; R5 680K; R6, 9 1K; R7, 8 470R

CAPACITOR

C1 33pF

23-way edge connector, double sided, 0.1in. spacing, wire wrap or solder terminals to suit — as sold for the ZX-81

Veroboard

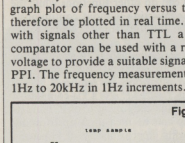
S1 switch spst

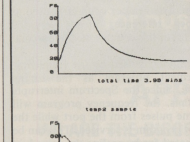
Interface

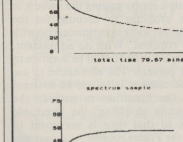
(continued from previous page)

program takes on second to measure a frequency and then returns to Basic. A graph plot of frequency versus time can therefore be plotted in real time. For use with signals other than TTL a voltage comparator can be used with a reference voltage to provide a suitable signal for the PPI. The frequency measurement is from 1Hz to 20kHz in 1Hz increments.

Figure 9.







Listing 1.

```
10 REM switch test
20 OUT 127,139
30 PRINT IN 96
40 GO TO 30

10 REM led test
20 OUT 127,139
30 OUT 96,0
40 PAUSE 25
50 OUT 96,8
60 PAUSE 25
70 GO TO 30

10 REM DAC test
20 REM outputs ramp wave
30 OUT 127,139
40 LET a=0
50 LET a=a+1
60 IF a>255 THEN GO TO 40
70 OUT 96,a
80 GO TO 50
```

Listing 2.

```
10 REM adc display
20 OUT 127,139
30 INPUT "enter sample rate (H
z)";n
40 INPUT "Enter name of sample
";a$
50 PLOT 16,139: DRAU 0,-123
60 PRINT AT 1,8;a$;" sample"
70 PRINT AT 3,0;"4V"
80 PRINT AT 5,0;"3V"
90 PRINT AT 7,0;"2V"
100 PRINT AT 10,0;"1V"
110 PRINT AT 12,0;"0V"
120 PRINT AT 21,12;"total time
";INT ((230/(n*60))*1000+.5)/100;
" mins"
130 LET x1=0
140 FOR z=16 TO 255
150 OUT 96,z
160 OUT 31,128
170 LET y=IN 63
180 PAUSE 9/n
190 IF x1=0 THEN GO TO 196
194 DRAU (61-y),((131/2)+16)-((
a-2)*16)
195 LET x1=x: LET a1=a
196 BEEP .1,a/8
200 NEXT a
```

Listing 3.

```
30 REM 8 channel counter logic
monitor and analyser
40 REM © Lyndsay Robinson 09/8
/88
50 OUT 127,139: REM set up PPI
60 LET c=0
70 BORDER 0: PAPER 0: INK 6
80 CLS
90 PRINT AT 0,0;
100 DIM s(0)
110 OUT 31,0: OUT 31,128: REM s
tart conversion
120 PRINT AT INK 7;"D7 D6 D5 D4 D3
 D2 D1 D0 Dec N"
130 POKE 23692,255: REM auto sc
roll
140 LET n=IN 63: REM read ADC
150 IF n<c THEN BEEP .1,30
160 LET c=n
170 FOR a=7 TO 0
180 FOR m=1 TO 8
190 LET s(m)=INT (a/2)
200 IF b<>0 THEN LET c(m)=1
210 IF b=0 THEN LET c(m)=0
220 LET a=INT (a/2)
230 NEXT m
240 FOR m=0 TO 1 STEP -1
250 IF c(m)=1 THEN PRINT INK 2;
c(m);
260 IF c(m)=0 THEN PRINT INK 6;
c(m);
270 NEXT m
280 PRINT INK 4;n;" "
290 IF n<>c THEN PRINT FLASH 1;
"*";
300 LET c=n
310 PRINT : PRINT
320 GO TO 110

D7 D6 D5 D4 D3 D2 D1 D0 Dec N
0  0  1  1  1  1  1  1  63 40

D7 D6 D5 D4 D3 D2 D1 D0 Dec N
0  0  1  1  1  1  1  1

D7 D6 D5 D4 D3 D2 D1 D0 Dec N
0  1  0  0  0  0  0  0  64 40

D7 D6 D5 D4 D3 D2 D1 D0 Dec N
0  1  0  0  0  0  0  0

D7 D6 D5 D4 D3 D2 D1 D0 Dec N
0  1  0  0  0  0  0  0  64 40

D7 D6 D5 D4 D3 D2 D1 D0 Dec N
0  1  0  0  0  0  0  0  64 40

D7 D6 D5 D4 D3 D2 D1 D0 Dec N
0  1  0  0  0  0  0  0  64 40

D7 D6 D5 D4 D3 D2 D1 D0 Dec N
```

Listing 4.

```
10 REM sequencer # Oct 82 by
Lyndsay Robinson
20 REM a sequence of notes and
note lengths can be recorded and
 played on a music synthesiser (
Korg MS20 used)
30 REM set up PPI
50 OUT 255,139
60 REM set up PPI
70 REM record
80 GO TO 500
90 CLS
100 LET a=0
110 LET b=32778
120 PRINT "enter key 0 for end
 record"
130 PRINT AT 20,0;"note ";a/2;1
140 PRINT "key=0 TO 37 ";A
150 IF a)37 THEN GO TO 140
160 IF a=0 THEN GO TO 260
170 LET z=(1.0594630*(k-1))
180 LET c=(2*10^6)/(z*2)
190 POKE (b+a),c: REM frequency
 data
200 INPUT "time (1 TO 8)";t
210 POKE (b+a+1),t
220 LET a=a+2
230 LET b=32768,a: REM number of
 bytes
240 GO TO 130
250 REM part 31 is kybd trigger
 , 159 is DAC
260 CLS : PRINT "repeat or sing
le (r or s)";a$
270 INPUT "press";a$
280 CLS : PRINT "sequencer play
ing": PRINT : PRINT "Press s to
 stop"
290 LET a=PEEK 32768
300 LET a=a+2
310 LET b=32770
320 OUT 159,PEEK (b+a1): OUT 31
,255: LET d=PEEK (b+a1+1): PAUSE
 (d*s+1): OUT 31,0
330 LET a1=a1+2
340 IF a1=a THEN
350 IF INKEY$="s" THEN GO TO 39
0
360 IF a1=a THEN GO TO 320
370 GO TO 320
380 IF a1=a THEN GO TO 290
390 CLS : PRINT "Sequence";" PR
INT : PRINT : PRINT "1 Record"
PRINT
400 PRINT "2 Play ": PRINT
410 PRINT "3 save on cassette"
420 INPUT a
430 IF a=3 THEN GO TO 98
440 IF a=2 THEN GO TO 260
450 IF a=1 THEN SAVE "tune1"COD
E 32768,(PEEK 32768)
460 GO TO 90
480 POH z=32770 TO 32900: PRINT
 PEEK z; : NEXT z
```

Listing 5.

```
5 REM fast data logger
10 FOR d=32500 TO 32559
50 REM© R. Phillips
60 READ n: POKE d,n: NEXT d
70 DATA 243,62,139,211,127,62,
0,211,31,205,85,127,211,31,219,
203,127,40,250,219,63,71,62,2,2
0,184,210,249,126,50,0,128,14,65
,6,239,62,0,211,31,62,255,211,31
```

```
237,91,5,128,27,122,179,32,251,
237,83,5,128,241,201
110 CLS : INPUT "Sample rate in
Hz";n
115 LET ra=(8/.000000925)
120 POKE 32769,INT ((r-256)
5/)
130 POKE 32768,(r-256*INT ((r/25
6)))
140 CLS : INPUT "trigger level
(0 to 5V)";b
150 POKE 32770,INT ((b/5)*255)
160 INPUT "name of sample";a$
165 PRINT 150,32800: CLS
195 PEEP 12,18
200 PRINT AT 1,0;a$;" sample"
210 PRINT AT 3,0;"5V"
220 PRINT AT 7,0;"4V"
230 PRINT AT 9,0;"3V"
240 PRINT AT 12,0;"2V"
250 PRINT AT 15,0;"1V"
260 PRINT AT 21,12;"sample rate
";r
270 LET x1=0
280 FOR x=16 TO 255
285 LET a=PEEK (32771+x-17)
290 PLOT x,(a/2)+16
295 IF x1=0 THEN GO TO 310
300 DRAU (x1-x),((la1/2)+16)-((
a/2)+16)
310 LET x1=x
320 LET a1=a
330 NEXT x
```

Listing 7.

```
7EF4 F2          DI
7EF5 3E98        LD   A,98
7EF7 D3FF        OUT  (IF),A
7EF9 3E00        LD   A,00
7EFB D33F        OUT  (3F),A
7EFD 3AFF00      LD   A,(00FF)
7F00 D33F        OUT  (3F),A
7F02 DB5F        IN   A,(5F)
7F04 C67F        ADD  A,7F
7F06 28FA        JR   Z,7F02
7F08 DB3F        IN   A,(3F)
7F0A 47          LD   B,A
7F0B 3A0280      LD   A,(8002)
7F0E B8          CP   B
7F0F D2F97E      JP   NC,7EF9
7F12 CD5A7F      CALL 7F5A
7F15 0E3F        LD   C,3F
7F17 06EF        LD   B,EF
7F19 3E00        LD   A,00
7F1B D31F        OUT  (1F),A
7F1D 3EFF        LD   A,FF
7F1F D31F        OUT  (1F),A
7F21 ED5B0080    LD   DE,(8000)
7F25 1B          DEC  DE
7F26 7A          LD   A,D
7F27 B3          OR   E
7F28 20FB        JR   NZ,7F25
7F2A ED42        INI
7F2C 20EB        JR   NZ,7F19
7F2E FB          EI
7F2F C9          RET
```

Listing 8.

```
10 REM adc display
15 REM modified for temperature
9 Oct 82
20 OUT 127,139
30 INPUT "enter sample rate (H
z)";n
40 INPUT "Enter name of sample
";a$
50 PLOT 16,139: DRAU 0,-125
60 PRINT AT 1,8;a$;" sample"
70 FOR z=8 TO 125 STEP 25: PLO
T 13,16+z: NEXT z
80 PRINT AT 0,8;a$;" sample"
85 PRINT AT 4,0;"5"
90 PRINT AT 6,0;"4"
98 PRINT AT 10,0;"3"
100 PRINT AT 13,0;"2"
110 PRINT AT 16,0;"1"
120 PRINT AT 21,12;"total time
";INT ((230/(n*60))*1000+.5)/100;
" mins"
130 LET x1=0
140 FOR z=16 TO 255
150 OUT 31,0
160 OUT 31,129
170 LET a=IN 63
180 PAUSE 9/n
190 IF x1=0 THEN GO TO 196
192 DRAU (x1-x),((la1/2)16)-((
a/2)+16)
195 LET x1=x: LET a1=a
196 BEEP .1,a/8
200 NEXT x
```

Listing 9.

```
8000 F5          PUSH AF
8001 E5          PUSH HL
8002 2A765C      LD   HL,(5C76)
8005 23          INC  HL
8006 227E5C      LD   (5C7E),HL
8009 F1          POP  AF
800A D5          OR   A
800B C3E303      JP   NZ,0048
800E FD2A4A00    INC  (IY+4A)
8012 D5          PUSH DE
8013 C5          PUSH BC
8014 CDDF02      CALL 02DF
8017 C1          POP  BC
8018 D1          POP  DE
8019 F1          POP  AF
801A FB          EI
801B C9          RET
801C E5          PUSH HL
801D 2A7E5C      LD   HL,(5C7E)
8020 7E          LD   A,(HL)
8021 FECB1E      CP   1ECB
8024 2B          DEC  HL
8025 FF          RST  38
8026 FF          RST  38
8027 FF          RST  38
8028 FF          RST  38
8029 FF          RST  38
802A FF          RST  38
802B FF          RST  38
802C FF          RST  38
802D FF          RST  38
802E FF          RST  38
802F FF          RST  38
8030 FF          RST  38
8031 FF          RST  38
8032 FF          RST  38
8033 FF          RST  38
8034 FF          RST  38
```

(continued on facing page)

(continued from facing page)

```
0065 FF          RST  38
0066 F5          PUSH AF
0067 E5          PUSH HL
0068 2A805C      LD   HL,(5C80)
006B 7C          LD   A,H
006C B5          OR   L
006D 2001        JR   NZ,0070
006F F9          LD   SP,HL
0070 E1          POP  HL
0071 F1          POP  AF
0072 ED45        RETN
```

Listing 11.

```
  10 REM frequency meter 11 oct
82
  20 FOR z=32500 TO 32542
  30 READ n: POKE z,n: NEXT z
  40 DATA 62,139,211,127,58,120,
92,71,60,120,198,184,48,250,16,65
,62,211,62,183,205,203,127,58,120,
92,254,71,48,250,16,65,201
  50 PRINT "USR 32500: REM start
address
  60 CLS : LET a=1
  70 LET a=((PEEK 32768)+256*(PE
EK 32769))
  80 PRINT INT (a+k)
  90 GO TO 60
```

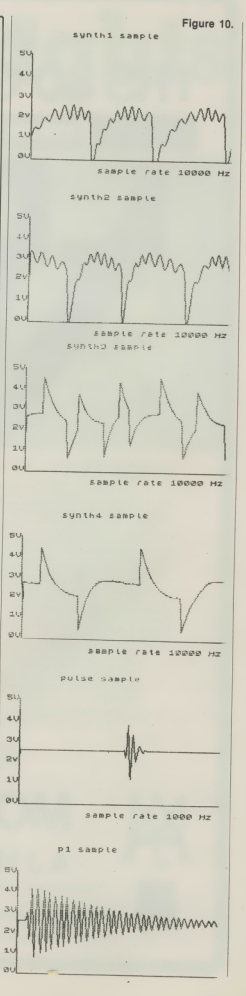
Listing 6.

```
7EF4            00100          ORG 7EF4H       ;48K SPECTRUM FAST DATA LOGGER 7 OCT 82
7EF4 F3         00110          DI              ;DISABLE INTERRUPTS
7EF5 3E8B       00120          LD A,139        ;SET UP PPI
7EF7 D37F       00130          OUT (127),A
                00140
                               ;CHECK FOR THRESHOLD
7EF9 3E00       00150 TRIG     LD A,0          ;SC PULSE FOR ADC
7EFB D31F       00160          OUT (31),A
7EFD 3EFF       00170          LD A,255
7EFF 00         00175          NOP
7F00 D31F       00180          OUT (31),A
7F02 DB5F       00190 WAIT     IN A,(95)       ;EOC OF ADC
7F04 CB7F       00200          BIT 7,A
7F06 28FA       00210          JR Z,WAIT
7F08 DB3F       00220          IN A,(63)       ;READ ADC
7F0A 47         00230          LD B,A
7F0B 3A0280     00240          LD A,(8002H)    ;GET TRIG LEVEL
7F0E B8         00250          CP B
7F0F D2F9FE     00260          JP NC,TRIG
                00270
                00280
                00290
                               ;DATA ACQUISITION
7F12 210380     00300          LD HL,8003H     ;MEMORY POINTER - START OF STORE
7F15 0E3F       00310          LD C,63         ;ADC PORT
7F17 06EF       00320          LD B,239        ;NO OF SAMPLES - 1 SCREEN WIDTH
7F19 3E00       00330 SAMPLE   LD A,0          ;SC PULSE
7F1B D31F       00340          OUT (31),A
7F1D 3EFF       00350          LD A,255
7F1F D31F       00360          OUT (31),A
7F21 ED5B0080   00370          LD DE,(8000H)   ;DELAY  VALUE FROM BASIC
7F25 1B         00380 TIME     DEC DE          ;DELAY BETWEEN CONVERSIONS
7F26 7A         00390          LD A,D
7F27 B3         00400          OR E
7F28 20FB       00410          JR NZ,TIME
7F2A EDA2       00420          INI             ;INPUT FROM ADC, INC HL
7F2C 20EB       00430          JR NZ,SAMPLE
7F2E FB         00440          EI              ;ENABLE INTERUPTS
7F2F C9         00450          RET             ;RETURN TO BASIC
7EF4            00470          END 7EF4H
00000 TOTAL ERRORS
```

Listing 10.

```
7EF4            00100          ORG 7EF4H       ;FREQUENCY MEASUREMENT 11 OCT 82
7EF4 3E8B       00110          LD A,139        ;SET UP PPI
7EF6 D37F       00120          OUT (127),A
7EF8 3A785C     00130          LD A,(23672)    ;TV FRAME COUNT INCREMENTS EVERY 20MS
7EFB 47         00140          LD B,A          ;START REFERENCE
7EFC 3A785C     00150 WAIT     LD A,(23672)
7EFF B8         00160          CP B
7F00 28FA       00170          JR Z,WAIT       ;IF SAME, CHECK AGAIN
7F02 C632       00180          ADD A,50
7F04 47         00190          LD B,A
7F05 210000     00200          LD HL,0         ;CLEAR FREQ REGISTERS
7F08 DB5F       00210 LOW      IN A,(95)       ;FREQ FLAG
7F0A CB4F       00220          BIT 1,A
7F0C 28FA       00230          JR Z,LOW
7F0E 23         00240          INC HL          ;COUNT
7F0F DB5F       00250 HIGH     IN A,(95)
7F11 CB4F       00260          BIT 1,A
7F13 20FA       00270          JR NZ,HIGH
7F15 220080     00280          LD (32768),HL   ;STORE FREQ
7F18 3A785C     00290          LD A,(23672)    ;FRAME COUNT
7F1B B8         00300          CP B            ;1 SEC TIMOUT?
7F1C C8         00310          RET Z           ;RETURN TO BASIC IF SO
7F1D 18E9       00320          JR LOW          ;OTHERWISE CONTINUE COUNT
7EF4            00330          END 7EF4H
00000 TOTAL ERRORS
```

Figure 10.



INNOVATIVE
TRS 80-GENIE SOFTWARE
from the professionals

LDOS

VERSION 5.1
THE TRS-80™ OPERATING SYSTEM
MODEL I AND III

- * **DOUBLE** Sided & **DOUBLE** Density support.
- * **AUTOMATIC** Density recognition.
- * 35, 40, 77, 80 and any other track counts are supported.
- * All available drive stepping rates are supported.
- * Hard Drive support, can be **HANDLED AS A SINGLE DRIVE.**
- * Hard drive partitioning, one drive can act as up to six.
- * Intermix 5", 8" and Hard drives, up to a total of 8 drives.
- Compatible with the Model I Radio Shack Expansion Interface.
- Upward compatible with **TRSDOS** (2.3 & 1.2 as documented).
- Fully supports Microsoft language products for the **TRS-80.**
- Complete media compatibility Model I to Model III and back.
- Full support for **LOBO's LX-80** interface.
- Full support for **AEROCOMP LC** double density controller(**DDC**).
- Full support for **PERCOM's DOUBLER II.**
- Complete documentation (well over 250 pages).
- Complete technical information.
- A Quarterly **LDOS** users magazine (The **LDOS QUARTERLY**).
- A liberal update policy.
- An enhanced **BASIC (LBASIC)** including:
  - > Upward compatible with Microsoft Basic.
  - > High speed **LOAD** and **SAVE**.
  - > Run multiple programs with common variables.
  - > **BLOCKED** (variable length) files are supported.
  - > **DOS** commands may be executed from **LBASIC.**
  - > Built in string array, **SORT.**
  - > Single stepper for debugging.
  - > Several new statements and file modes.
- A compiled **JOB CONTROL LANGUAGE (JCL).**
- **CONV**ert utility to move files from Model III **TRSDOS.**
- An Extended Debugging and Monitor program (with disk access).
- **CMDFILE** for movement of disk and/or tape system **(/CMD)** files.
- Device independent operation.
- Full **LINK**ing, **ROUTE**ing, **FILTER**ing and **SET**ting are supported.
- Mini**DOS** feature for constant access to certain **DOS** commands.
- **RS-232 DRIVER** for serial support.
- Sophisticated communications software included.
- Wildcard characters and partial Filespecs are supported.
- **DATED FILES,** show when a file was last written to.
- Backup: Mirror, by Class, if Modified, by Date, by Extension, etc.
- Selectable **PURGE** for fast disk "cleanup" of unwanted files.
- Print formatter, for control of printer output.
- Built in printer **SPOOLER,** to both disk and ram.
- Joblog to record all system operations with time stamps.
- **UPPER** and lower case support, throughout the system.
- Blinking cursor with selectable cursor character.
- 128 character **TYPE AHEAD** buffering for keyboard input.
- Assign strings to individual keys with Key Stroke Multiply **(KSM).**
- **SUPER FAST** operation with the **SYSRES** feature.
- Extensive user control and system feedback.
- Advanced **PATCH** utility for easy maintenance.
- Complete transportability of software among all **Z-80 LDOS** systems through the use of the **LDOS** high ram supervisory call system **(SVC).**

* Specific hardware is required to use these features.

LDOS for TRS-80 I / III and all current Genie machines
£85.00 + V.A.T. and P & P £3 Receipted Parcel Post

MOLIMERX LTD
· A J HARDING (MOLIMERX)

1 BUCKHURST ROAD, TOWN HALL SQUARE, BEXHILL-ON-SEA, EAST SUSSEX.

TEL: [0424] 220391 / 223636 **TELEX 86736 SOTEX G**

TRS-80 & VIDEO GENIE SOFTWARE CATALOGUE £1.00 [**refundable**] plus £1 postage.

BARCLAYCARD VISA Buy it with Access

● **Circle No. 186**

Forth thoughts

Can Forth claim to be structured? Boris Allan scrutinises this suddenly fashionable language in search of the answer.

A STRUCTURED PROGRAMMING language can mean different things to different people, but on analysis it would seem to be gauged on three main criteria: The ability to use subroutines and procedures in a modular approach to programming; the ability to use powerful control structures possibly eliminating the errant Goto; and the ability to investigate a program's consistency by purely logical means — the use of correctness proofs. To call any language "structured" is to imply that it satisfies at least the first two criteria. If they are applied to Forth, can it claim to be a structured language?

Forth is an interactive language which was devised about 10 years ago as a convenient method of controlling equipment by computer. The languages then available on smaller computers were mostly too slow for such applications — though Basic compilers now available are very fast in execution — and machine code was too tedious to write at length.

Forth is supposed to solve the problem by allowing the user to write programs which are fast executing, and yet are in a high-level language. On a small system Forth uses very little memory for program storage since each part of the program is compiled as it is entered, as long as it is grammatically correct. This is why Forth is so speedy — it is a compiled language.

Forth is an extensible language too in that when a new word is defined it becomes part of the language and can be used to define other words. Forth operates at several levels:

Executing a word.
Defining what a word does.
Forming a new mode of defining words.
Generating new ways of forming modes — called meta-Forth.

Subroutines

Possibly the most common form of subroutine is that of Basic. A call is made to a section of program at line zzzz by the command Gosub zzzz. The program jumps to line zzzz and executes the code starting at zzzz until a Return is encountered, at which point control returns to the statement after Gosub zzzz. Subroutine zzzz may be used several times in a program and called from many different places, saving such repetitious coding. If you have a variable called Bill in the main program and the subroutine also uses a variable called Bill, then Bill will be the same variable in both the main program and the subroutine.

In Fortran and many other languages, including BBC Basic there is a series of parameters against the name of the subroutine. In Fortran there might be a subroutine:

Subroutine Nurdle (Bill, Ben)

Within the body of the subroutine Nurdle there are then variables called Bill and Ben, but these are not same variables as any Bill and Ben in the main program. Bill and Ben might not even be in the main program.

If within the main body of the program, or within another subroutine, a call to the subroutine is made by

CALL NURDLE(TOBY,JUG)

then the variable Toby is used in the routine whenever Bill is mentioned, and Ben is replaced by Jug. It means that other variables can be used for instance

CALL NURDLE (MAID, MEIRION)

In BBC Basic it is possible to use parameters in this way with defined procedures — though few books which purport to teach you about the BBC Micro mention parameters. Most use procedures as if they were Gosubs.

In Fortran a subroutine can call another subroutine as long as it is not recursive — that is, the subroutine may not call itself. In Pascal, a procedure can call itself but it cannot call a procedure later in the program unless that later procedure has an earlier dummy declaration, called a forward declaration. In some Basic variants with a subroutine can call itself and any other subroutine. In Forth things are rather more complex.

Forth has a single-minded approach to life, centred on the stack. If you enter

2 3 4 + *

Forth executes the calculation

2 * (3 + 4)

which is the mysterious reverse-Polish notation. To print out the answer you enter a full point, the instruction to print the number on the top of the stack.

All procedures in Forth take their parameters off the stack, and thus do not have the ease of Fortran, Pascal, or BBC Basic. In Forth the words themselves are the subroutines. The Forth word for Print is "." though you might prefer to use the word Print as it is rather more explicit. In this case a new word might be defined by

: PRINT. ;

To calculate 3 + 4 – 5 and print out the answer you then enter

3 4 + 5 – PRINT

and to calculate 4 × 4

4 DUP *PRINT

where Dup means duplicate the entry on top of the stack. It is now possible to define a new word to calculate squares and print out the answer by

:SQUARED DUP *PRINT ;

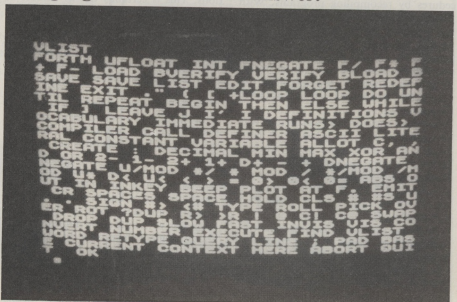
The word assumes there is a number already on the stack. Now to find the square of 5 you simply enter

5 SQUARED

The sequence is interesting. First Print is defined and then Squared is defined using Print. The definition of Print might then be altered, for example by executing

: PRINT DUP. ;

(continued on next page)



The VList command lists the whole dictionary which contains defined Forth words.

(continued from previous page)

so that the number on the top of stack is not removed by the operation of Printing. The word Squared remains unaware of this later definition of Print and continues to use the earlier definition. By ignoring any later changes Forth avoids some unwelcome surprises.

In Fortran and many other languages it is possible to incorporate changes in procedures by recompiling programs. With Forth it is not as simple, but by not allowing surprises Forth assures a faster-running program as fewer checks are needed. By forcing the development of procedures from the bottom-up rather than the top-down, Forth runs contrary to accepted practices in structured programming.

In Pascal and Fortran you can start with the main body of the program which merely calls procedures, and get it working before concentrating on the procedures. In Forth you have to dot the i's before you can write the word. Forth encourages bottom-up methods but it is certainly not structured in any proper sense.

Different languages use different control structures. Loops in Algol 68 take the form For-From-By-To-While-Do, where any or all parts can be ommitted. There is also If-Then-Else-Fi, where the Else can be omitted, plus Case-In . . . . . Out, . . . Esac, where the Out is not always necessary.

These are a powerful set of commands to control a program, against which Forth offers If- Else- Then, for which the Then is the equivalent to the Algol 68 Fi. The test is on the stack so the portion after If corresponds to the portion after Then in Algol 68, and Else is not necessary. There is a loop in Forth, but the loop index is always called I for an inner loop, J for the loop which encloses the inner loop, and then loop indices have to be given colon definitions. This is certainly not as flexible as might be hoped.

There are three forms of indefinite loop: Begin-Again, Begin-Until, and Begin-While-Repeat. In terms of control structures Forth comes out well, though you have to remember that tests are of the top of the stack.

There is no Goto in Forth because there is nowhere to go — there are no labels. In Pop 2, another stack-based language, there are no loop structures but there is a Goto.

A program may be perfectly correct yet not work on a computer, and this is especially true of Forth. It is a very standardised language, so it is easy to take programs written for one implementation and implement them on a different computer. The trouble with Forth is that it seems to be low on useful checks such as "Is my stack going to overwrite something important?" or "I think there was something wrong with the word Prune, shall I use it to see what happens?" These are both rather good ways of crashing most Forth systems.

Wishing to write a recursive word to calculate factorials, I first set an upper limit to the factorial by

```
8 VARIABLE UPPER
```

I then defined a special word to allow another word to refer to itself:

```
: RECURSIVE LATEST PFA CFA,
  IMMEDIATE
```

And so to the factorial:

```
: FACTORIAL—DUP IF DUP ROT*SWAP
  1—RECURSIVE THEN;
```

To test it I used a word Test:

```
: TEST UPPER @ 1 DO 1 I FACTORIAL I.
  CR LOOP;
```

in this way:

```
CR TEST
```

The program works: the output is all the factorials from one to seven.

To see what happens at larger numbers I entered:

```
1000 UPPER ! CR TEST
```

which should have given factorials up to a new limit of 999. On all three computers which ran this program funny things happened after 7 factorial. After a time the system crashed and could not be revived: the stack had overwritten where it should not have written.

This only one example among many, and it seems that Forth systems are not foolproof. The lack of checks appears to be tied into a desire to make Forth run as swiftly as possible: if you ignore the checks Forth is a very simple language to implement, but not one for the novice. ■



MOM SYSTEMS LTD.

Aberdeen — London — Singapore

ADVANCED MICROCOMPUTER SOFTWARE

COMMUNICATIONS

★ Asynchronous terminal emulator. Allows mainframe/to micro communication. Configurable for a variety of protocols. — **£350**

★ Micro to micro file transfer utilities. Configurable for various reader/punch or port addresses. — from **£225**

DATABASE

★ CONDOR™ relational database CPM or CPM86 (Sole UK Distributors). Multiple data set operations. — **£650**

ENGINEERING

★ **Mechanical** — Superpipe, Superframe & Superrig Structural Analysis program. from **£995**

★ **Chemical** — MINI-DES Process Simulation Distillation — Pipeline — Column Sizing — Equilib Calcs — Physical Property Prediction — Sour Gas — Heat Exchangers **P.O.A.**

Tel. (0224) 22863 Telex 739740
Tel. (0474) 57746 Telex 965462

● **Circle No. 187**

P.M.S. Developments
0432-265768

22 Tarsmill Court Rotherwas Ind. Est. Hereford

ZENITH 16-Bit Computer with High Resolution Colour Graphics (640 by 250), 8088 and 8085 processors, 128K user ram, 2 DSDD 320KB drives, 2 Serial ports, 1 Parallel port, Disk controller supporting 4 each 8" drives and 4 each 5.25" drives, 4 slots of S-100 bus for options, Light-pen socket. Supplied with MSDOS, CP/M85 and 16-Bit Microsoft Colour Basic with FULL GRAPHICS implementation, complete documentation including MSDOS assembler listings (7 manuals).

With 12 Month Warranty. From £1,975

8" DISK SUBSYSTEM, Capacity: 2.4MBytes, 2 Double-sided Double Density Drives in case 9"wx10"hx18"d with PSU, Fan, 50-way data connector, 1.5M data cable, mains cable.

Only £1,050

ZENITH ZVM-121 12" Green screen monitors **£85.00**

OSBORNE I personal computer and software **£1,250**
OSBORNE II Double Density Disk model **£1,375**
Supplied with FREE 12" Green Monitor!

ZENITH Z-89 Second User Computers from £950
Z-87 Dual 5.25" Hard sector drives £275 — one only.
Z-37 Dual 5.25" Soft sector drives £595.

MULTIBUS HARD DISK SYSTEM comprising: Intel 80/24 CPU card, 64K ram, DMA disk controller, 4-port serial card, Cynthia D140 Drive (10MB + 10MB removable cartridge) CP/M operating system and Basic.
ex-Development system, only **£1,750**

We are unable to list all our items. If you would like details of these or more information on the above, please contact us.

Please add VAT to all prices.

● **Circle No. 188**

PORTABLE MICROS

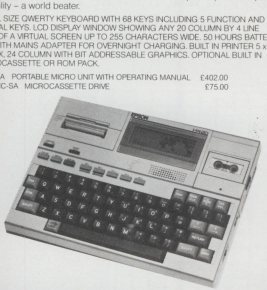
TAKING THE COMPUTER A STEP FURTHER

EPSON HX20

A computer small enough to fit into a briefcase yet with a full size typewriter keyboard, LCD virtual screen, printer and microcassette facility actually built in. High speed serial communication with other computers plus the Epson reliability – a world beater.

A FULL SIZE QWERTY KEYBOARD WITH 68 KEYS INCLUDING 5 FUNCTION AND 13 SPECIAL KEYS. LCD DISPLAY WINDOW SHOWING ANY 20 COLUMN BY 4 LINE PART OF A VIRTUAL SCREEN UP TO 255 CHARACTERS WIDE. 50 HOURS BATTERY LIFE WITH MAINS ADAPTER FOR OVERNIGHT CHARGING. BUILT IN PRINTER 5 x 7 MATRIX, 24 COLUMN WITH BIT ADDRESSABLE GRAPHICS. OPTIONAL BUILT IN MICROCASSETTE OR ROM PACK.

HX20UA PORTABLE MICRO UNIT WITH OPERATING MANUAL	£402.00
HX20MC-SA MICROCASSETTE DRIVE	£75.00



NEWBRAIN

You thought it would never arrive, but here it is with all those promises fulfilled. We never appreciated the full computing potential of the NEWBRAIN but suffice to say, it's a machine with a great future. We'll be able to tell you how to fully utilize the considerable power of the NEWBRAIN and take advantage of all that CP/M software.

THE NEWBRAIN IS A FULLY SPECIFIED PROFESSIONAL COMPUTER BUILT TO THE HIGHEST STANDARDS OF ENGINEERING AND RELIABILITY. CHOSEN BY LEADING OEM SUPPLIERS DESIGNED TO FACILITATE EASY EXPANSION FOR USE WITH THE CP/M OPERATING SYSTEM AND THE ADDITION OF 5¼" FLEXIBLE AND WINCHESTER DISKS. 12" GREEN PHOSPHOR PROFESSIONAL STANDARD MONITOR. 80 CPS PROFESSIONAL QUALITY DOT MATRIX PRINTER WITH PIN ADDRESSABLE GRAPHICS.

NEWBRAIN MODEL A	£199.00
NEWBRAIN MODEL AD	£229.00



HEWLETT PACKARD

HP75C A TOTALLY NEW PORTABLE PERSONAL COMPUTER.
An executive tool for the man in a hurry. 600 appointments can be held in memory. Never miss a board meeting or a birthday. In addition, – an impressive scientific aid to engineers and Scientists with magnetic card strips for handy programs and a magnificent BASIC.

HP75C SPECIFICATION 5" x 10" x 1" WEIGHING 26 oz. 16K RAM EXPANDABLE TO 24K. 48K OPERATING SYSTEM WITH 187 KEYWORDS AND FULL SCIENTIFIC BASIC. 8 BIT CPU. 32 CHARACTER LCD DISPLAY WITH SCROLLING TO 96 CHARACTERS; FULL INSTRUMENT AND PERIPHERAL CONTROL USING THE HPIL INTERFACE LOOP.30HR BATTERY LIFE WITH RECHARGER. 3 PLUG IN 16K ROM MODULES. A FULL REDEFINABLE TOUCH TYPE "QWERTY" KEYBOARD WITH EDITING KEYS AND HIDDEN NUMERIC PAD. A BUILT IN PROGRAMMABLE ALARM/TONE GENERATOR AND APPOINTMENT CALENDAR. THIS IS ONE OF THE MOST COMPACT AND POWERFUL PORTABLES WITH HP's SCIENTIFIC AND TECHNICAL BACKGROUND AND SUPPORT DOCUMENTATION. ITS POWER IS YOURS TO APPLY.

HP75C PORTABLE COMPUTER	£728.40
HP-82700A 8K MEMORY MODULE	£142.75



SHARP PC1500

This machine is the least expensive portable on the market. It is ideal for salesmen, contract engineers and anyone wanting to produce figures or small graphics for clients. Its 4 colour printer is a masterpiece of simplicity and it offers a medium speed BASIC for keeping standard programs in RAM. It is particularly useful for engineers who wish to do 'set calculations' on site and produce results on the spot. Great value for money.

WITH 16K BYTES OF ROM AND UP TO 11.5K BYTES OF RAM MEMORY, WITH BATTERY PROTECTION. UP TO 36 PROGRAMS STORAGE CAPACITY. BASIC PROGRAM LANGUAGE WITH TWO DIMENSIONAL ARRAYS AND VARIABLE STRINGS. QWERTY KEYBOARD WITH UPPER AND LOWER CASE. FULL RANGE OF SCIENCE AND MATHS FUNCTIONS (STATISTICS WITH MICROL SOFTWARE) ALARM CLOCK AND CALENDAR. MULTI TONE GENERATOR, MINI GRAPHIC 7 x 156 DOT MATRIX DISPLAY. ALL UNDER BASIC PROGRAM CONTROL. LINE WIDTH 26 CHARACTERS.
CE-150 FOUR COLOUR GRAPHIC PRINTER/TWO CASSETTE INTERFACE.

PC 1500 COMPUTER	£147.78
CE150 PRINTER/TAPE INTERFACE	£130.39
CE155 8K RAM MEMORY MODULE	£69.52



Visit our Portable Micro Centre
or contact us for further
information.

Transam
Microsystems Limited

Telephone and mail orders
accepted on Barclaycard
or Access
All prices exclude carriage and VAT

59/61 Theobald's Rd. London WC1X 8SF. Tel: 01-405 5240/2113. Telex: 24224 (Ref. 1422).

For full proposed range of Portable Computers and typewriters, including the Osborne, Kaypro II, Teleram, Panasonic, Toshiba, Andromeda, Brother, Husky, please contact us for price and availability. Not all items are yet in production so it is best to telephone for delivery details.

● Circle No. 189

Apple games

The Hitch-Hikers Guide to the Galaxy

ADVENTURE GAMES are a bit like *The Times* crossword — either you have that kind of brain or you don't. Even if you do have that kind of brain, successful adventuring depends to a great extent on practice and perseverence, and these are qualities we have not acquired. Our first venture into The Hitch-Hikers Guide soon lead us into a Total Perspective Vortex in which commands like up, down, north, south, east and west had no visible effect. Typing Help brought the response that this was no time for old Beatles hits.

HHG is an all-text Adventure game where the text and characters are related to the popular trilogy by Douglas Adams, starring Arthur Dent, Ford Prefect and others. The disc boots up with a title page "Don't Panic!" and then asks, "Eddie, your ship-board computer needs to know if you hoopy froods have lower-case capability. (Y/N)".

Then we are off. Pausing only to pick up a bowl of petunias at the Five Artifacts Inn, we board the Heart of Gold space ship, eat an Arcturian Megadonkey steak, collect a cheque signed by Zaphod Beeblebrox and get stuck in Total Perspective Vortex. Oh well, that is fairly typical of the approach.

One good point about HHG is that it recognises single-letter abbreviations such as U, D, N, S, E, W, etc. Also the program varies its responses. Another Help produces "I'm as puzzled as you are!"

Specification

Type: Adventure game, text
Format: One 5·25in. floppy disc
Language: Compiled Basic
System: Apple with one disc drive
Minimum RAM: 32K
Manufacturer: Estuary Software Products, 261 Victoria Avenue, Southend-on-Sea, Essex
Price: £16.95
Rating: Not applicable

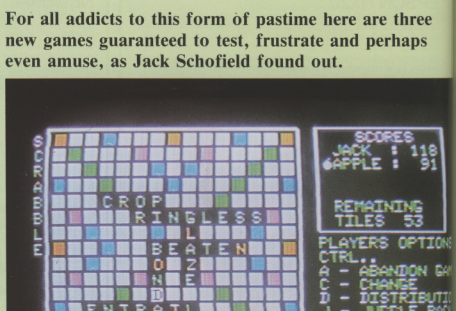
```
WE'RE IN THE TOTAL PERSPECTIVE VORTEX
LOOKS LIKE LIFE'S NOT BEEN SO GOOD
A CHEQUE SIGNED BY ZAPHOD BEEBLEBROX
YOU MIGHT GET     NORTH.EAST.WEST.SOUTH.UP
OR DOWN
WHAT SHALL WE DO -INVENTORY

WE'RE CARRYING
A BOWL OF PETUNIAS
WHAT SHALL WE DO -HELP

I'M AS PUZZLED AS YOU ARE !
WHAT SHALL WE DO -HELP

I'M AS PUZZLED AS YOU ARE !
WHAT SHALL WE DO -W
```

For all addicts to this form of pastime here are three new games guaranteed to test, frustrate and perhaps even amuse, as Jack Schofield found out.



Computer Scrabble

SCRABBLE is the kind of game that ruins friendships and wrecks marriages because it is compulsive, and because it leads to arguments about the validity of certain words. Nothing is more frustrating than sitting with a good word on your rack waiting for the other person to play. It is these characteristics that make computer Scrabble an ideal version of the game. The micro does not stall for time, it does not cheat and it does not argue.

Computer Scrabble from Little Genius is a full and accurate version of the Spear & Sons game, written for a 48K Apple with disc drive. The program started life on an ICL mainframe as part of Peter Turcan's PhD research study into word structures and their analysis. It was eventually transported to the Apple via a Superbrain version which has not been made commercially available. The Apple version is supplied on a double-sided disc; one side contains the program and the other a 9,100-word dictionary. Booting up the program provides a title screen followed by a series of questions to establish the configuration being used — colour or monochrome; sound; the number of players, up to four; the first player's name; and other factors including the skill level.

If you want to play the Apple select a two-player game where one of the players is called "Apple" — unless you have a pet name for your computer. The Apple will happily play a one-player game by itself, or keep the board and score, and generate random letters for four human players without playing any of the hands. It is very flexible.

The screen display holds the board, a box containing the scores and the number of letter tiles left, a list of options and, while Apple is playing, your own rack. The human player can use Ctrl plus letter keys to find out the values of squares or letters — which are not marked, as they are in Scrabble — or juggle or reorder his letters.

When playing a word, this list of options changes to show the letters used to position a cursor where the word is to start, and then play it across or down. You are then told

how much the word will score, and asked if you want to accept it. Answering Y plays the word and scoring is automatic; answering N returns you to the rack to try again. Thus you can try a number of alternatives before selecting the best. Only a computer will allow you to do this.

Computer Scrabble will not accept illegal entries where the word goes over the edge of the board, does not match an existing word or includes letters not in your rack. Again, it does not deprive you of your turn.

If you play a word that is not in its dictionary — including "id", "en" and "zein" — it asks "Are you sure (Y/N)". Pressing Esc-Y plays the word, but it is not then added to the dictionary.

Designing the dictionary was a major part of programming the game. The contents were chosen with the assistance of Dr Alan Richter, a former British National Scrabble Champion, and include many words that are not exactly common in everyday speech, such as "weans" and "twex". Obviously a lot of them are short words like "qua", "eh", "ha" and "ho", which are particularly useful in Scrabble. Even so, coding had to be used to fit 40K of dictionary into the 26K available to the game.

The Apple takes about two minutes to play a word, and it plays surprisingly well. It does not exhibit much idea of strategy, except for being careful with blanks and the letter s. It happily opens up triple-word squares for its opponent if this maximises its own score on the turn. However, it scores consistently well, and this makes it hard to beat.

Little Genius says that on Level 4 it will score, on average, 300 points in a two-player game. The first time we played it made a seven-letter word, "devious", for 50 bonus, then plonked "jaws" on a triple-word square to emerge with 376 points and a crushing victory. Something around 340 is more usual, but this is enough to beat perhaps 80 percent of Scrabble players. At the lowest level, Computer Scrabble averages about 160 points, which should be enough to challenge beginners without overwhelming them.

In terms of screen display, word entry and general user friendliness Computer Scrabble is outstanding. Possibly the only criticism to be made is that the cursor movement for placing words does not offer auto-repeat, but the cursor always starts in the top left-hand corner. It takes many key presses to reach some squares. Apart from that, Computer Scrabble is an excellent version of the game and highly recommended.

Specification

Type: Real-time board game on screen, with colour graphics and sound optional
Format: Single 5·25in. floppy disc, two sides
Language: Machine code
System: Apple with disc drive
Minimum RAM: 48K
Manufacturer: Little Genius, 203 Kilburn High Road, London NW6 7HY
Price: £24.95
Rating: 18/20

Choplifter

MOST ARCADE-TYPE games are based on killing things, and even if they are "aliens", and even if the destruction is only symbolic, this worries people. Some recent games are more happily devoted to saving lives. Defender is the most important of the genre, and Choplifter another example.

Choplifter, by Dan Gorlin, is a high-resolution colour arcade game from Broderbund Software of San Rafael, California. It requires an Apple II or II Plus with 48K RAM, a disc drive with DOS 3.2 or 3.3, and either a joystick with two button or two games paddles. As with most good American games nowadays, an Atari version is also available.

The game seems to be based on the American hostages who were held by the tyrannical Iranian regime, and the helicopter rescue mission which turned into a fiasco. The game itself takes place in "Bungeling" which is "to the south of Kurdistan" — near enough Iran as makes no difference. To play you fly your "chopper" to a series of four barracks, land, and rescue the 16 occupants of each. That means you have to rescue 64 people in all.

Meanwhile the Bungelings are, of course, trying to prevent you. Your helicopter can only hold 16 people, so you have to make several trips. During the first sortie you are attacked by tanks. Then you have to cope with enemy fighters and, last of all, intelligent "space mines".

Your helicopter can either drop bombs or fire forwards. The bombs are used to break open three of the barracks and perhaps against tanks. The canon is used against fighters and space mines. You must be careful not to kill hostages by shooting them, landing on top of them, or hitting them with a rotor blade. The game ends when every hostage is either rescued or dead, or before that if you use up the three choppers allowed.

The game is played in a long horizontal landscape which is quite realistically drawn with good use of perspective. It scrolls past as you fly. The helicopter is good, but the tiny people are best of all: though really little more than stick figures, they rush to your helicopter very realistically and climb aboard, while those left behind actually wave at you as you take off. It is really quite touching.

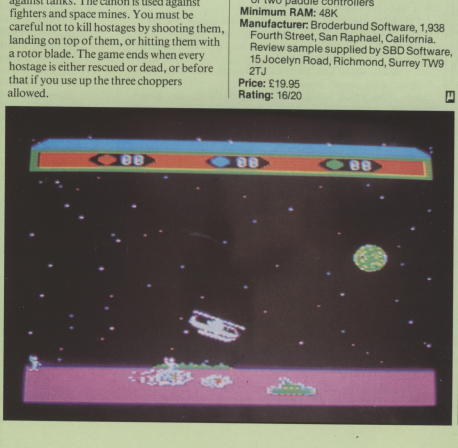
The colour is also good on a colour TV or monitor, but the game becomes very hard to play in monochrome as the tanks blend into the landscape almost completely. The sound is mainly blips — not very exciting. It would be interesting to know if good use has been made of the excellent sound facilities of the Atari in the version available for that machine.

Also, the game is very difficult to play using two paddles. A good joystick is virtually essential. Though one person in our office did manage to rescue all the hostages using paddle controllers, for most of us just controlling the helicopter was difficult. Perhaps this is part of the realism which adds to the game — though it must be said that the realism is spoiled at the end by the space mines.

At any rate, Choplifter is an original, challenging and exciting game, and recommended.

Specification

Type: Real-time arcade game with colour graphics and sound
Format: One 5·25in. floppy disc, Atari version also available
System: Apple II with disc drive and joystick or two paddle controllers
Minimum RAM: 48K
Manufacturer: Broderbund Software, 1,938 Fourth Street, San Raphael, California. Review sample supplied by SBD Software, 15 Jocelyn Road, Richmond, Surrey TW9 2TJ
Price: £19.95
Rating: 16/20



Disassembler for BBC Micro

Use of a hash table, unusual perhaps, has enabled John Leach to devise a program which will read machine code quickly and comprehensibly.

THE BBC MICRO contains a very powerful machine-code assembler built into the basic system, but lacks a disassembler which allows the user to read code in memory in a comprehensible format. This program, written in BBC Basic, decodes at about nine lines per second and, as a simple option, highlights certain machine-code instructions in colour. The concepts used in the program could easily be adapted to other machines using the 6502 chip.

The key to the fast decoding lies in the use of a hash table, a technique rarely used in programs published in *Practical Computing* — but see page 127 of the September 1982 issue. Simple disassemblers have been published in the past, but these have all relied on a relatively lengthy look-up of a series of data statements. The use of a hash table means that a second or two is taken up at the beginning of the program in building up the table, but after that it only takes a few microseconds to locate each new machine-code instruction.

Examination of the 6502 instruction set reveals that there are 56 separate instruction types, some of which contain up to eight addressing modes, of which there are 13 in all. However, the characteristics of the addressing mode are constant for every instruction that uses it, that is the number of bytes following the instruction — zero, one or two — and the addressing mode — zero page, absolute, X, relative branch, etc.

All the disassembler program needs to know after reading a machine-code instruction byte is the corresponding mnemonic — Add, And, Asl, etc. — and the addressing mode. By implication they will tell the program how many further bytes, if any, will have to be read to decode the instruction fully. This, after all, is what the 6502 chip itself has to do when instructions are decoded, although

Machine-code disassembler.

```
   10 REM Fast 6502 Disassembler for BBC
 Microcomputer
   20 REM J.M. Leach, June 1982
   30 REM
   40 ON ERROR GOTO 880
   50 MODE 7:@%=1:NLINES=0:TSTART%=TIME
   60 DIM MOSHOW% 7:$MOSHOW%="        ":R
EM Instruction mode display
   70 DIM HASH%(255):REM 6502 code hash
table for mode and mnemonic position
   80 DIM MOTYPE$(13):REM Holds text cha
racters for mode display
   90 DIM NBYTES(13):REM Holds number of
 bytes for each mode
  100 DIM PCGET%(3):REM Hold 1, 2 or 3 b
ytes of memory
  110 REM Get mode descriptors into arra
ys
  120 REM the order is :
  130 REM  1) Accumulator    2) Immediate

  140 REM  3) Zero page      4) Zero page
,X
  150 REM  5) Zero page,Y    6) Absolute
  160 REM  7) Absolute,X     8) Absolute,
Y
  170 REM  9) Implied       10) Relative

  180 REM 11) (Indirect,X) 12) (Indirect
),Y
  190 REM 13) Absolute Indirect Jump
  200 REM
  210 FOR I=1 TO 13:READ N: NBYTES(I)=N:
NEXT
  220 FOR I=1 TO 13:READ Q$:.MOTYPE$(I)=
Q$:NEXT
  230 REM Number of bytes for each mode
  240 DATA 1,2,2,2,2,3,3,3,1,2,2,2,3
  250 REM Display format for each mode
  260 DATA"A       ","£&..   ","&..    ",
"&..,X  ","&..,Y  ","&....  ","&....,X",
"&....,Y","        ","&..
"(&..),Y","(&....)"
  270 REM
  280 REM Build Mnemonic string, in alph
abetical order
  290 REM
  300 MNE$=""
  310MNE$=MNE$+"ADC AND ASL BCC BCS "
  320MNE$=MNE$+"BEQ BIT BMI BNE BPL "
  330MNE$=MNE$+"BRK BVC BVS CLC CLD "
  340MNE$=MNE$+"CLI CLV CMP CPX CPY "
  350MNE$=MNE$+"DEC DEX DEY EOR INC "
  360MNE$=MNE$+"INX INY JMP JSR LDA "
  370MNE$=MNE$+"LDX LDY LSR NOP ORA "
  380MNE$=MNE$+"PHA PHP PLA PLP ROL "
  390MNE$=MNE$+"ROR RTI RTS SBC SEC "
  400MNE$=MNE$+"SED SEI STA STX STY "
  410MNE$=MNE$+"TAX TAY TYA TSX TXA TXS"
  420 REM
  430 REM Build Hash table to hold chara
cteristics for each 6502 code
  440 REM In the following DATA statemen
ts a negative number gives the position
  450 REM of the associated Mnemonic in
the MNE$ string
  460 REM the following (Hexadecimal) nu
mbers give the Instruction Mode (1 digit
)
  470 REM and the instruction code of 2
digits, which direct the position in the
  480 REM Hash table
  490 REM
  500 READ Q$:IF LEFT$(Q$,1)="-" THEN NM
NE%=ABS(EVAL(Q$)):GOTO 500
  510 REM Encode Hash table entries
  520 Q%=EVAL("&"+Q$):I%=(Q% AND &FF):HA
SH%(I%)=(Q% AND &FF00) + NMNE%:GOTO 500
  530DATA -1,269,365,475,66D,77D,879,B61
,C71
```

the chip's logic works differently from the way this program is written.

The idea of hashing is that the subscript for an array or the index to a record in a file is generated by the data itself. In practice this can be a complicated process for open-ended data input because an index number has to be generated from whatever is read in. Unless you define a very large hash table, which will have many empty slots, different input data can generate the same index number, which has to be dealt by the program.

However, in the case of the 6502 disassembler a very simple situation exists, because a maximum of 256 index numbers can be generated, that is, all the possible values derived from reading a single byte. All that is required, therefore, is a singly dimensioned array of 256 words, subscripted 0 to 255. In the program this is called Hash%.

The data for the disassembler is built up in four separate sections:

MNES — A long string containing all the 6502 mnemonics in alphabetical order, separated by a space.

MOTYPE$ — This dimensioned string array contains the-13 formats for display of the 6502 addressing modes.

NBYTES — An array of 13 words giving the number of bytes for each addressing mode, that is one, two or three.

HASH% — Dimensioned at 255, contains information for each valid 6502 code, indexed by code number; otherwise contains zero.

The data for building up the Hash% array is structured in the following manner. If a negative number is read, this is taken as the position of the mnemonic in alphabetical order, starting from 1, assigned to MNE% in line 500. If a – sign is not found, a three-digit hexadecimal number is assumed, the first digit of which, 1 to D, is decoded as the addressing mode, while the second and third hex digits taken together are the 6502 instruction code, and form the subscript to the Hash% array, calculated in Line 520. The Eval function is used in the program to interpret the hexadecimal number: if Q$ is the hex number read from the Data list, the decimal equivalent is given by

```
Q% = EVAL("&" + Q$)
```

The word saved in the Hash% array is built up from the numerical value of the mnemonic position, determined by the negative number previously read, and the addressing mode read from the hexadecimal numbers following. In the Data list, the number of hexadecimal numbers ranges from one for implied instructions such as NOP, INX, etc., to eight for ADC, AND, etc.

Once the disassembler data is set up, the rest of the program is quite straightforward. After enquiring if you want a colour-coded list, you are asked to enter the hex values of the Start and End memory locations for the disassembly, the Start number corresponding to the program counter. Checks for valid entry are, of course, made before the listing commences. Lines 1050 to 1080 show the colour coding if this is requested.

Peeks and loops

The listing loop starts at line 1100, with a Repeat-Until construct. This line reads the next byte from memory with ?PC%, the BBC equivalent to Peek, and this forms the subscript for the Hash% array. The number in Hash% is retrieved, with

```
B% = HASH%(Q%)
```

and decoded to give the mnemonic number and addressing mode, the converse of the process used to set up Hash%. PCGet%() retains the instruction byte.

If the code is invalid — where, for example, a text string is being read — B% will be zero. Line 1110 deals with this situation. However, if it is valid, line 1120 decodes B%, giving the mnemonic index,

(continued on next page)

```
  540DATA -2,229,325,435,62D,73D,839,B21
,C31
  550DATA -3,10A,306,416,60E,71E
  560DATA -4,49B,-5,A80,-6,AF0
  570DATA -7,324,62C
  580DATA -8,A30,-9,AD0,-10,A10
  590DATA -11,900
  600DATA -12,A50,-13,A70
  610DATA -14,918,-15,908,-16,958,-17,9B
8
  620DATA -18,2C9,3C5,4D5,6CD,7DD,8D9,BC
1,CD1
  630DATA -19,2E0,3E4,6EC
  640DATA -20,2C8,3C4,6CC
  650DATA -21,3C6,4D6,6CE,7DE
  660DATA -22,9CA,-23,988
  670DATA -24,249,345,455,64D,75D,859,B4
1,C51
  680DATA -25,3E6,4F6,6EE,7FE
  690DATA -26,9E8,-27,9C8
  700DATA -28,64C,D6C
  710DATA -29,620
  720DATA -30,2A9,3A5,4B5,6AD,7BD,8B9,BA
1,CB1
  730DATA -31,2A2,3A6,5B6,6AE,8BE
  740DATA -32,2A0,3A4,4B4,6AC,7BC
  750DATA -33,14A,346,456,64E,75E
  760DATA -34,9EA
  770DATA -35,209,305,415,60D,71D,819,B0
1,C11
  780DATA -36,948,-37,908,-38,968,-39,92
8
  790DATA -40,12A,326,436,62E,73E
  800DATA -41,16A,366,476,66E,67E
  810DATA -42,940,-43,960
  820DATA -44,2E9,3E5,4F5,6ED,7FD,8F9,BE
1,CF1
  830DATA -45,938,-46,9F8,-47,978
  840DATA -48,385,495,68D,79D,899,B81,C9
1
  850DATA -49,386,596,68E
  860DATA -50,384,494,68C
  870DATA -51,9AA,-52,9AB,-53,998,-54,9B
A,-55,9BA,-56,99A
  880 ON ERROR OFF
  890 CLS:PRINT TAB(7,2)";CHR$141;"6 5 0
 2  Disassembler":PRINTTAB(7,3);CHR$141;"
6 5 0 2  Disassembler":PRINT TAB(5,5)"
Do you want Colour codes ?";:PROCYN:CFLA
G=Y%
  900 ON ERROR GOTO 1020
  910 PRINT TAB(30,8)"      ":PRINT TAB
(30,10)"      "
  920 PRINT TAB(5,10)"Enter END to stop
                "
  930 PRINT TAB(5,8);:INPUT "Disassemble
from :Hex.) "Q$
  940 PRINT TAB(0,14);STRING$(39," ");
  950 IF Q$="END" THEN PRINTTAB(0,14)"E
nd of run:  ";NLINES;"  lines listed":PR
INT TAB(0,16);:PROCTIME:END
  960 PC%=EVAL("&"+Q$)
  970  PRINT TAB(5,10);:INPUT "
   to   (Hex.) "Q$
  980 PCEND%=EVAL("&"+Q$)
  990 IF PC%>PCEND% THEN PRINT CHR$(7);:
PRINT TAB(0,14);CHR$133;"Start address h
isher than end address": GOTO 910
 1000 ON ERROR GOTO 890
 1010 GOTO 1030
 1020 PRINT CHR$(7);:PRINT TAB(5,14);CHR
$(131);"Bad Hex. entry: start again":GOT
O 910
 1030 PRINT TAB(7,12)"When listing use
:-"TAB(2,14)"SPACE BAR to Pause: ESCAP
E to Stop"
 1040 IF CFLAG=0 GOTO 1090
 1050 PRINT TAB(7,16)"Colour codes are:
"
 1060 PRINT TAB(6,18);CHR$130;"Branches
and Jumps"
```

(listing continued on next page)

(continued from previous page)

MNE%, and the mode index, MoIndex%.

The variable MoShow% has eight bytes allocated to it by a Dim statement, without parentheses, in line 60. In line 1120 the format for the mode is assigned to it with the statement

$MOSHOW% = MOTYPE$(MOINDEX%)

which will be modified later.

Branching out

Lines 1130 to 1150 deal with the branch instruction set, reading the next byte to get the branch range, and then calculating the destination address from the current program counter and the branch offset. This is more meaningful than simply displaying as

B.. + 15 or -23

Line 1180 deals with all the other situations where one or two following bytes have to be read in. ProCnum is the procedure that inserts the instruction address into MoShow%. Line 1190 retrieves the mnemonic, and at line 1200 ProChex prints the program counter as a four-digit hex number, and displays the hex code, using ProCode for formatting. Lines 1220 to 1240 put in the colour coding if requested.

The rest of the disassembled line is printed in Line 1250, which also increments the program counter PC%. Finally ProcASCII puts in the printable equivalent of the code. Line 1260 allows the program to be halted by pressing any key except Escape which causes the program to go back to ask for a new listing.

ProcNum at lines 1290 to 1340 modifies MoShow% by inserting the ASCII characters representing the hex instruction address. ProcHex at lines 1370 to 1430 shows how the four-digit hex number is printed with leading zeros, the hex digit being output with the Print ~N% format. ProcASCII at lines 1490 to 1520 displays the printable code, but if the byte is outside the range of ASCII characters a "." is displayed. This part of the display shows any text messages within the disassembled code. Try starting the listing at &0E00 to see what Basic looks like, but ignore the mnemonics.

A byte of code

The disassembled listing is quite conventional, showing the program address as four hex digits, the hex code as one, two or three bytes, the 6502 mnemonic, and the instruction address, if any, in the appropriate addressing mode, followed by the ASCII equivalent of the code. Any invalid code, usually manifested when an area of text information is being accessed, is displayed as ???. A little refinement for the BBC Micro, which is very simple to implement, consists of showing all branches and jumps in green, JSRs and RTSs in yellow, and errors in red.

The listing scrolls up rather quickly, at nine lines per second. It can be halted at any time by pressing the space bar, and resumed by pressing it again. To abort a listing press Escape. The colour coding of branches and JSRs is helpful as they are highlighted on display.

No particular effort has been made to diminish the size of the program as listed, as there are at least 5,000 free bytes when the program is loaded in mode 7. Space can, of course, be saved by omitting remarks, and a further 512 bytes could be saved by juggling with the Hash% array. Each BBC word occupies four bytes, while the information stored in Hash% corresponds to two bytes only, so each word in Hash% could have information on 6502 codes. This development would complicate the logic of the program and make it run a little slower, but readers are welcome to experiment. Even better would be to rewrite everything in machine code, but this hardly seems necessary as the program runs quite fast enough in Basic.

(listing continued from previous page)

```
 1070 PRINT TAB(6,15);CHR$131;"JSR's and
 RTS's"
 1080 PRINT TAB(6,20);CHR$129;"Invalid c
odes"
 1090 PRINTTAB(1,22);CHR$131;"Press";CHR
$136;"SPACE BAR";CHR$137;"to continue":X
=GET:CLS
 1100 REPEAT  QX=?PC%:B%=HASH(QX):PCGET
%(1)=QX
 1110 IF B%=0 THEN $MOSHOW%="          ":M$
="???":NBYTE%=1:MOINDEX%=0:GOTO 1200
 1120MNE%=M% AND &FF:MOINDEX%=QX DIV
256:$MOSHOW%=MOTYPE$(MOINDEX%):NBYTE%=NB
YTES(MOINDEX%)
 1130 IF MOINDEX%<10 GOTO 1160
 1140 K%=?(PC%+1):PCGET%(2)=K%:IF K%>127
 THEN K%=K%-256
 1150 PROCNUM(PC%+K%+2):GOTO 1190
 1160 IF NBYTE%=1 GOTO 1190 ELSE FOR I%=
2 TO 3:PCGET%(I%)=?(PC%+I%-1):NEXT I%
 1170 REM Display next 1 or 2 bytes
 1180 IF NBYTE%=2 THEN PROCNUM(PCGET%(2)
) ELSE PROCNUM(PCGET%(3)*256 + PCGET%(2)
)
 1190 M$=MID$(MNE$,(NMNE%-1)*4+1,3)
 1200 PROCHEX(PC%):PRINT "  ";:FOR I%=1
TO NBYTE%:PROCODE(PCGET%(I%)):NEXT I%
 1210 IF CFLAG=0 GOTO 1250
 1220 IF MOINDEX%=0 THEN PRINT CHR$129;:
GOTO 1250:REM Errors in Red
 1230 IF MOINDEX%=10 OR M$="JMP" THEN PR
INT CHR$136;:GOTO 1250:REM Branches and
Jumps in Green
 1240 IF M$="JSR" OR M$="RTS" THEN PRINT
 CHR$131;:GOTO 1250:REM Subroutine calls
 in Yellow
 1250 PRINT TAB(20);M$;" ";$MOSHOW%;:PRO
CASCII:::PCX=PC%+NBYTE%:NLINES=NLINES+1
 1260 X=INKEY(0):IF X=-1 GOTO 1270 ELSE
X=GET
 1270 UNTIL PC%>=PCEND%
 1280 PRINT "      RETURN to continue":X=
GET:GOTO 890
 1290 DEF PROCNUM(N%):REM Insert Hex num
ber into mode display
 1300 NN%=N%
 1310 N$="":N1=INSTR($MOSHOW%,".."):N2=I
NSTR($MOSHOW%,"....")
 1320 IF N2=0 GOTO 1340
 1330 FOR I%=N2+2 TO N2-1 STEP -1:Z%=(NN
% AND &F):Z%=Z%+48-7*(Z%>9):MOSHOW%?I%=Z
%:NN%=NN%/16:NEXT I%:ENDPROC
 1340 FOR I%=N1 TO N1-1 STEP -1:Z%=(NN%
AND &F):Z%=Z%+48-7*(Z%>9):MOSHOW%?I%=Z%:
NN%=NN%/16:NEXT I%:ENDPROC
 1350 DEF PROCYN
 1360 Y%=0:X$=GET$:IF X$="Y" OR X$="y" T
HEN Y%=1:ENDPROC ELSE IF X$="N" OR X$="n
" THEN ENDPROC ELSE GOTO 1360
 1370 DEF PROCHEX(N%):REM Print Program
Counter in Hex
 1380 PRINT TAB(5);"$";
 1390 IF N%>&FFF GOTO 1430
 1400 IF N%<=&FFF THEN PRINT "0";
 1410 IF N%<=&FF THEN PRINT "0";
 1420 IF N%<=&F THEN PRINT"0";
 1430 PRINT~N%;:ENDPROC
 1440 DEF PROCODE(N%)
 1450 IF N%<=&F THEN PRINT "0";
 1460 PRINT ~N%;:ENDPROC
 1470 DEF PROCTIME
 1480 T=TIME-!START%:PRINT "Time was  ";
(T DIV 360000) MOD 12;" hrs ";(T DIV 600
0 MOD 60;" mins ";(T DIV 100 MOD 60;" se
cs":ENDPROC
 1490 DEF PROCASCII
 1500 PRINT CHR$135;TAB(32);"/";
 1510 FOR I%=1 TO NBYTE%:QX=PCGET%(I%):I
F QX>=&20 AND QX<&7F THEN PRINTCHR$QX; E
LSE PRINT".";
 1520 NEXT I%:PRINT"/":ENDPROC
```

EP4000

EPROM EMULATOR PROGRAMMER



- EP4000 emulates/programs all NMOS EPROMs up to 4k × 8.
- *2564/2764/Bipolar PROMs programmable with adaptors
- 300ns access time in emulation mode
- Editing facilities — data entry, match, display, shift, move, clear, define, block program, etc.
- Input/Output as standard — RS232C (ASCII Hex and binary), 20mA, printer, cassette, parallel handshake and DMA
- Video output for memory map display
- Fully buffered cold ZIF socket
- Price £545 + VAT + £12 delivery
- Ex-stock delivery. Write or phone for more details

2564*, 2764*, 2732A*, 2732, 2532, 2716, 2516, 2758, 2508 2716(3), 2708, 2704

P8000

THE PRODUCTION PROGRAMMER TO HANDLE ALL NMOS EPROMS

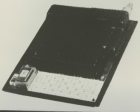


NEW PRODUCT

- Checks, Programs, Compares up to 8 devices simultaneously
- Handles all NMOS EPROMs up to projected 128K designs with no personality modules of characterisers — See list below
- Easy to use, menu driven operation for blankcheck, program, verify, illegal bit check, checksum, self-test
- Constant display of device type, mode and fault codings
- Individual socket LED indicators for EPROM status
- Comprehensive EPROM integrity checks — Illegal bit check, data and address shorts, constant power line monitoring
- Full safeguard protection on all sockets
- Automatic machine self test routine
- Powered down sockets
- Cost effective price — £695 + VAT
- Available from stock. Write or phone for more details

2564, 2764, 68764, 68766, 68732-1, 68732-0, 2732A, 2732, 2532, 48016, 2716, 2516, 2758A, 2758B, 2508, 2716(3), 2708, 2704

SOFTY 2 2716 EMULATOR PROGRAMMER



- 2716 Emulator/Programmer
- Can program 2532/2732 in two halves
- Multifunction touch keypad
- Editing facilities: Data entry/deflection, block shift, block store, match byte, displacement calculation
- High speed cassette interface and serial interface
- Direct output to T.V.
- Price £169 + VAT

MODEL 14 EPROM ERASERS



- 14 EPROM Capacity
- Fast reliable erase time
- Built-in 5-50 minute timer (UV141)
- Safety interlocked to prevent eye and skin damage
- Convenient slide tray loading of devices
- UV141 available ex-stock £78 + VAT
- UV140, similar to UV141, but without timer £61.50

GP Industrial Electronics Ltd

Unit E, Huxley Close, Newnham Ind. Estate, Plymouth PL7 4JN
Tel: Plymouth (0752) 332961 Telex: 42513 SHARET

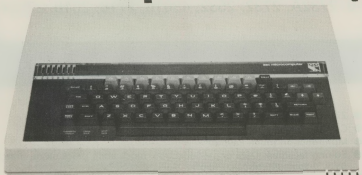
● Circle No. 190

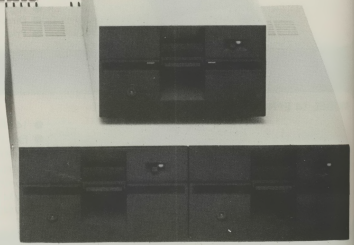
Cumana drives BBC Micro best!



CUMANA DRIVES + OWN POWER SUPPLY = BIG PLUS FOR BBC MICRO USERS . . . JUST FOR STARTERS

. . . PLUS NO HASSLE 12 MONTH WARRANTY





The 'ice on the cake' is that, because the Cumana Drive has its own power supply, it can be used with many other Micros when connected via the appropriate cable. Cumana supply a Drive connecting cable which has a standard 34 way edge connector plus 34 way BBC connector in the same cable length. This allows the Cumana Drive to be connected to numerous makes of micro without the need to change connecting cable. And the Japanese manufactured disk drives are quiet and utterly dependable.

CS50A	Single sided 40 track TEAC drive in a cabinet with own power supply 100K	**£199**
CD50A	2 single sided 40 track TEAC drives in a cabinet with own power supply 200K	**£369**
CS50E	Single sided 80 Track TEAC Drive with cabinet and own power supply 200K	**£265**
CD50E	2 single sided 80 Track TEAC Drives in cabinet with own power supply 400K	**£495**
CS50F	Double sided 80 Track TEAC Drive with cabinet and own power supply 400K	**£345**
CD50F	2 double sided 80 Track TEAC Drives with cabinet and own power supply 800K	**£619**
	2 drive Cable for BBC Micro	**£15**
	2 drive Cable for BBC Micro plus TRS80, Video, Genie etc.	**£18**
UPGRADE KITS	**A → B**	**£90**

Please add VAT to all prices

CUMANA LTD

Unit 1, The Pines Trading Estate, Broad Street, GUILDFORD, Surrey. GU3 3BH. Tel: (0483) 503121. Telex: 859380 CUMANA.

DEALER & EDUCATIONAL ENQUIRIES WELCOME – GENEROUS DISCOUNTS AVAILABLE

● Circle No. 191

Open File

This regular section of *Practical Computing* appears in the magazine each month, incorporating Tandy Forum, Apple Pie, Sinclair Line-up and other software interchange pages.

Open File is the part of the magazine written by you, the readers. All aspects of microcomputing are covered, from games to serious business and technical software, and we welcome contributions on CP/M, BBC Basic, Microsoft Basic, Apple Pascal and so on, as well as the established categories.

Contributors receive £30 per published page and pro rata for part pages, with a minimum of £6. Send contributions to: Open File, *Practical Computing*, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

Sinclair line-up: Security code to protect files; Graph plotter for ZX-81; Alphabetical list sorting program; Family tree on ZX-81; Car fault-finding diagnosis **141**

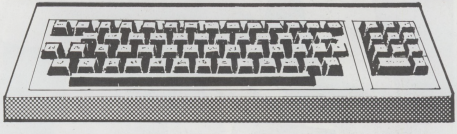
Apple Pie: Noughts and crosses in three dimensions; Space voyage game; Sounds brief USR call; "Pretty pictures" with Lissajous figures; Paged listings — introduced by John Harris **152**

Atari Accent: Input routines — introduced by Jack Schofield **156**

Tandy Forum: Ticker tape newscast display; Using commas as a separator; Printer/screen shift; Micro word processor — introduced by John Wellsman **158**

BBC Bytes: Automated drawing of circuit diagrams; Maps of the British Isles; Gladiator game — introduced by John Harris **163**

Commodore Corner: Key-wait loop; Fast machine-code routines for interactive programs; Line counter; Matching strings **167**

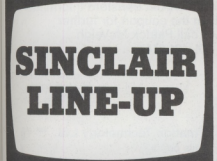


Guidelines for contributors

Programs should be accompanied by documentation which explains to other readers what your program does and, if possible, how it does it. It helps if documentation is typed or printed with double-line spacing — cramped or handwritten material is liable to delay and error.

Program listings should, if at all possible, be printed out. Use a new ribbon in your printer, please, so that we can print directly from a photograph of the listing and avoid typesetting errors. If all you can provide is a typed or handwritten listing, please make it clear and unambiguous; graphics characters, in particular, should be explained.

We can accept material for the Pet, Vic and Sharp MZ-80K on cassette, and material for the larger machines can be sent on IBM-format 8in. floppy discs.



Security codes

THE PROGRAM Security Codes by Gary Nugent of Dublin was designed to keep prying eyes away from private or confidential files. It is used with programs which run automatically upon loading. A five-digit alphanumeric code is entered. If the code matches that stored within the program, the main file/program is run. If the code does not match then the whole program is destroyed. Incidentally, RAMtop is reset to 32768, that is address 16389 contains the value 128. So if you have any machine-code routines above RAMtop, these also will be destroyed.

The routine is written entirely in machine code, being 207 bytes long. It should be placed in a line 1 Rem statement, with 207 Xs after the Rem, using any hex loader. Once the program is entered into the Rem statement it should not be edited. This is because the listing contains some hidden bytes which will be lost if the line is edited, and consequently the program will not work.

Addresses 16514 to 16518 hold the code, each character of which being Poked into these addresses. Addresses 16519 to 16523 hold the code you input when the main program is loaded. The routine is called by

```
RAND USR 16609.
```

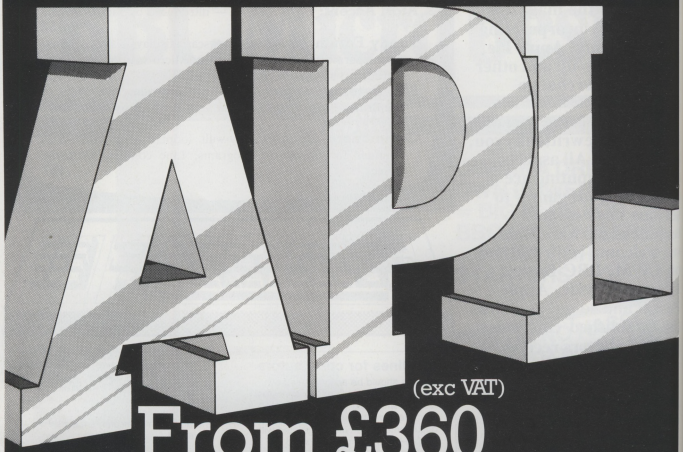
It is used in the following way:

```
1 REM (containing machine code routine)
  :
  :
(main program)
  :
  :
9000 SAVE "X"
9010 RAND USR 16609
9020 CLS
9030 RUN
```

When a program is loaded, the code is entered one character at a time, without the need to press Newline after each character. Keys should not be held down too long or the key will repeat, causing an incorrect entry code. If you find that you

(continued on page 145)

NOW YOU'RE TALKING APL



(exc VAT)

From £360

with VIZ::APL and your Micro

- VIZ::APL will run on most Z80 based micros with diskette storage.
- VIZ::APL gives your Z80 micro IBM 4300 capabilities.
- VIZ::APL is based on the IBM APL programming manual (GC26-3847-2) and the proposed ANSI standard.
- VIZ::APL enables you to run a megabyte of work space on a micro.
- VIZ::APL can be learnt quickly – programmers can be productive within days.
- VIZ::APL can cut systems development costs by up to 70% or more.
- VIZ::APL comes complete with conversion keytops, character generation EPROM's and self tutor text.
- VIZ::APL utilities include Graphics, Prestel Interface, a Reporting Language, a File Handler and Communications Driver.

VIZ::APL is now available from Berisford Information Technology Ltd – fill in the coupon for further details or call Patrick McVeigh 01-481 9144.

BIT

Berisford House
50 Mark Lane
London
EC3R 7QJ
01-481 9144

To Berisford Information Technology Ltd.

Please supply further details on
☐ **Berisford Information Technology**
☐ **VIZ::APL**

Name _____

Company _____

Address _____

_____

_____

● **Circle No. 192**



Time Technology

Where the price of progress is less than you think

The **Transtec** Business Computer Range from Time Technology means a lot more than you think for a lot less than you imagine.

The sophisticated BC2 (twin 5¼" 400K floppy disk) starts from around £1,395 and the highly advanced HD5 (internal 5MB + 400K floppy disk) starts from £2,750.

Both offer Z80A processor with 4MHZ clock; 64K RAM expandable to IMB; CPM Operating System; DMA capability; Character generating RAM; Memory mapped video display; 12" non-glare screen (80×24 characters with 25th status line); full Qwerty keyboard (numerical pad, 13 function keys and 4-way cursor control keys) and parallel and serial parts are available.

Remember, when you buy from Time Technology you buy after-sales care that's second-to-none, with full nationwide back-up.

● **Circle No. 193**

For further details talk to Chris Francis on 01-622 4555 or write to **Time Technology Ltd., 150 Clapham Manor Street, London SW4 6DA.**
Dealer enquiries welcome.



Micro Modeller

The Leading Business Management System

Today MicroModeller is used for the planning and control of Financial and other operations of over 2,500 organisations in the UK. Our clients include many Times Top 1000 companies, banks and financial institutions as well as smaller businesses.

MicroModeller is available on the following micro computers:–
ADDS Multivision
Altos
Apple II & III
Commodore 8032 & 8096
Digico Prince
Dynabyte
Future Technology 88
Hewlett Packard HP125 & 87
Hytec 4500
IBM PC
Memory 7000
National Panasonic
NEC PC8000
Pericom
Rair Black Box
Sirius
South West S09
Superbrain
T.A Alphatronic
The Globe
VTS 2200 (NEXOS)
Wang Writer
Xerox 820

Our range of software products now includes the following:–
Decision Modeller
Strategic Financial Planning Tool.
Micro Link Line
Communicates with main frame computers or bureaux.
Micro Graph Power
Produces high resolution, colour business graphics on a plotter.

Our clients also have the benefits of Intelligence (UK) Customer Services, providing support and assistance in the use of our software. These services include:–
Telephone Hotline
Training
Consultancy
User Magazine
User Groups

Further information and enquiries to:
Sales Director
Intelligence (UK) Limited
Nelson House
271 Kingston Road
London SW19 3NW
Telephone 01-543 3711
Telex CALLIN G 444423

● **Circle No. 194**

(continued from page 141)

cannot enter the entry code fast enough — that is, keys repeat — try altering the pause between keystrokes by Poking 16646 with a value between 0 and 255. The larger the value the longer the pause.

One word of warning though: do not forget the codes you use. If you do you will not be able to gain access to the file/program. Break has no effect on machine-code programs.

Security codes.

```
        ** (C) GARY NUGENT **

"SECURITY CODES" HEX DUMP:

00  00  00  00  00  00  00  00
00  00  35  33  2A  25  00  2A
00  00  2A  2A  2A  2A  30  00
38  26  3A  37  2A  00  2A  00
25  34  28  2A  0E  FF  00  0E
AE  B3  AA  B4  B7  B7  AA  AA
B9  B8  BB  AA  AA  BA  B7  AE
B9  AE  BB  AA  B6  AA  00  00
FF  35  37  34  2C  37  26  32
00  29  2A  30  39  37  3A  26
39  00  2E  33  00  1F  00  3E
3A  26  3A  37  2A  36  FF  2A
49  41  11  6C  40  CD  40  41
3E  05  01  67  40  F5  CD  CD
88  02  44  4D  81  14  3E  00
20  F5  CD  6D  07  75  C1  02
03  F5  01  00  0C  00  75  B1
20  F5  01  67  40  06  0E  11
32  40  21  67  40  06  0E  1A
BE  28  05  13  23  10  F5  18
CD  49  41  11  AE  40  CD  48
41  11  28  00  19  11  C3  40
CD  40  41  01  FF  FF  05  79
B1  28  FB  CD  00  00  1A  FE
FF  C8  77  13  23  18  F7  3A
0C  40  11  4D  01  19  C9

   CALL WITH "RAND USR 16669"
```

Graph plotter.

```
  1 REM GRAPH PLOTTER
  2 REM J LOWE MAY 82
  3 REM ********
 10 IF INKEY$="" THEN GOTO 10
 11 IF INKEY$="S" THEN STOP
 12 IF INKEY$="C" THEN GOSUB 20
00
 15 CLS
 30 PRINT "EQUATION OF X?"
 40 INPUT A$
 50 PRINT "MIN. X VALUE?"
 60 INPUT XMIN
 70 PRINT "MAX. X VALUE?"
 80 INPUT XMAX
 90 PRINT "NO. POINTS?"
 95 INPUT NP
100 LET YMIN=10E10
110 LET YMAX=-10E10
120 LET XR=ABS (XMAX-XMIN)
130 FOR X=XMIN TO XMAX STEP XR/
95
135 IF X=0 THEN NEXT X
140 LET YC=VAL A$
150 IF YC>YMAX THEN LET YMAX=YC
160 IF YC<YMIN THEN LET YMIN=YC
170 NEXT X
180 LET YR=ABS (YMAX-YMIN)
190 LET XG=ABS (XMIN)*63/XR+(XM
IN<0 AND XMAX>0)*63+(XMIN<0 AND
XMAX<0)
210 LET YG=ABS (YMIN)*43/YR+(YM
IN<0 AND YMAX>0)*43+(YMIN<0 AND
YMAX<0)
220 PRINT "PLOT OVER RANGE OR 5
% POINTS?"
230 PRINT "(""R"" OR ""P"")"
240 INPUT B$
245 CLS
250 IF B$="R" THEN GOTO 280
260 IF B$="P" THEN GOTO 500
270 GOTO 240
280 GOSUB 1000
290 FOR P=XMIN TO XMAX STEP XR/
95
293 IF P=0 THEN NEXT P
294 LET X=P
300 LET VAL A$
310 LET X=(P-XMIN)*63/XR
315 LET Y=(Y-YMIN)*43/YR
320 PLOT X,Y
330 NEXT P
340 GOTO 10
500 GOSUB 1000
510 FOR N=1 TO NP
520 INPUT X
530 LET Y=VAL A$
540 PLOT (X-XMIN)*63/XR,(Y-YMIN
)*43/YR
550 NEXT N
560 GOTO 10
1000 FOR N=0 TO 43
1010 PLOT XG,N
1020 NEXT N
1030 FOR N=0 TO 63
1040 PLOT N,YG
1050 NEXT N
1060 RETURN
2000 LPRINT "EQUATION OF :"
2010 LPRINT "Y=";A$
2020 LPRINT "FOR X=";XMIN;" TO "
;XMAX
2030 LPRINT " (";NP;" POINTS)"
2040 LPRINT
2050 COPY
2060 RETURN
```

Graph plotter

THE MAIN DISADVANTAGES suffered by the graph-plotting routines I have seen for the ZX-81 are that the axes and scale are fixed in the program thus making them inflexible and not utilising screen space to the full, writes Jason Lowe of Hyndburn, Lancashire.

The program listed, after accepting the equation to be plotted, the minimum and maximum values of X and the number of desired points, will first adjust the position of the axes to suit the spread of points — negative and positive values of X and Y. You will then be asked if you want to intput the values of X individually or if the computer is to plot the graph over the range specified.

The points are then scaled to fit on to the screen and axes and plotted. After plotting another input is awaited — pressing "C" will produce hard copy from the printer, "S" will stop the program and any other key will clear the screen to start the next cycle.

This removes the chore of calculating scale factors and constants for each equation to be plotted and makes experimentation with different functions fun.

Lines 15-80 accept the input for initial data.

100-210 position the axes — XO is the X origin, YO the Y origin.

220-270 directs the program to the appropriate plotting routine

290-340 plots the whole rangeof X values

500-560 plots single points specified by the user

1000-1060 draws the axes

2000-2060 handles output to the printer. The origins are set at zero unless minimum values of X or Y are negative in which case the origin is positioned according to the ratio of the negative range to the whole range — lines 200 and 210. Take care of this.

Lines 135 and 293 will skip an X value if it is zero so that, for example, if Y = 1/X is the equation an error code is not returned.

Alphabetical list

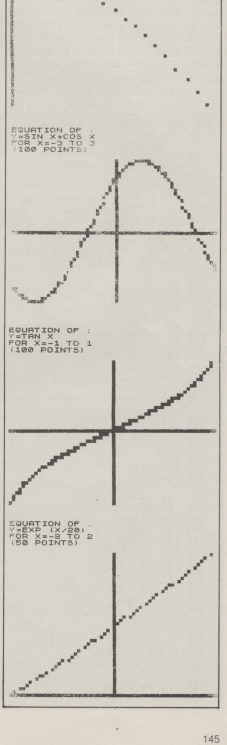
THIS PROGRAM by John Loncaster of Hornsea, East Yorkshire is designed to enable a list of items, together with two sets of figures — the amount and cost of each item — to be entered in any order, sorted into alphabetical order, listed on the screen and altered. It runs on a ZX-81 with 16K RAM.

The program as written allows for a list of up to 60 items, printed 20 at a time on the screen, the remaining lines being required for operating instructions, and with easy access back and forth. The names of the items can contain up to 15 characters, including spaces. In fact, by amendment of the arrays in lines 13, 15, 17, 19 and 21 the capacity can be increased up to 300 items.

Also of course the maximum length of the item names can be increased or decreased by altering the figure 15 in the string array at line 13. If this figure is increased, then it will decrease the total number of items which could be entered to something less than 300. Also it is important to ensure that each item with its attendant figures does not occupy more than one line when printed on the screen, otherwise the program would have to be modified to print less than 20 items at a time.

To ensure that a list entered and stored on tape is not deleted when the program is loaded, Save "Alphabetical Listing" is

(continued on next page)



(continued from previous page)

provided in line 150 and line 151 then directs the computer to go to line 132 to print out the existing list.

If, however, a list of items has not yet been entered, then the code 2/133 will appear. The list can then be commenced by using the command Run. This will then ask you to enter the number of items you want to put initially in the list. This requires the Input Z in line 24; Z is an important number throughout the program, because it keeps track of the amount of items in the list and is automatically amended whenever an item is added or deleted.

However, while it is necessary to enter some number for Z at the commencement, it does not matter if you subsequently find that you have entered too large or too small a number. If you have entered just the right number, say 30, then as soon as you have entered 30 items the screen will blank — assuming, as the program is written, that a ZX-81 is in East mode — for some time as the computer gets busily down to the task of sorting the list into alphabetical order. It will then display the first 20 items.

However if you allowed too many when entering Z, and you find, say, that you have only 25 items to list instead of 30, then after entering the 25 items, press Newline by itself when the next item is called for: Z is automatically amended to 25, and the computer starts sorting.

On the other hand, if you find you have more than 30 items, then after entering the initial 30 and allowing the computer to sort and display you can add as many as you like (up to 60, or whatever the Arrays have been set at) by using the "Add" operation. Items can only be added one at a time and the computer will sort and display after each addition. Again Z is automatically amended.

Likewise, having entered your initial complete list, you can not only add to it, but also substitute one item for another, or delete an item. Remember that the larger the number of items entered, the longer the time it will take the computer to sort.

Once the list is sorted the first page of 20 items will be displayed on the screen. To move forward to the next page press 5 and Newline, and then Cont and Newline. To move back to page 1, press 4 and Newline.

When considering what length of string to allow in the string array at line 13 it is necessary to ensure that it allows sufficient room for the maximum length of name (including any spaces) of any item. It does not of course matter if you allow more than sufficient for the longest name. This means that most, if not all, the names of items are shorter than the length allowed in the string array. This would therefore cause the computer to print a lot of spaces at the end of each item name before printing the cost. To prevent this the array L is used to measure and store the length of each name or string as it is entered. Then in the list-printing section — lines 134 and 135 — the computer is instructed to print only up to the length of each name plus one, for a space before the £ sign.

As it stands this program simply lists items in alphabetical order, together with the amount and cost of each item. However it can readily be adapted for various different uses. For example, names and addresses and telephone numbers; contents of a freezer; Christmas card list — linked with ZX Printer to address your cards. Likewise it can, as I have done, be included as a subroutine in some calculating program — for example to list a portfolio of investments, and then provide valuations.

Alphabetical list.

```
  10 REM "ALPHABETICAL LISTING"
  11 REM BY D.H. LONCASTER, JAN
     1982
  12 REM TO SAVE GOTO 1370
  13 DIM A$(50,18)
  50 REM A$ ARRAY CONTAINS THE
     ITEMS
  60 DIM A(60)
  70 REM A ARRAY CONTAINS AMOUNT
  80 DIM C(60)
  90 REM C ARRAY CONTAINS COST
 100 DIM N(60)
 110 REM N NUMBERS THE ITEMS
 120 DIM L(60)
 130 REM L MEASURES LENGTH OF A$
 140 PRINT "HOW MANY ITEMS DO YO
U WISH TO      ENTER INITIALLY ?"
 150 INPUT Z
 160 REM Z KEEPS TRACK OF NUMBER
     OF ITEMS ENTERED AND
     CONTROLS LOOPS
 170 LET Z=Z
 180 LET N1=0
 190 FOR H=1 TO Z
 200 PRINT "ENTER NAME OF ITEM,
IF YOUR LISTIN IS LESS THAN THE NUM
BER SET      INITIALLY, PRESS NEW
LINE WHEN    YOU HAVE COMPLETED L
IST."
 210 INPUT X$
 220 CLS
 230 IF X$="" THEN LET Z=H-1
 240 IF X$="" THEN GOTO 410
 250 LET L(H)=LEN X$
 260 PRINT "ENTER AMOUNT OF ITEM
"
 270 INPUT A1
 280 CLS
 290 PRINT "ENTER COST OF ITEM"
 300 INPUT C1
 310 CLS
 320 PRINT N1+1;". ";A1;" ";X$;"
£";C1
 330 LET N1=N1+1
 340 LET A$(H)=X$
 350 LET A(H)=A1
 360 LET C(H)=C1
 370 LET N(H)=N1
 380 LET L(H)=L1
 390 NEXT H
 400 CLS
 410 FOR W=1 TO Z
 420 LET D=0
 430 FOR J=1 TO Z
 440 IF A$(J)<=A$(J+1) THEN GOTO
     500
 450 LET T$=A$(J)
 460 LET A$(J)=A$(J+1)
 470 LET A$(J+1)=T$
 480 LET T1=A(J)
 490 LET A(J)=A(J+1)
 500 LET A(J+1)=T1
 510 LET T2=C(J)
 520 LET C(J)=C(J+1)
 530 LET C(J+1)=T2
 540 LET D=D+1
 550 LET T3=L(J)
 560 LET L(J)=L(J+1)
 570 LET D=1
 580 NEXT J
 590 IF D=0 THEN GOTO 610
 600 NEXT K
 610 GOTO 690
 620 PRINT AT 20,0,"ADD 1, SUBST
     2 DELETE 3, RETURN 4, CONT 5 T
HEN CONT"
 640 INPUT Y
 650 IF Y=2 THEN GOTO 860
 670 IF Y=3 THEN GOTO 1040
 680 IF Y=4 THEN GOTO 1190
 690 PRINT AT 20,0,"..
     ..
 700 PRINT AT 21,0,"ENTER NAME O
F NEW ITEM"
 710 INPUT X$
 720 LET A$(1)=X$
 740 LET L(1)=LEN X$
 745 PRINT AT 21,0,"..
     ..
 750 PRINT AT 21,0;"ENTER AMOUNT
 OF NEW ITEM"
 760 INPUT A1
 770 LET T=A(1)=A1
 780 PRINT AT 21,0,"..
     ..
 790 PRINT AT 21,0;"ENTER COST O
F NEW ITEM"
 800 INPUT C1
 810 LET C(1)=C1
 820 LET N(1)=N(2)+Z-1
 830 LET Z=Z+1
 850 GOTO 410
 860 PRINT AT 21,0;"..
     ..
 870 PRINT AT 21,0;"ENTER NUMBER
 OF ITEM TO BE SUBST"
 880 INPUT X
 885 PRINT AT 20,0;"..
     ..
 890 PRINT AT 21,0;"..
     ..
 900 PRINT AT 21,0;"ENTER NAME O
F NEW ITEM"
 910 INPUT X$
 920 LET A$(X+1)=X$.
 930 PRINT AT 21,0;"..
     ..
 940 PRINT AT 21,0;"ENTER AMOUNT
 OF NEW ITEM"
 950 INPUT A1
 960 LET A(X+1)=A1
 970 PRINT AT 21,0;"..
     ..
 980 PRINT AT 21,0;"ENTER COST O
F NEW ITEM"
 990 INPUT C1
1000 LET C(X+1)=C1
1010 LET L(X+1)=LEN X$
1030 GOTO 410
1035 PRINT AT 20,0;"..
     ..
1040 PRINT AT 20,0;"..
     ..
1045 PRINT AT 21,0;"..
     ..
1050 PRINT AT 21,0;"ENTER NUMBER
 OF ITEM TO DELETE"
1060 INPUT Y
1070 N=Y+Z-1
1080 FOR P=(Y+1) TO Z
1090 LET A$(P-1)=A$(P+1)
1100 LET A(P)=A(P+1)
1110 LET C(P)=L(P+1)
1120 NEXT P
1130 LET Z=Z-1
1140 LET A$(P)=""
1150 LET A(P)=0
1160 LET C(P)=0
1170 GOTO 410
1180 REM
1200 LET U=1
1210 FOR R=1 TO Z
1220 IF N(U)<=9 THEN PRINT " ";N
(U);". ";A$(U);TAB L(U)+1 TO
 L(U)+1);"£";C(U);1
1230 IF N(U)>=10 THEN PRINT N(U)
;". ";A$(U);TAB L(U)+1 TO L(
U)+1);"£";C(U);1
1240 IF N(U)=U+20 THEN GOSUB 126
0
1250 NEXT U
1260 GOTO 620
1270 RETURN
1280 PRINT AT 20,0;"..
     ..
1290 PRINT AT 20,0;"ADD 1, SUBST
     2 DELETE 3, RETURN 4, CONT 5 TH
EN CONT"
1300 INPUT Y
1310 IF Y=1 THEN GOTO 630
1320 IF Y=2 THEN GOTO 860
1330 IF Y=3 THEN GOTO 1040
1340 IF Y=4 THEN GOTO 1190
1350 LET U=U+1
1360 GOTO 1210
1370 SAVE "ALPHABETICAL LISTING"
1380 GOTO 1200
1385 STOP
```

Family tree

MR A N LITTLE asked for a family tree program for the ZX-81 — see March 1982 issue page 45. I have written such a program for a 16K computer, which might be useful to him, writes H A A Cabot.

I have traced my family back to AD1010, which involves 26 generations and around 280 names. This was too much for my computer and I have cut it down to 143 names. I have gone down in a direct line to my father — member number 100, see line 155 in printout section and line 220 in input section.

If you want to spread out from the beginning, lines 220 to 235 Input and 155 to 170 will be omitted. You start by writing all the family names down, generation by generation, and number them. Heir does not mean heir but the following person in the descending line.

I have dimensioned the names of the person to a length of 28, but the names must not be longer than 26. If you want to save memory you dimension to the longest name plus 2. The name of the marriage partner can be the same length as the dimension, but the main person requires a minimum of blank spaces after the name — see search section 100.

Printout section Input. Run enter all information, taking note of the cue. You can enter small cues. If you made a wrong

entry you can correct them at the end of the program: make a note of the wrong entries. If, however, you have made a big mistake, you can get out of the input program by entering a letter, when the computer asks for a figure.

You change the number I in line 60 to the number where you went wrong — X stands for the number of descendants, not husbands/wives — and restart the program by entering the Goto 60. On no account use Run or go through the Dim section, for you lose all entries. After entering all information, you can do any corrections as follows: for example, you made a spelling mistake in the name of main person (A$) number 55, you enter, no line number

LET A$(55) = " (enter correct name)".

This way you can correct all entries.

If you want to check a certain entry enter

PRINT A$(55)

no line number. You can also put a little program at the end:

500 for N = 1 TO X

505 PRINT AT 21,0 " A$(N)

510 SCROLL

515 NEXT N

Note that I do not use CLS in the Input program, but covèr up with blank spaces. While entering you can check your program regularly to see whether the coverups are big enough. Do not enter Next N till you are satisfied. Line 105: If the person is not married enter 0.

In my family tree there are no married people without children, but you can include them by inserting

in INPUT 201 IF O(N) = 0 THEN GOTO 240

PRINTOUT 261 PRINT AT 9,0;"no children"

262 GOTO 300

240-250 clear the screen

255-300 print out all entries for final check

You can save the program now. To clear the screen for the Printout program, you enter the line numbers followed by Newline. Do not use New, you will lose all the entries. Alternatively you can type the new program over the old, but I always get lost this way.

Search and printout section:

Lines 40-80 speed up the search program about 10 times but can be omitted.

85-100 cut the length of A$ from 28 to the actual length of the name and compares it with the requested name U$3 It shows why A$ has to be at least two spaces longer than the name

110-125 inform you that the name is not found and asks you to re-enter, U$ is used here as in line 30.

130-145 select the type of printout.

150-170 find the father, grandfather, etc. of the requested person.

173-325 and 415-430 print out the generations in turn, starting at the first generation, giving the name of person N, birthday, whether son or daughter, parents, married, children's names and generation.

180-225 print the name of person N in the middle at the top of the screen and underline it.

330-410 give the three different running methods.

(continued on page 149)

```
  1 REM "FAMILY TREE"
  2 REM INPUT SECTION
  3 REM M,A,B, CHABOT
  4 REM HEMINGFORD GREY
  5 REM 020.225
 10 LET X=1
 15 DIM A$(X,28)
 20 DIM B$(X,23)
 25 DIM S$(X,10)
 30 DIM A(X)
 40 DIM C(X)
 45 DIM G(X)
 50 DIM H(X)
 55 DIM O(X)
 60 FOR N=1 TO X
 65 PRINT AT 18,0,N; AT 20,13; "
    "
 70 INPUT A$
 75 IF LEN A$<=26 THEN GOTO 90
 80 PRINT AT 20,10;" TOO LONG "
 85 GOTO 70
 90 LET A$(N)=A$
 95 PRINT AT 18,4;A$(N);AT 20,1
    3;"
100 SCROLL
105 PRINT AT 20,10;" MARRIED "
110 INPUT M$
115 IF M$="" THEN GOTO 130
120 IF LEN M$<=23 THEN GOTO 130
125 PRINT AT 20,10;" TOO LONG "
130 CLS
135 PRINT A$(N) $35
138 PRINT AT 15,4;U$(N);AT 20,1
    3;"
140 INPUT S$(N)
145 PRINT AT 19,27,S$(N);AT 20,
    13;"
150 INPUT P(N)
155 PRINT AT 18,29,P(N); AT 20,1
    3;"
160 INPUT D$(N)
165 SCROLL
170 PRINT AT 18,10;"
    "
175 PRINT AT 18,4;A$(N); AT 20,10;"MARRIED "
180 INPUT G(N)
185 PRINT AT 18,15,G(N); AT 20,3
    "
190 IF U$(N,1)="0" THEN GOTO 24
    0
195 PRINT AT 20,10;"CHILDREN"
200 INPUT C(N)
205 PRINT AT 18,18,C(N); AT 20,1
    3;"
210 FOR T=1 TO C(N)
215 PRINT AT 18,22,T;N); AT 20,1
    3;"
220 IF N>99 THEN GOTO 240
225 PRINT AT 20,10;"
    "
230 INPUT H(N)
235 PRINT AT 18,26,H(N); AT 20,1
    3;"
240 SCROLL
245 NEXT N
250 REM CLEARING THE SCREEN
255 SLOW
260 FOR S=1 TO 22
270 SCROLL
275 NEXT S
280 REM CHECK LIST
285 FOR N=1 TO X
290 PRINT AT 20,0,N;TAB 4;A$(N)
    TAB 27;S$(N);TAB 2
295 IF O(N)=0 THEN GOTO 305
300 IF N$(N,1)="0" THEN GOTO 30
    0
305 PRINT TAB 18;C(N);TAB 21;T(
    N)
310 IF N>99 THEN GOTO 300
315 PRINT TAB 25;H(N)
320 FOR S=1 TO 4
325 SCROLL
330 NEXT S
335 NEXT N

  1 REM "FAMILY TREE"
  2 REM SEARCH/PRINT SECTION
  3 REM M,A,B, CHABOT
  4 REM HEMINGFORD GREY
  5 REM 020.225
 10 SAVE "FAMILY TREE"
 15 REM SEARCH SECTION
 20 PRINT "ENTER NAME TO BE FOU
    ND"
 30 INPUT U$
 40 FOR N=1 TO X
 45 IF A$(N,1)<>U$(1) THEN GOTO
    105
 50 IF A$(N,2)<>U$(2) THEN GOTO
    105
 55 IF A$(N,3)<>U$(3) THEN GOTO
    105
 60 IF LEN U$<4 THEN GOTO 85
 65 IF A$(N,4)<>U$(4) THEN GOTO
    105
 70 IF LEN U$<5 THEN GOTO 85
 75 IF A$(N,5)<>U$(5) THEN GOTO
    105
 80 IF LEN U$<6 THEN GOTO 85
 83 IF A$(N,6)<>U$(6) THEN GOTO
    105
 85 FOR L=1 TO 28
 90 IF A$(N,L)=" " AND A$(N,L+1
    )=" " THEN GOTO 100
 95 NEXT L
100 IF U$=A$(N, TO L-1) THEN GO
    TO 130
105 NEXT N
110 PRINT U$;" NOT FOUND.";TAB
    32;"DO YOU WANT TO TRY AGAIN, RE
    -EN-TER NAME, IF NOT ENTER "a0"
115 INPUT U$
120 IF U$="0" THEN STOP
125 GOTO 35
130 REM PRINT SECTION
135 PRINT AT 10,0;"STATE WHICH
RUNNING METHOD YOU WANT AT 12,5;0) MA
NUALLY, 1) FOR 5::1) AUTOMATIC ( FAST
)";TAB 5;2)
140 INPUT A
145 CLS
150 LET N=N
155 IF A=1 THEN GOTO 175
160 LET P(N)=N
165 LET N=P(N)
170 GOTO 160
180 FOR D=1 TO 28
185 IF A$(N,D)=" " AND A$(N,D+1
    )=" " THEN GOTO 195
190 NEXT D
195 LET C$=A$(N, TO D-1)
200 LET CA=LEN C$
205 LET CP=INT (32-CA)/2-1
210 PRINT AT 0,CP;C$
215 FOR L=1 TO CA
220 PRINT AT 1,CP-1+L;"="
225 NEXT L
230 PRINT AT 2,22;D$(N)
235 IF S$(N)="M" THEN PRINT AT
2,0;"MARRIED"
240 IF S$(N)="F" THEN PRINT AT
2,0;"DAUGHTER OF"
245 IF N=1 THEN PRINT AT 4,4;"P
ARENTS NOT KNOWN"
250 IF N>1 THEN PRINT AT 4,4;A$
(P(N));TAB 32;"AND ";U$(P(N))
255 IF N=1 THEN GOTO 300
260 PRINT AT 7,0;"MARRIED ";U$(
N)
265 PRINT AT 9,0,"CHILD";
270 IF C(N)>1 THEN PRINT "REN";
275 PRINT
280 FOR S=T(N) TO T(N)+C(N)-1
285 IF S=T(N) THEN PRINT TAB 2;
A$(S)
290 PRINT TAB 4;A$(B)
295 NEXT B
300 PRINT AT 21,0,G(N);
305 IF G(N)=1 THEN PRINT "ST";
310 IF G(N)=2 THEN PRINT "ND";
315 IF G(N)=3 THEN PRINT "RD";
320 IF G(N)>3 THEN PRINT "TH";
" GENERATION"
330 IF A THEN GOTO 355
335 SLOW
340 PRINT AT 21,22;"PRESS ";
345 IF A=2 THEN GOTO 345
350 GOTO 375
355 IF A=1 THEN GOTO 390
360 SLOW
365 FOR U=1 TO 50
370 NEXT U
375 FOR S=1 TO 22
380 SCROLL
385 NEXT S
390 IF A>2 THEN GOTO 415
395 FAST
400 PAUSE 500
405 POKE 16437,255
410 CLS
415 IF N=X THEN GOTO 435
420 LET N=N(N)
425 SLOW
430 GOTO 180
435 PRINT AT 12,0;"THIS IS THE
END. ENTER -->";TAB 10;"0) STOP ",
TAB 10;"1) RE-RUN"
440 INPUT A
442 GOTO 442+1
443 STOP
444 GOTO 20
```

Introducing the first business system that speaks English, does what it's told ..... and likes people



Now for the first time, you don't have to be Einstein (or even Barbara Woodhouse) to get a computer to do what you want it to do. Silicon Office is a new computer software system that responds to commands in English, not "computerese".

It can also, unlike some of the older dogs, learn any new trick you care to teach it, so unlike more rigid systems, Silicon Office will work just as well for a dentist as a quantity surveyor.

Silicon Office is also what we call "user friendly" which simply means that there's no offputting difficult procedures to master, so virtually anyone can use it.

For more details about the businessman's best friend, fill in the coupon.

SCV

NAME _____ POSITION _____

COMPANY _____ ADDRESS _____

_____

COUNTY _____ POST CODE _____ TEL. NO: _____

CONTACT: SILICON OFFICE INFORMATION CENTRE
675 AJAX AVENUE, TRADING ESTATE, SLOUGH, BERKSHIRE SL1 4BG. TEL: SLOUGH (0753) 79292

SILICON OFFICE

THE OFFICE COMPUTER THAT SPEAKS YOUR LANGUAGE

● Circle No. 195

Car diagnosis — sample run.

```
 ZX81 CAR DIAGNOSIS PROGRAM


PRESS THE REQUIRED NUMBER,
 BEGINNING ON WHERE THE FAULT
 LIES:-
1.ENGINE/STARTER
2.ELECTRICAL/WARNING LIGHTS
3.BRAKES
4.STEERING
5.GEARS/CLUTCH
6.SUSPENSION


        ZX81 CAR DIAGNOSIS
        ******************
        ******************
        ******************
THE FOLLOWING MAY BE:-


1.FLAT BATTERY
6.LOOSE OR DIRTY BATTERY
 CONNECTIONS
3.STARTER MOTOR PINION NOT
 ENGAGING ON JAMMED
4.SEIZED ENGINE


PRESS NEULINE TO RUN AGAIN.
```

Main menu.

```
 10 REM ****CAR DIAGNOSIS****
 20 CLS
 30 PRINT "        ******************
 40 PRINT "        ******************
 50 PRINT "        ******************
 60 PRINT "  ZX81 CAR DIAGNOS
IS PROGRAM"
 70 PRINT "        ******************
 80 PRINT "        ******************
 90 PRINT "        ******************
 100 PRINT
 110 PRINT "  ZX81 CAR DIAGNOSIS
 120 PRINT
 130 PRINT "  ******************
 140 PRINT "  ******************
 150 PRINT "  ******************
 160 PRINT
 170 PRINT "  ******************
 180 PRINT "  ******************
 190 PRINT "  ******************
 200 PRINT
 210 PRINT "  ******************
 220 PRINT "  ******************
 230 PRINT "  ******************
 240 PRINT "3.BRAKES"
 250 PRINT "4.STEERING"
 260 PRINT "5.GEARS/CLUTCH","6.
SUSPENSION"
 270 PRINT
 280 PRINT "PRESS THE REQUIRED
 NUMBER, DEPENDING ON WHERE
 THE FAULT"
 290 PRINT "  LIES.-"
 300 PRINT "1.ENGINE/STARTER",
"2.ELECTRICAL/WARNING LIGHTS"
```

(continued from page 147)

365-400 are pauses and can be altered. Some input instructions are:

Married — if married enter name or N.N; if not enter 0.

Sex — enter M or F.

Parent number — enter number of parent.

Number of children — enter the number of children.

First child — enter number of oldest child.

Heir — enter number of child, which carries on the "direct" line.

Car diagnosis

THIS PROGRAM by Geoffrey Harmon of Solihull, West Midlands was written for the 16K Sinclair ZX-81, but can easily be adapted for other computers. The program is menu driven and analyses the possible faults with a car by the user answering questions in order to identify symptoms.

Two sample screen displays are shown on sheet number 1, while sheets 2 to 7 go through the various sections of the program. I will provide the program on cassette for £2 for the ZX-81 for people not wishing to type it in who write to me at 38 Heaton Road, Solihull, West Midlands B91 2DX.

In diagnosing the problem to a car, the program goes through a series of menus until enough information is known to tell fault or faults. A list of possible is usually given.

There are six areas, called from the main menu:

- The engine and starter
- The electrical system
- The brakes
- The steering
- The gears and clutch
- The suspension

```
 240 PRINT "3.BRAKES"
 250 PRINT "4.STEERING"
 260 PRINT "5.GEARS/CLUTCH","6.
SUSPENSION"
 270 PRINT
 280 PRINT "PRESS THE REQUIRED
 NUMBER, DEPENDING ON WHERE
 THE FAULT"
 290 PRINT "  LIES.-"
 300 PRINT "1.ENGINE/STARTER",
"2.ELECTRICAL/WARNING LIGHTS"
```

Engine and starter.

```
1000 REM **ENGINE/STARTER**
1010 PRINT "DOES THE ENGINE ST
ART USING"
1020 INPUT A$
1040 IF INKEY$="Y" THEN GOTO 150
0
1050 PRINT ,,"DOES THE STARTER T
URN (YOU"
1060 GOSUB 900
1070 IF INKEY$="Y" THEN GOTO 125
0
1080 CLS
1090 PRINT ,,"1.HEADLIGHTS DO NO
T COME ON"
1100 PRINT ,,"2.HEADLIGHTS DIM"
1110 PRINT ,,"3.HEADLIGHTS ARE B
RIGHT"
1120 INPUT A
1130 IF A<1 OR A>3 THEN GOTO 112
0
1135 CLS
1140 IF A=2 THEN GOTO 1190
1145 IF A=3 THEN GOTO 1200
1150 PRINT AT 10,0;"1.FLAT BATTE
RY","2.LOOSE OR DIRTY BATTERY
 CONNECTIONS"
1160 GOTO 9000
1190 PRINT AT 10,0;"1.FLAT BATTE
RY","2.LOOSE OR DIRTY BATTERY
 CONNECTIONS"
1195 PRINT "3.STARTER MOTOR PINI
ON NOT ENGAGING OR JAMMED"
1200 PRINT "4.SEIZED ENGINE"
1210 GOTO 9000
1220 PRINT AT 10,0;"1.LOOSE,DIRT
Y OR CORRODED CONNECTION
2.IN SUFFICIENT EARTH STRA
1225 PRINT "3.STARTER MOTOR JAMM
ED IN MESH"
1230 PRINT "4.DEFECTIVE STARTER
ON SOLENOID OR IGNITI
1240 GOTO 9000
1250 CLS
1260 PRINT AT 10,0;"1.LOOSE,DIRT
Y OR CORRODED CONNECTIONS
2.INSUFFICIENT EARTH STRA
PS"
1270 PRINT "3.DEFECTIVE STARTER
OR SYNCRO SOLENOID."
1280 GOTO 9000
```

Electrical system.

```
2000 REM **ELECTRICAL**
2010 CLS
2020 PRINT ,,"DOES IT CONCERN...
2030 PRINT ,,"1.WARNING LIGHTS"
2040 PRINT ,,"2.EXTERIOR LIGHTS"
2050 PRINT ,,"3.ELECTRICAL SYS
TEMS"
2060 INPUT A
2070 IF A<1 OR A>3 THEN GOTO 206
0
2080 IF A=3 THEN GOTO 2400
2090 IF A=2 THEN GOTO 2300
2100 CLS
2110 PRINT ,,"1.IGNITION WARNING
LIGHT","2.OIL PRESSURE WARNING L
IGHT"
2120 INPUT A
2130 IF A<1 AND A>3 THEN GOTO 21
20
2140 IF A=2 THEN GOTO 2200
2145 CLS
2150 PRINT AT 10,0;"1.THE ALTERN
ATOR DRIVE BELT IS LOOSE OR B
ROKEN"
2160 PRINT ,,"2.A FUSE IS BLOWN"
2170 PRINT ,,"3.THE VOLTAGE REGU
LATOR (CHARGING)
2180 GOTO 9000
2200 PRINT AT 10,0;"1.LOW OIL LE
VEL-CHECK DIPSTICK"
2205 PRINT ,,"2.DEFECTIVE OIL PRES
SURE SWITCH"
2230 GOTO 9000
2400 CLS
2410 PRINT ,,"1.MAIN LIGHTS FAIL
TO DIM ON DAY","2.INDICATORS D
O NOT WORK"
2420 INPUT A
2430 IF A<1 AND A>2 THEN GOTO 22
0
2440 IF A=2 THEN GOTO 2600
2450 CLS
2460 PRINT ,,"1.BULBS BURN OUT R
EPEATEDLY"
2470 PRINT ,,"2.LIGHTS DIM WHEN EN
GINE IS"
2480 INPUT A
2490 IF A=2 THEN GOTO 2550
2500 CLS
2510 PRINT AT 10,0;"1.FAULTY CON
NECTIONS OR BROKEN WIRES"
2520 PRINT ,,"2.DEFECTIVE INDICAT
OR SWITCH"
2530 PRINT ,,"3.ALTERNATOR REGULAT
OR FAULTY"
2540 GOTO 9000
2550 CLS
2560 PRINT AT 10,0;"1.LOOSE OR B
ROKEN ALTERNATOR
                DRIVE BELT
2570 PRINT ,,"2.LOW BATTERY-
2580 GOTO 9000
2600 CLS
2610 PRINT AT 10,0;"1.FUSE BLOWN
2620 PRINT ,,"2.INDICATOR RELAY IN
OPERATIVE"
2630 PRINT ,,"3.DEFECTIVE INDICATO
R SWITCH"
2640 GOTO 9000
2700 CLS
2710 PRINT AT 10,0;"1.FLAT BATTE
RY","2.LOOSE OR DIRTY BATTERY
 CONNECTIONS"
2720 PRINT ,,"3.FUSE BLOWN","4.FU
SE LINK FROM BATTERY TO MAIN LO
OM BLOWN"
2730 GOTO 9000
```

Brakes.

```
3000 REM **BRAKES**
3010 CLS
3020 PRINT ,,"1.PEDAL","2.NOISE
3030 INPUT A
3035 IF A<1 OR A>2 THEN GOTO 303
0
3040 PRINT ,,"R
3050 IF A=2 THEN GOTO 3500
3060 PRINT ,,"1.SPONGY FEEL OR E
XCESSIVE          TRAVEL"
```

```
3070 PRINT "2.HEAVY PRESSURE"
3080 PRINT ,,"3.PULLING"
3090 IF A<1 OR A>2 THEN GOTO 300,
3100 IF A=2 THEN GOTO 3200
3110 CLS
3120 PRINT AT 10,0;"1.AIR IN SYS
TEM"
3130 PRINT "2.LEAKS IN SYSTEM"
3140 PRINT "3.WORN BRAKE SELF-AD
JUSTING
                MECHANISM DEFECTIV
E"
3150 GOTO 9000
3200 CLS
3210 PRINT AT 10,0;"1.WATER ON B
RAKE LININGS"
3220 PRINT "2.SEIZED WHEEL CYLIN
DERS"
3230 PRINT "3.SERVO INOPERATIVE"
3240 GOTO 9000
3300 PRINT "1.BRAKES ARE NOISI
E"
3310 PRINT "2.BRAKES JUDDER"
3320 INPUT A
3330 IF A<1 AND A>2 THEN GOTO
3520
3340 IF A=2 THEN GOTO 3300
3350 CLS
3360 PRINT AT 10,0;"THE FRONT BR
AKE PADS OR REAR
                BRAKE LINING
S HAVE WORN OUT."
3370 GOTO 9000
3500 CLS
3510 PRINT AT 10,0;"1.BADLY WORN
 DISC PADS OR PADS"
3520 PRINT "2.INCORRECT WHEEL BE
ARING ADJUSTMENT"
3530 PRINT "3.DISTORTED ASSEMB
LED BRAKE
                PLATE CAUSING
3540 PRINT "4.OIL OR FLUID CONTA
MINATION ON
                LININGS"
3550 GOTO 9000
```

Steering.

```
4000 REM **STEERING**
4010 PRINT ,,"1.CAR PULLS TO ONE
 SIDE"
4020 PRINT ,,"2.STEERING HEAVY"
4030 PRINT ,,"3.LOOSE WHEELS"
4040 INPUT A:IF A<1 THEN GOTO 420
0
4050 IF INKEY$="3" THEN GOTO 440
0
4060 IF INKEY$="2" THEN GOTO 460
0
4070 GOTO 4040
4080 CLS
4090 PRINT AT 10,0;"1.TYRE PRESS
URES INCORRECT"
4100 PRINT "2.TYRES NEED ATTENT
ION"
4110 PRINT "3.OIL AND/OR GREASE
 PLUGS ON
                LINING"
4120 PRINT "4.SEIZED WHEEL CYLIN
DERS"
4130 GOTO 9000
4140 PRINT AT 10,0;"1.TYRE PRESS
URES"
4150 PRINT "2.UNEVEN CONVERGENCE"
4160 PRINT "3.STEERING RACK ADJU
STMENT"
4170 GOTO 9000
4180 CLS
4190 PRINT AT 10,0;"1.TYRE PRESS
URES"
4200 PRINT "2.UNEVEN LOADING"
4210 PRINT "3.WHEEL BEARING
 NEEDS
                ADJUSTMENT"
4220 GOTO 9000
```

Gears.

```
5000 REM **GEARS**
5010 PRINT "1.DIFFICULTY IN EN
GAGING GEARS"
5020 PRINT "2.CLUTCH SLIPS"
5030 PRINT "3.CLUTCH JUDDERS WHEN EN
GAGING"
5040 INPUT A
5050 IF A<1 OR A>3 THEN GOTO 504
0
5055 CLS
5060 IF A=2 THEN GOTO 5100
5070 IF A=3 THEN GOTO 5200
5080 CLS
5090 PRINT AT 10,0;"1.WHEEL BOLT
S LOOSE"
5100 PRINT "2.WHEELS OUT OF BALA
NCE"
5110 PRINT "3.INOPERATIVE SHOCK
ABSORBERS"
5120 GOTO 9000
5130 CLS
5140 PRINT AT 10,0;"1.EXCESSIVE
LOAD ON ROOF RACK"
5150 PRINT "2.UNEVEN LOADING"
5160 PRINT "3.WEAK/BROKEN SPRING
S"
5170 PRINT "4.DEFECTIVE SHOCK AB
SORBERS"
5180 GOTO 9000
5190 CLS
5200 PRINT AT 10,0;"1.TYRE PRESS
URES"
5210 PRINT "2.DEFECTIVE SHOCK AB
SORBERS"
```

Final results.

```
9000 PRINT
9010 PRINT ,,"1.ENGINE/STARTER"
9020 PRINT ,,"2.ELECTRICAL/WARNIN
G LIGHTS"
9025 PRINT ,,"PRESS NEULINE TO R
UN AGAIN."
9030 PRINT AT 0,0;"
9040 PRINT "
9050 PRINT "
9060 PRINT "
9070 PRINT "
9080 PRINT "
9090 PRINT "
9100 PRINT "
9110 PRINT "
9120 PRINT "
9130 PRINT "
9140 PRINT "
9150 PRINT "
9160 PRINT "
9170 PRINT "
9180 PRINT "
9190 PRINT "
9200 PRINT "
9830 PRINT "          ZX81 CAR DIAG
NOSIS
9831 PRINT "
9840 PRINT "
9845 PRINT "
9850 PRINT "THE FOLLOWING MAY B
E WRONG:-"
9860 IF CODE INKEY$=11 THEN GO
TO 9860
9870 RUN
```

SOLIDUS SYSTEMS

STOCK CONTROL WITH STOCKFILE

* 9486 on-line items, TWO SECOND access.
* Part numbers up to 20 characters long, alpha or numeric.
* Complete report generation facility plus 5 pre-defined master reports.
* Any report can be printed in any sequence.
* Provides the data-base for STOCKSELLER and STOCKMAKER.



TOTAL SALES CONTROL WITH STOCKSELLER

* Up to 1750 customers, unlimited number of invoices.
* Produces customised invoices, quotes, packing slips, credit notes, statements and backorders.
* Complete sales and profit analyses, summaries, month & year-to-date statistics, customer aged trial balance.
* Individual discounts for each line item on an invoice.
* Up to 9 V.A.T. rates and full V.A.T. reporting.

THE MODERN WAY TO CONDUCT YOUR BUSINESS

MANUFACTURING CONTROL WITH STOCKMAKER

* Processes 980 assemblies with up to 90 components per assembly and six levels of sub-assembly.
* Determines availability of stock for production.
* Calculates cost prices of finished goods.
* Updates stock levels of raw materials & finished goods.
* Reserves stock for future production.

designed for the Apple II Plus* microcomputer

SOLIDUS INTERNATIONAL CORPORATION (UK) LTD **Tel: (01) 688 5164**
Mill House, Wandle Road, Beddington, Croydon, CR0 4SD.

● Circle No. 196

PLEASE PHONE FOR LATEST PRICES

MICRO-MADNESS CRAZY PRICES!

All goods sold are brand new and with full manufacturer warranty.

PRINTERS

EPSON PRINTERS	£
MX82	345
MX82FT	338
MX80 Type III	278
MX80FT Type III	314
RS232 Interface	30
RS232 Interface with 2K Buffer	53
MX100 Type III	418
Serial Interface Type III	60
IEEE – 488 Parallel Interface	37
Apple Interface (Non-Graphics) + Cable	49
Apple Interface (Graphics) + Cable	57
TRS80 Interface	22
Ribbon for MX80/82 Series	5
Ribbon for MX100 Series	9
CENTRONICS PRINTERS	
737 – 2 Parallel	337
739 – 2 Parallel	433
150 – 2 Parallel	430
152 – 2 Parallel	495
152 – 4 Serial	558
1 Cartridge Ribbon for 150/152	4
1 Zippack Ribbon for 737/739	3
ANADEX PRINTERS	
DP9000A Serial/Parallel (Graphics)	945
DP9001 Serial/Parallel	884
DP9001A Serial/Parallel (Graphics)	945
DP9500L Serial/Parallel	838
DP9500 Serial/Parallel (Graphics)	905
DP9500A Serial/Parallel (Graphics)	1006
DP9501 Serial/Parallel (Graphics)	951
DP9501A Serial/Parallel (Graphics)	1006
DP9620A Serial/Parallel (Graphics)	1093
Ribbon for DP9000/9500 Series	10
Apple II Graphics Interface Card	120

WALTERS PRINTER – BRITISH MADE	£
120 – Parallel	377
I.D.S. PRISM PRINTERS	
Prism 80 Full Option inc. Colour	1031
Prism 80 – Graphics/Sprint/Auto Sheet Feed	827
Prism 80 – Graphics/Sprint	730
Prism 132 Full Option inc. Colour	1186
Prism 132 – Graphics/Sprint/Auto Sheet Feed	973
Prism 132 – Graphics/Sprint	879
Black Ribbon for Prism	11
4 Colour Process Ribbon for Prism	22
4 Colour Primary Ribbon for Prism	22
INTEGREX COLOUR PRINTERS	
CX80 Colour – Parallel	707
Apple II Interface Card	88
CX80 Colour – RS232 Serial	767
CX80 Colour – IEEE	755
CX80 Colour – RS232 3.7K Buffer	830
SMITH CORONA DAISY WHEEL PRINTERS	
TP1 Daisy Wheel – Parallel	430
TP1 Daisy Wheel – Serial	430
IEEE Interface Box for TP1	67

PRINTER INTERFACE CARDS FOR APPLE II

CCS Serial Printer Card	100
CPS Multifunction Card	108
CPS Printer Cable (Please Specify)	10

APPLE INTERFACE CARDS AND ACCESSORIES

MC 8-Slot Expansion Chassis	361
Clock Calendar Card	142
Supertalker – for talking programs	151
ROM – Plus Board	84
RAMplus	99
ROMwriter	96
Copyplus ROM	33
Ramex 128K	245
Ramex 16K	64
Analog Output Board 4 Channel	138
Analog Output Board 8 Channel	214
Digital Interface	173
Analog Input Board 16 chl. 8 bit	150
Analog Input Board 16 chl. 12 bit	280
Video 80 Column Card	160
Omnivision 80-col Display Card	168
SUPR Terminal Card	170

MONITORS

KAGA VIDEO MONITORS	£
High – res. 12" B/W Inc. Cable	86
High – res. 12" Green Inc. Cable	86
High – res. 12" Amber Inc. Cable	86
12" RGB Colour Monitor	212
Apple II RGB Card + Cable	42
RGB Cable for Apple III	8
RGB Cable for IBM P/C	8
APPLEFAN & ACCESSORIES	
Applefan Standard Unit	58
Cassette Connector Set	4
Disc Drive Connector Set	14
Eurocolour TV Output	4
Games Connector Set	9
Monitor 40/80 Char. Display Switch	9
Mains Output Set	7
Printer Connector Set	14
Graphics Tablet Connector	13
DEMONSTRATION/TRANSIT CASE	
For Apple + 2 Disc Drives	49

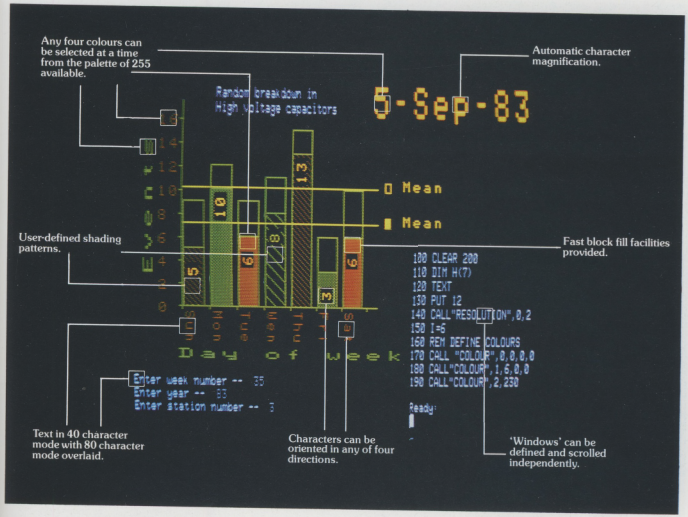
Terms of business: Cash/cheque/P.O.S. with order.
P & P: Interface cards and ribbons – per unit 50p
Printers, monitors, and cases – per unit £6
VAT: All prices are exclusive of VAT. Please add 15% to the total cost including P & P.
Goods damaged in transit will be replaced FOC.

Please send me the following goods:

Total (inc. P&P) _____ 15% VAT _____
I enclose cash/cheques/P.O.S. for sum of _____
Name _____
Address _____

AIMGRAM AIMGRAM LTD 31 Roman Gardens, Kings Langley, Herts WD4 8LG Tel: Kings Langley **(09277) 68211**

● Circle No. 197



A picture may be worth a thousand words but it still tells only half the story about graphics on the 380Z.

For a start, our standard graphics functions include point plotting, line drawing, instant block fill, block copying, offsetting, and Exclusive Or Plotting.

Then there is the important fact that our Level 2 High Resolution Graphics is supported by Basic, Algol, and Fortran. And since it is contained in an additional 16K of RAM, every byte of user memory remains available for applications programs.

It is also worth noting that 380Z graphics are equally effective in monochrome — for 'colour' just read 'shades of grey'. Again there are 255 shades available, and there's also a very useful facility for fading up and down throughout the grey scale.

There are also the special effects — such as moving between graphics 'pages' for pseudo-animation, or the ability to produce 'instant' graphics by drawing them with the colour 'switched' off and then 'switching' on.

Next, not only can 380Z graphics pictures be saved on and retrieved from disc, they can also be output to one of a range of popular dot matrix printers.

Remember, too, that HRG is not a third-party add-on but designed, developed, and supported by Research Machines itself as an integral part of the 380Z.

And finally, we've now implemented GINO. So for the first time this well-established, professional suite of flexible, device-independent graphics software from the CAD Centre is available on a micro.

GRAPHICS MACHINE



If you are interested in graphics — for scientific, technical, and industrial research; or in secondary or higher education; or for design, engineering, or control, then you will be interested in the 380Z.

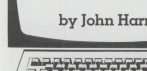
RESEARCH MACHINES
MICROCOMPUTER SYSTEMS

RESEARCH MACHINES LTD Mill Street, Oxford OX2 0BW. Tel: (0865) 249866

● **Circle No. 198**

APPLE PIE

by John Harris



Noughts and crosses.

```
10  LOMEM: 16384: TEXT : HOME : VTAB
    10: HTAB 5: PRINT "THREE IN A
    OUGHTS AND CROSSES": VTAB 20
    : HTAB 21: PRINT "PLEASE WAI
    WHILE I READ IN DATA"
30  DIM T(76,4),U(64,7),C(76),B(7
    8),N(64,1): FOR J = 1 TO 76:
     FOR I = 1 TO 4: READ T(J,I)
     : NEXT I,J: FOR S = 1 TO 64:
     FOR J = 1 TO 7: READ U(S,J)
     : NEXT J,S
60  FOR I = 1 TO 16: READ X(I,1),
    X(I,0): FOR J = 1 TO 3:X(I,J *
     2 + 1,1) = X(I,1):X(I,J * 2 +
    1,0) = X(I,0) + 40 * J: NEXT
    J,I
70  N = 0: FOR B = 1 TO 76:C(B) =
    N:B(B) = N: NEXT
80  VTAB 20: HTAB 3: PRINT "DO YO
    U WANT TO PLAY THE COMPUTER,
    2 OR 3": GET A$: PRINT A$: IF A
    $ = "Y" THEN PL$(1) = "THE C
    OMPUTER": INPUT "YOUR NAME..
    ";PL$(2):PL = 1: GOTO 110
100 PL$(1) = "PLAYER 1":PL$(2) =
     "PLAYER 2":PL = 2
110 HOME : HGR : A = 0: HCOLOR= 3
    : GOSUB 1500:X = 140: GOSUB
    1500
120 FOR I = 1 TO 64:X = 140 + K(
    I,1):Y = K(I,0):H = INT (I
    / 10):LD = I - H * 10: IF
    H( ) 0 THEN ON H1 GOSUB
    1520,1530,1540,1550,1560,157
    0,1580,1590,1600: HPLOT
    X(I,1),X(I,0): NEXT
140 IF END (I) 1.5 THEN HTAB
    1: VTAB 21: PRINT PL$(1)" WI
    LL MOVE FIRST": FOR I = 1 TO
    10001: NEXT : GOTO 380
150 HTAB 1: VTAB 21: PRINT PL$(2
    )" WILL MOVE FIRST": FOR I =
    1 TO 10001: NEXT
160 HOME : VTAB 23: HTAB 5: PRINT
    "YOUR MOVE "PL$(2);: INPUT M
    IF M =
170 IF M = INT (M AND M ) 0 AND
    M ( 65 THEN 210
180 HTAB 24: VTAB 21: PRINT "ILLE
    GAL/TRY AGAIN": FOR I = 1 TO
    10001: NEXT : GOTO 190
190 IF M = 0 THEN 380
200 GOTO 160
210 IF B(M) ( ) 0 THEN  VTAB 21:
     HTAB 21: PRINT "ILLEGAL/SPA
    CE TAKEN/TRY AGAIN": FOR I =
    1 TO 10001: NEXT : GOTO 190
220 X = K(M,1):Y = K(M,0): HTAB 5
    : VTAB 24: PRINT "DO YOU WEP
    N HERE ?": A = A + 1
230 Z7 = 1: HCOLOR= 3
240 IF A = 1 THEN  GOSUB 1610
    : GOTO 250
245 IF Z7 = 0 THEN  GOSUB 2010: GOTO
    250
246 GOSUB 2000
250 FOR I = 1 TO 25: IF PEEK ( -
    16384) ( 128 THEN 260
260 GET A$: IF A$ = "Y" THEN  HCOLOR=
    3: GOTO 300
270 IF A$ = "N" THEN  HCOLOR= 0:
     GOSUB 1610: HCOLOR= 3: HPLOT
    K(M,1),K(M,0): GOTO 190
280 NEXT : IF Z7 = 1 THEN Z7 = 0
    : HCOLOR= 0: GOTO 240
290  GOTO 230
300 X = K(M,1):Y = K(M,0): IF F =
    2 - 1 THEN  GOSUB 1610: GOTO
    320
310  GOSUB 2000
320 B(M) = F: FOR J = 1 TO 7:P =
    U(M,J): IF P = 0 THEN 360
330 C(P) = C(P) + F: IF C(P) = 2 -
    4 THEN 460
340  IF C(P) = 4 THEN 420
350  NEXT
360 N = N + 1: IF N = 64 THEN 480
370  IF F = 1 THEN 160
380 F = 1: HOME : IF PL = 1 THEN
    HTAB 5: VTAB 23: PRINT PL$(
    1)" WILL MOVE NEXT": GOSUB 50
    0
390  HOME : VTAB 23: HTAB 5: IF P
    L = 2 THEN  PRINT "YOUR MOVE
    "PL$(1);: INPUT M:MO = 1: GOTO
     170
400  HTAB 5: VTAB 23: PRINT "THE
    COMPUTER MOVES AT "M; SPC( 6
    )
410  FOR I = 1 TO 1000: NEXT : GOTO
     300
420  HOME : VTAB 21: PRINT " AND
    "PL$(1)" WINS"
430  PRINT
440  FOR I = 1 TO 3:M1 = T(P,I):M
    2 = T(P, I + 1): HPLOT K(M1,1
    ),K(M1,0) TO K(M2,1),K(M2,0)
    : NEXT : PRINT "DO YOU WANT
    ANOTHER GAME ?":I GET A$: IF
    A$ = "N" THEN  TEXT : HOME :
     END
450  TEXT : HOME : GOTO 70
460  HOME : VTAB 21: PRINT "CONGR
    ATULATIONS , "PL$(2)" WON !"
470  GOTO 430
480  HOME : VTAB 21: PRINT "THE G
    AME IS A DRAW"
490  GOTO 430
500  IF N ( 5 THEN 550
505  FOR P = 1 TO 76: IF C(P) ( )
    3 THEN  NEXT : FOR P = 1 TO
    76: IF C(P) ( )  - 3 THEN  NEXT
     : GOTO 530
510  FOR I = 1 TO 4:M = T(P,I): IF
     B(M) = 0 THEN  RETURN
520  NEXT
530  G = 2: GOSUB 590:G = - G: GOSUB
     590:G = - G: GOSUB 650:G =
    - G: GOSUB 710
540  G = 1: GOSUB 740:G = - G: GOSUB
     740
550  V = 0: FOR S = 1 TO 64: IF B(
    S) ( ) 0 THEN  NEXT S: RETURN
560  A = 0: FOR J = 1 TO 7:P = U(S
    ,J): IF P ( ) 0 THEN  A = A +
    1 + ABS (C(P)) * NEXT J
570  IF A ) V THEN V = A:M = S
580  NEXT S: RETURN
590  FOR P = 1 TO 76: IF C(P) ( )
    G THEN  NEXT P: RETURN
600  FOR I = 1 TO 4:M = T(P,I): IF
     B(M) = - G / 2 THEN  NEXT P
    : RETURN
610  IF B(M) ( ) 0 THEN  NEXT I,
    P: RETURN
620  FOR K = 1 TO 7:B = U(M,K): IF
    B = 0 THEN  NEXT I,P: RETURN
630  IF C(B) ( ) G OR P = B THEN
     NEXT K,I,P: RETURN
640  PDP : RETURN
650  FOR P = 1 TO 76: IF C(P) ( )
    G THEN  NEXT P: RETURN
660  FOR I = 1 TO 4:M = T(P,I): IF
     B(M) =  - G / 2 THEN  NEXT P
    : RETURN
670  IF B(M) ( ) 0 THEN  NEXT I,
    P: RETURN
680  FOR N = 1 TO 7:B = U(M,K): IF
     B = 0 THEN  NEXT I,P: RETURN
690  IF C(B) ( ) G / 2 THEN  NEXT
    K,I,P: RETURN
700  FOR J = 1 TO 4: IF B(T(B,J))
     =  - G / 2 THEN  NEXT J,P
    : RETURN
710  NEXT J:M = T(B,2): IF B(M) =
    0 THEN  PDP : RETURN
720  M = T(B,3): IF B(M) = 0 THEN
     PDP : RETURN
730  NEXT K,I,P: RETURN
740  FOR P = 1 TO 76: IF C(P) ( )
    G THEN  NEXT P: RETURN
750  IF B(T(P,1)) =  - G OR B(T(P
    ,2)) =  - G OR B(T(P,3)) =  -
    G OR B(T(P,4)) =  - G THEN  NEXT
     P: RETURN
760  FOR I = 1 TO 4:M = T(P,I): IF
     B(M) ( ) 0 THEN  NEXT I,P: RETURN
770  TA = 0: FOR J = 1 TO 7:B = U(
    M,J): IF C(B) = G AND B(T(B,
    1)) ( )  - G AND B(T(B,2)) (
    )  - G AND B(T(B,3)) ( )
    - G AND B(T(B,4)) ( )  - G THEN
     TA = TA + 1
780  NEXT : IF TA ) 1 THEN  POP :
     RETURN
790  NEXT I,P: RETURN
800  DATA 1,2,3,4,5,6,7,8,9,10,1
    1,12,13,14,15,16,17,18,19,20
    ,21,22,23,24,25,26,27,28,29,
    30,31,32,33,34,35,36,37,38,3
    9,40,41,42,43,44,45,46,47,48
    ,49,50,51,52,53,54,55,56,57,
    58,59,60,61,62,63,64
810  DATA 1,9,17,25,33,41,49,57,2
    ,10,18,26,34,42,50,58,3,11,1
    9,27,35,43,51,59,4,12,20,28,
    36,44,52,60,5,13,21,29,37,45
    ,53,61,6,14,22,30,38,46,54,6
    2,7,15,23,31,39,47,55,63,8,1
    6,24,32,40,48,56,64
820  DATA 33,38,43,48,36,39,42,4
    5,49,54,59,64,52,55,58,61,1,
    17,33,49,2,18,34,50,3,19,35,
    51,4,20,36,52,5,21,37,53,6,2
    2,38,54,7,23,39,55,8,24,40,5
    6,9,25,41,57,10,26,42,58,11,
    27,43,59,12,28,44,60,13,29,4
    5,61,14,30,46,62,15,31,47,63
830  DATA 16,32,48,64,1,21,41,61
    ,2,22,42,62,3,23,43,63,4,24,
    44,64,8,23,38,53,12,27,42,57
    ,16,28,40,52,15,27,39,51,14,
    26,38,50,13,25,37,49,7,26,45
    ,60,5,22,39,56,1,18,35,52,4,
    19,34,49,16,31,46,61,13,30,4
    7,64,1,22,43,64,4,23,42,61,1
    3,26,39,52
840  DATA 16,27,38,49,1,17,33,41
    ,57,69,75,1,18,42,58,0,0,0,1
    ,19,43,59,0,0,0,1,20,34,44,6
    0,70,74,2,17,45,68,0,0,0,2,1
    8,33,46,0,0,0
910  DATA 2,19,34,47,0,0,0
920  DATA 2,20,48,61,0,0,0
```

Noughts and crosses in 3-D

Once upon a time, I am told — though I certainly can't remember it — the hula-hoop held sway through the classrooms of the land. Subsequently it was marbles. Of late it has been the scoopy-doo of the cafe. But for a brief space the four-by-four-by-four board reigned supreme, and had there been Apples in those far-off days this implementation from Kieron Leech of Warrington, Cheshire would have kept me happy.

It plays a far better middle game than I ever did, and if it survives the first 10 moves it will probably beat you too. It is coded with a nice attention to detail, and carefully avoids shape tables to play on any high-resolution configuration, disc-based or no, without the need to load machine-code files. The odd-looking lines from 1500 on allow the body of the program to sketch elegant cue- and playing-boards with positions numbered 1 to 64, and one- or two-player selection is built in with the program acting as opponent or checker.

I think a slight juggling of the order in the winning ways table — the first 64 by four codes from line 800, stored in T — would preclude the "forcing win" available at the start of the game, which is the one weak point in its play, and you may find tuning the fighting ability of the program as much fun as actually playing against it.

Space voyage

I have played a lot of arcade-style games over the years and many are the showers of meteors I have eventually successfully learnt to avoid. It is a long time, however, since I came across an implementation the speed, style, difficulty, duration and visual clarity of which have kept me stuck to the screen for so long as the program sent to me by Andrew Finnemore of Trentham, Stoke on Trent.

It does not, like so many, require the physical and mental response times of a Russian gymnast; neither does it flicker, flash, disappear or jump about in the way so many games programs do. The screen layout and internal loop times match to give an effect that is easy on the eye, allowing the mind to concentrate on getting through the full voyage.

The run starts with an asteroid dodge. Left and right arrows vector the ship, while Esc freezes it and fires a laser battery into the oncoming asteroid stream — which includes both discrete masses and broad belts — clearing a path and scoring points in the process. Surviving the asteroid dodge, enter the maze. This section requires avoidance of both walls and blocks, and uses the same keys as above. The game hots up here firstly because the laser battery is now dead and secondly because the maze inexorably narrows the further you progress. The final phase of the run crosses a blazing asteroid storm, where points are won by picking up survival capsules from an exploded transporter.

Having given you the program, I shall now give you the puzzle it raised in my mind. It is a puzzle with a solution, and the solution is not difficult to find, the whole thing being really one of those paradoxes which exist only because of a contradiction in the original statement. Still, here goes.

Andrew Finnemore may have written the program in its current unreadable form so as to bury a trick or two, knowledge of which helps in getting through the maze — one such trick I have found, and the game is indeed more difficult if you are unaware of its presence. Discounting that possibility you are left with a listing which all the good books tell you is wrong; it has no structure, no control loops, no procedures, no input-output modules: it is in

(continued on next page)

```
920 DATA 3,17,33,51,0,0,0
940 DATA 3,18,34,50,0,0,0
950 DATA 3,19,33,51,0,0,0
960 DATA 3,20,52,62,0,0,0
970 DATA 4,17,34,53,66,72,75
980 DATA 4,18,54,65,0,0,0
990 DATA 4,19,55,64,0,0,0
1000 DATA 4,20,35,56,62,71,76
1010 DATA 5,21,36,57,0,0,0
1020 DATA 5,22,42,69,0,0,0
1030 DATA 5,23,41,70,0,0,0
1040 DATA 5,24,36,44,0,0,0
1050 DATA 6,21,45,57,0,0,0
1060 DATA 6,22,46,58,68,73
1070 DATA 6,23,36,47,59,61,74
1080 DATA 6,24,48,60,0,0,0
1090 DATA 7,21,49,84,0,0,0
1100 DATA 7,22,36,50,65,67,75
1110 DATA 7,23,35,51,62,64,76
1120 DATA 7,24,52,63,0,0,0
1130 DATA 8,21,36,53,0,0,0
1140 DATA 8,22,54,0,0,0,0
1150 DATA 8,23,55,71,0,0,0
1160 DATA 8,24,35,56,0,0,0
1170 DATA 9,25,37,44,0,0,0
1180 DATA 9,26,42,70,0,0,0
1190 DATA 9,27,43,69,0,0,0
1200 DATA 9,28,38,44,0,0,0
1210 DATA 10,25,45,66,0,0,0
1220 DATA 10,26,37,45,61,65,76
1230 DATA 10,27,38,47,64,68,75
1240 DATA 10,28,48,63,0,0,0
1250 DATA 11,25,49,57,0,0,0
1260 DATA 11,26,58,61,62,74
1270 DATA 11,27,37,51,59,67,73
1280 DATA 11,28,52,60,0,0,0
1290 DATA 11,25,38,53,0,0,0
1300 DATA 12,26,54,71,0,0,0
1310 DATA 12,27,55,72,0,0,0
1320 DATA 12,28,37,56,0,0,0
1330 DATA 13,29,39,41,66,70,76
1340 DATA 13,30,40,0,0,0,0
1350 DATA 13,31,43,64,0,0,0
1360 DATA 13,32,40,44,63,69,75
1370 DATA 14,29,45,61,0,0,0
1380 DATA 14,29,45,61,0,0,0
1390 DATA 14,31,40,47,0,0,0
1400 DATA 14,32,46,48,0,0,0
1410 DATA 15,29,49,62,0,0,0
1420 DATA 15,30,40,50,0,0,0
1430 DATA 15,31,39,51,0,0,0
1440 DATA 15,32,52,67,0,0,0
1450 DATA 16,29,42,68,71,74
1460 DATA 16,30,54,58,0,0,0
1470 DATA 16,31,55,59,0,0,0
1480 DATA 16,32,39,56,60,72,73
     ,32,27,23,32,23,77,23,102,23
     ,32,14,57,14,82,14,107,14,37
     ,5,62,5,87,5,112,5
1500 FOR I = 1 TO 121 STEP 40: HPLOT
     X + 30,I TO X + 130,I: HPLOT
     TO X + 110,I + 38: HPLOT TO
     X + 10,I + 38: HPLOT TO X +
     10,I: NEXT: HPLOT X + 10,39
     TO X + 10,159: HPLOT X + 13
     0,1 TO X + 130,121: RETURN
1510 HPLOT X - 2,Y - 3 TO X + 2,
     Y - 3: HPLOT TO X + 2,Y + 3
     : HPLOT TO X - 2,Y + 3: HPLOT
      TO X - 2,Y - 3: RETURN
1520 HPLOT X,Y - 3 TO X,Y + 3: RETURN

1530 HPLOT X - 2,Y - 3 TO X + 2,
     Y - 3: HPLOT TO X + 2,Y: HPLOT
      TO X - 2,Y: HPLOT TO X - 2
     ,Y + 3: HPLOT TO X + 2,Y + 3
     : RETURN
1540 HPLOT X - 2,Y - 3 TO X + 2,
     Y - 3: HPLOT TO X + 2,Y + 3
     : HPLOT TO X - 2,Y + 3: HPLOT
      TO X + 2,Y: HPLOT TO X - 2,Y
1550 HPLOT X - 2,Y - 3 TO X - 2,
     Y: HPLOT TO X + 2,Y: HPLOT
     X + 2,Y + 3 TO X + 2,Y + 3: RETURN
1560 HPLOT X + 2,Y - 3 TO X - 2,
     Y - 3: HPLOT TO X - 2,Y: HPLOT
      TO X + 2,Y: HPLOT TO X + 2
     ,Y + 3: HPLOT TO X - 2,Y +
     3: RETURN
1570 HPLOT X + 2,Y - 3 TO X - 2,
     Y - 3: HPLOT TO X - 2,Y + 3
     : HPLOT TO X + 2,Y + 3: HPLOT
      TO X + 2,Y: HPLOT TO X - 2
     ,Y: RETURN
1580 HPLOT X - 2,Y - 3 TO X + 2,
     Y - 3: HPLOT TO X + 2,Y + 3
     : RETURN
1590 HPLOT X - 2,Y - 3 TO X + 2,
     Y - 3: HPLOT TO X + 2,Y + 3
     : HPLOT TO X - 2,Y + 3: HPLOT
      TO X - 2,Y: HPLOT TO X + 2
     ,Y TO X + 2,Y: RETURN
1600 HPLOT X + 2,Y TO X - 2,Y: HPLOT
      TO X - 2,Y - 2: HPLOT TO X
     + 2,Y - 3: HPLOT TO X + 2,
     Y: HPLOT TO X - 1,Y + 3
     : RETURN
1610 HPLOT X - 3,Y TO X + 3,Y: HPLOT
      X,Y - 3 TO X,Y + 3: RETURN
1630 HGR : HCOLOR= 3:X = 101:Y =
     10: GOSUB 1510:X = X + 10: GOSUB
     1510:X = X + 10: GOSUB 400
2000 HCOLOR= 0: HPLOT K(M,1),K(M
     ,0): HCOLOR= 3: HPLOT X - 3,
     Y - 3 TO X + 3,Y - 3: HPLOT
     TO X + 3,Y + 3: HPLOT TO X
     - 3,Y + 3: HPLOT TO X - 3,
     Y - 3: RETURN
2010 HCOLOR= 3: HPLOT K(M,1),K(M
     ,0): HCOLOR= 0: HPLOT X - 3,
     Y - 3 TO X + 3,Y - 3: HPLOT
     TO X + 3,Y + 3: HPLOT TO X
     - 3
```

Space voyage.

```
9  REM  INSTRUCTIONS
10 I$ = "....YOU ARE.....USING THE
     LEFT AND RIGHT ARROW KEYS Y
     OU ARE TO TRAVEL THROUGH SPA
     CE SHOOTING THE ASTEROIDS IN
     YOUR SPACE SECTOR, THROUGH
     THE MAZE AND OUT THROUGH THE
     OTHER SIDE....."
11 I$ = ".....HERE WE GO"
20 TEXT : HOME : N$RACE : FOR I
     = 1 TO LEN (I$) - 20: VTAB
     12: PRINT  TAB( 10) MID$ (I$
     ,I,20): FOR J = 1 TO 100: NEXT
     J,I: VTAB 12: HTAB 31: GET D
     $
29 REM  START OF GAME 1
                ASTEROID DODGE
30 D = 0:T = 0:S = 0: HOME : FOR
     I = 1 TO 5 STEP 2
40 COLOR= 2: FOR J = I TO 47 STEP
     2: HLIN 0,39 AT I: NEXT I
50 COLOR= 14:Y = INT (RND (1) *
     40): PLOT Y,47
60 FOR I = 1 TO 5 STEP L
70 M = SCRN( X,11)N = SCRN( X,2
     ): IF M = 14 OR M = 10 OR N =
     14 OR N = 10 THEN GOTO 210
80 D = D + 1: IF D ) 300 OR B ) 5
     0 THEN GOTO 220
90 O = PEEK (- 16384)
100 IF O = 149 THEN X = X + 1: IF
     X ) 39 THEN X = 39
110 IF O = 136 THEN X = X - 1: IF
     X ( 0 THEN X = 0
120 COLOR= 3: PLOT X,2
130 IF O = 155 THEN GOTO 180
140 CALL - 912
150 COLOR= 2: HLIN 0,39 AT 47
160 IF RND (1) ( .01 THEN COLOR=
     10: HLIN 0,39 AT 47
170 NEXT : GOTO 50
180 P = INT ( RND (1) * 17 + 30)
     : FOR J = 2 TO P: IF SCRN(
     X,J) = 14 OR SCRN( X,J + 4) =
     : PRINT CHR$ (7): COLOR= 2:
     PLOT X,J: GOTO 200
190 COLOR= 2: FOR J = 2 NEXT J
200 POKE - 16368,0: COLOR= 0: FOR
     K = 2 TO 6 STEP 2: PLOT X,K:
     NEXT K: GOTO 540
210 NEXT : GOTO 540
219 REM  START OF GAME 2

                MAZE
220 A = (101B = 28IC = 11LE = INT
     ( RND (1) * 50)
230 FOR I = 1 TO LE
240 CALL - 912: COLOR= 2: HLIN
     0,39 AT 47: COLOR= 14: HLIN
     0,A AT 47: HLIN B,39 AT 47:A
     = B + 2: IF A ) 39 THEN A =
     DR B = 37 THEN C = - C
250 IF RND (1) ( .25 THEN PLOT
     X,47
260 IF SCRN( X,3) = 14 THEN GOTO
     540
270 D = D + 1: T = T + 1: IF T = 5
     THEN T = 0:S = S + 1
280 O = PEEK (- 16384)
290 IF O = 149 THEN X = X + 1: IF
     X ) 39 THEN X = 39
300 IF O = 136 THEN X = X - 1: IF
     X = - 1 THEN X = 0
310 COLOR= 3: PLOT X,2: IF D / 5
     0 = INT (D / 50) THEN A = A
     + 1:B = B - 1
320 NEXT : IF D ) 600 OR S ) 100
     THEN GOTO 540
330 LE = INT ( RND (1) * 31)
340 IF ABS (C) = 1 THEN C = 0: GOTO
     230
350 IF A ( 21 THEN C = 1: GOTO 2
     30
360 C = - 1: GOTO 230
369 REM  START OF GAME 3
                SPACE VOYAGE
370 COLOR= 2: HLIN 0,39 AT 47: COLOR=
     10: PLOT INT ( RND (1) * 40
     ),47
380 O = PEEK (- 16384)
390 IF O = 149 THEN X = X + 1: IF
     X ) 39 THEN X = 39
400 IF O = 136 THEN X = X - 1: IF
     X ( 0 THEN X = 39
410 IF SCRN( X,3) = 10 THEN GOTO
     540
420 IF SCRN( X,2) = 7 THEN S =
     S + 10: PRINT CHR$ (7)
430 IF RND (1) ( .5 THEN COLOR=
     7: PLOT INT ( RND (1) * 40)
     ,45
440 COLOR= 3: PLOT X,2
450 CALL - 912: GOTO 370
```

(listing continued on next page)

(continued from previous page)

its own small way a plate of spaghetti. Had it conformed to the good book techniques, however, its timings might have been different, thereby introducing all manner of hideous flickerings, flashings, disappearings and jumpings which would have kept it from this page, and from your machines.

Think about it — but more importantly key the program up; it is well worth the effort.

Sounds brief

JOHN MARR of Middlesborough, Cleveland has sent a code for a USR call sound routine, which I print because it provides the games coder with sound for the fewest keystrokes. Include the Basic initialisation shown, and beeps are yours for each use of

var = USR(n)

where

n = (255 * h + d)

d = 1 to 255 and indicates duration

h = 1 to 128

You will find that h is related to that curious attribute of sound, wavelength, and that h = 1 gives an almost inaudible squeal while h = 128 gives a subsonic string of clicks, so covering the spectrum.

Pretty pictures

Have you ever wondered about Lissajous figures? Well, neither have I, but a program sent by Martin Roberts of Dewsbury not only draws representative samples on the screen but provides the basis for experimenting with others. At least now I know that if it, though the what and why still elude me.

Paged lister

A routine to page listings when taking a hard copy is a good way to avoid printing over the perforations. The routine is even more of a good thing if it cates for LF as well as CR characters in the print output. Such a routine has been sent to me by Mr A Hourd to handle 11in. paper and initialise the printer to condensed mode with 132 characters per line maximum. Mr Hourd uses a parallel interface card to an Epson MX-80F/T on his Apple II, which pleasantly coincides with what sits on my own desk.

I print his solution in assembler to allow other initialisations or page-length patches

```
*300.392
0300- A9 00 85 36 A9 C1 85 37
0308- 20 8E FD A9 8F 20 ED FD
0310- 20 8E FD A9 A9 20 ED FD
0318- A9 B1 20 ED FD A9 B2 20
0320- ED FD A9 B2 20 ED FD A9
0328- CF 20 ED FD 20 8E FD A9
0330- A0 85 26 A9 03 85 27 A9
0338- 00 85 06 85 07 4C E8 03
0340- A8 20 0C C1 68 C9 8D F0
0348- 05 C9 A0 F0 01 60 EE 06
0350- A5 06 C9 3A D0 F7 A5 06
0358- C9 42 F0 04 A5 06 A9 BA
0360- 20 0C C1 38 E0 F0 A9 00
0368- 85 06 E6 07 A9 D0 20 ED
0370- FD A9 C1 20 ED FD A9 C7
0378- 20 ED FD A9 C5 20 ED FD
0380- A9 BA 20 ED FD A5 07 A9
0388- B0 20 ED FD 20 8E FD 20
0390- 8E FD 60
```

(listing continued from previous page)

```
460  COLOR= 2: HLIN 0,39 AT 47
470 D = PEEK ( - 16384)
480 IF D > 149 THEN X = X + 1: IF
    X ) 39 THEN X = 39
490 IF D = 136 THEN X = X - 1: IF
    X ( 0 THEN X = 0
500 IF SCRN( X,3) = 14 THEN  GOTO
    540
510 IF D + 1: IF P ) 50 THEN  GOTO
    530
520 CALL  - 912: GOTO 460
530 A$ = "MISSION SAFELY COMPLETE
    D!"
540 HOME : VTAB 5: PRINT A$;A$ =
    "";
550 VTAB 9: PRINT  TAB( 18)"SCOR
    E ";S: PRINT  TAB( 13)"YOU
    R BEST SCORE ";HS: IF S )
    HS THEN HS = S: PRINT  TAB(
    9)"NEW HIGH SCORE ";HS
560 VTAB 20: PRINT "ANOTHER GAME
    (Y/N) ?";: GET A$: IF A$ =
    "Y" THEN  GOTO 20
570 IF A$ ( ) "N" THEN  PRINT :
    GOTO 560
580 END
```

to be worked in, and a monitor listing to enable you to BSave your tailored version for next use.

Loaded at decimal 768 and started with a Call 768, the routine initialises the printer and waits for a command. Typing List will give the required output and at the end of the listing typing PR # 0 will return output to the screen.

Paged lister.

```
SOURCE FILE: PAGER XII
----- NEXT OBJECT FILE NAME IS PAGER XII
0300:           ORG  $300
0300:       2 *
0300:       3 *
0300:  4 COUNT  EQU  $06
0007:  5 COUNT2 EQU  $07
003A:  6 CSWL   EQU  $3A
0037:  7 CSWH   EQU  $37
0BBA:  8 BOS    EQU  $BBA
C100:  9 PRINT  EQU  $C100  ; PRINTER IN SLOT 1
FDED: 10 COUT   EQU  $FDED
FE23: 11 COUT   EQU  $FE23
0300: 12 *
0300: 13 *
0300: 14 *
0300: 15 *
0300: 16 INITIALISE PRINTER TO COND CHAR AND
         132 CHAR PER LINE
0300: 17 *
0300: 18 *
0300:A9 00    19        LDA  #/PRINT
0302:85 3A    20        STA  CSWL
0304:A9 C1    21        LDA  #/PRINT
0306:85 27    22        STA  CSWH
0308:20 8E FD 23        JSR  CROUT
030B:         24 *
030B:A9 BF    25        LDA  #$BF       ;CHR(15)
030D:20 ED FD 26        JSR  COUT
0310:20 8E FD 27        JSR  CROUT
0313:         28 *
0313:A9 B9    29        LDA  #$B9
0315:20 ED FD 30        JSR  COUT       ;CTRL I
0318:A9 B1    31        LDA  #$B1
031A:20 ED FD 32        JSR  COUT       ; 1
031D:A9 B3    33        LDA  #$B3
031F:20 ED FD 34        JSR  COUT       ; 3
0322:A9 B2    35        LDA  #$B2
0324:20 ED FD 36        JSR  COUT       ; 2
0327:AA CE    37        LDX  #$CE
0329:20 ED FD 38        JSR  COUT       ; N
032C:20 8E FD 39        JSR  CROUT
032F:         40 *
032F:         41 *
032F:         42 NEXT OF INITIALISATION
032F:         43 *
032F:         44 NOW BACK TO ROUTINE
0329:A9 40    45        LDA  #/START
0331:85 3A    46        STA  CSWL
0333:A9 03    47        LDA  #/START
0335:85 37    48        STA  CSWH
0337:A9 00    49        LDA  #$00
0339:85 06    50        STA  COUNT
033B:85 07    51        STA  COUNT2
033D:4C EA 03 52        JMP  BOS        ;WAIT FOR A COMMAND NOW
0340:         53 *
0340:         54 *
0340:A8       55 START  PHA
0341:20 0C C1 56        JSR  PRINT      ;ROUTINE STARTS HERE
0344:68       57        PLA             ;SEND CHAR TO PRINTER
0345:C9 8D    58        CMP  #$8D       ;CARRIAGE RETN?
0347:F0 05    59        BEQ  LINE       ;BRANCH IF SO
0349:C9 A0    60        CMP  #$A0       ;LINE FEED?
034B:F0 01    61        BEQ  LINE       ;ALSO BRANCH IF SO
034D:60       62 NEXT   RTS
034E:EE 06    63 LINE   INC  COUNT      ;INCREMENT LINE COUNT
0350:A5 06    64        LDA  COUNT
0352:C9 3A    65        CMP  #$3A       ;LINE COUNT =58?
0354:D0 F7    66        BNE  NEXT       ;IF NOT RETURN
0356:A5 06    67 BLANK  LDA  COUNT
0358:C9 42    68        CMP  #$42       ;PAGE LENGTH MET?
035A:F0 04    69        BEQ  LOOP       ;IF SO PRINT
035C:E6 06    70        INC  COUNT      ;INCREMENT LINE CNTR
035E:A9 BA    71        LDA  #$BA       ;LOAD LINE FEED
0360:20 0C C1 72        JSR  PRINT      ;SEND IT TO PRINTER
0363:38       73        SEC
0364:E0 F0    74        BCS  BLANK      ;ZERO THE COUNTER
0366:A9 00    75 LOOP   LDA  #$00
0368:85 06    76        STA  COUNT
036A:E6 07    77        INC  COUNT2
036C:A9 D0    78        LDA  #$D0
036E:20 ED FD 79        JSR  COUT       ; P
0371:A9 C1    80        LDA  #$C1
0373:20 ED FD 81        JSR  COUT       ; A
0376:A9 C7    82        LDA  #$C7
0378:20 ED FD 83        JSR  COUT       ; G
037B:A9 C5    84        LDA  #$C5
037D:20 ED FD 85        JSR  COUT       ; E
0380:A9 BA    86        LDA  #$BA
0382:20 ED FD 87        JSR  COUT       ; SPACE
0385:A5 07    88        LDA  COUNT2
0387:A9 B0    89        ADC  #$B0
0389:20 ED FD 90        JSR  COUT       ; COUNT2 DECIMAL UP TO 9
038C:20 8E FD 91        JSR  CROUT
038F:20 8E FD 92        JSR  CROUT
0392:60       93 DONE   RTS
0393:00       94        BRK

### SUCCESSFUL ASSEMBLY: NO ERRORS
```

Sound brief.

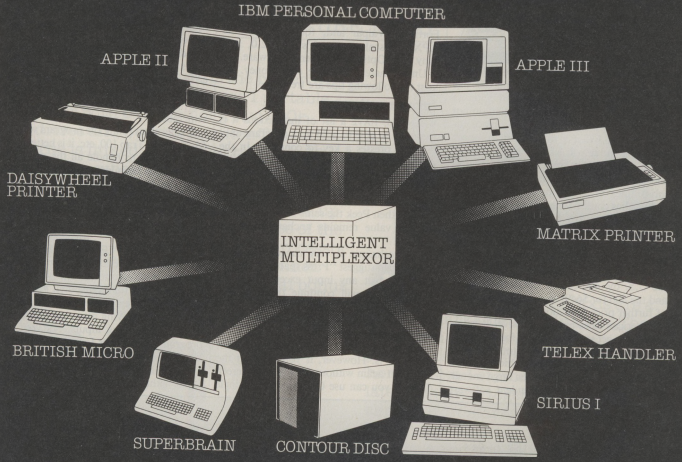
```
LIST
10  REM  *** ADD LINES FOR SOUND
12  REM  *** EFFECTS, WITH USR
14  REM  *** ROUTINE
16  REM
18  REM
30  FOR I = 768 TO 786: READ C: POKE
    I,C: NEXT
40  DATA 32,12,225,172,161,0,173
    ,160,0,32,168,252,173,48,192
    ,136,208,244,96
45  POKE 10,76: POKE 11,0: POKE 1
    2,3
```

Pretty picture.

```
LIST
10  FOR P = 1 TO 11
20  READ P,Q,H,S,B
30  HGR2
40  H = RND (1) * 6 + 1
50  IF H ) 3 AND H ( 5 THEN 40
60  HCOLOR= INT (H)
70  FOR A = 1 TO B
80  X = K * SIN (P * A):Y = K *  COS
    (Q * A)
90  HPLOT  TO X + 135,Y + 90
100 HPLOT X + 135,Y + 90
110 NEXT : GET A$: NEXT
111 TEXT : HOME : END
120 DATA  7,30,90,1,200,20,10,80
    ,1,72,2,4,90,1,100,3,4,90,1,
    200,4,3,90,0.5,200,4,2,90,0.
    4,200,27.8,139,80,0.208,31.3
    0,20,80,1,78,40,20,80,1,100,
    30,40,80,1,100,10,30,80,1,10
    0
```

GOODBYE TO FLOPPIES C/WP BRINGS YOU A LOCAL NETWORK FOR £495

(+ £150 PER STATION)



C/WP announces a new solution to the network problem, the C/WP STARNET, based on an intelligent multiplexor serving up to 64 microcomputers.

STARNET allows each station to access up to 42 megabytes of CONTOUR Winchester disc storage (soon to be increased to 84 megabytes).

STARNET can include a wide variety of microcomputers in a single network, including APPLE II, APPLE III, SUPERBRAIN, OSBORNE, SIRIUS, IBM PERSONAL.

STARNET handles many operating systems in the same network – DOS 3.3, CP/M, CP/M 86, PASCAL, BOS, MSDOS. PCDOS.

STARNET will support printer spooling, electronic mail, and a communications gateway to mainframes and other networks.

C/WP STARNET offers extraordinary value for money. A six station network with 12 megabyte shared disc storage, tape streamer back-up (2.5 minutes for whole disc), Qume Sprint 5 shared printer with CP/M and WordStar, and multiple print spooling costs less than £10500 ie. £1750 per station.

Write or telephone for full details of this great price breakthrough. Now you can afford the luxury of a network.

(All prices exclude VAT)

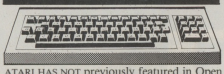
C/WP PRICES STILL TURN OTHERS GREEN

C/WP

C/WP Computers
108 Rochester Row, London SW1P 1JP
TELEPHONE: 01-828 9000

ATARI ACCENT

by Jack Schofield



ATARI HAS NOT previously featured in Open File for one very good reason: no one has submitted any programs. Either this means none of you own Ataris, or else you do not send them in because there is no place for them in Open File. For this column to appear again, the latter will have to be the correct explanation. Take a break from Star Raiders and send in your favourite progams or subroutines on cassette or disc.

Atari has come a long way in the last year, with the setting up of Atari U.K. and the cutting of prices. The £345 Atari 400 is down to £245, including Basic, and the £645 Atari 800 down to £449. This, and television and press advertising, should help sales. However, in the U.S. the 400 can be obtained for $269 and the 800 for $649, so we can live in hope of further price reductions as sales pick up.

American sales remain massive. It is impossible to get separate figures for the home-computer division, but Atari's total turnover for 1982 is passing $2 billion, which is quite a lot. Computer sales have been large enough to generate massive independent software support. A recent catalogue from Sidcup's Silica Shop includes over 350 programs from over 60 firms. Atari has also greatly increased the number of programs in its APX scheme, and the current catalogue lists over 130, which are in addition to the programs in the "main line", now approaching 50.

Recent add-ons now include an 80-column card from Bit 3, a typewriter keyboard for the 400 from Softcell, a ROM toolkit for the right-hand cartridge slot (Monkey Wrench) from Eastern House, independent disc drives from Percom, and double-density drives that bring CP/M capability. Languages now include a third Basic by Microsoft, a third Forth by Valpar and, for the first time APX's Pascal, Datasoft's Lisp 2.0, and Tiny C by Optimized Systems Software.

Unfortunately all these cost money. At least the following tips are free.

Input routines

WHEN YOU HAVE a list of instructions it is useful to be able to hold up a program until the user presses a key to continue. In the Atari location 764 holds the internal code of the last key pressed, which makes it possible to read a key without an input statement. The idea is to Poke 764 with a value of 255 to clear it, then Peek the same location as long as that value remains unchanged — see listing 1.

The technique is very rugged. While a prompt can suggest "Press space bar to continue", in fact any input except Break or System Reset will continue the program. And, if required,

```
POKE 53774,64:POKE 16,64
```

will disable the Break key.

In this case you are not interested in what the input is. However, if you do want the input but again without upsetting the screen display, you can use Get to collect a single byte from the keyboard, To do this, open a file, # 1 for input only — the code for this is 4 — give the device number, 0, and the name. The name must start with a letter and can be up to eight characters long, but for the keyboard K: is used. Thus the command is

```
OPEN #1,4,0,"K:"
```

Then

```
GET #1, LETTER
```

will collect one letter, which can then be checked for suitability. Note that after files have been opened they must be closed, so it is sometimes convenient to issue a Close before you issue the Open — see listing 2.

For many inputs you can use Atari's useful error-trapping routine, which works as "on error Goto line XXX", and which is called simply Trap. For example, Trap 100 sends the program to line 100 on an input error. Each time the trap is used it must be cleared with a number from 32767 to 65535. Normally Trap 40000 is used as being easy to remember.

Rather than filling the program with Trap 65, Trap 80, Trap 100, etc. it is better to use a small routine to handle all the errors. This can be done because locations 186 and 187 hold the line number at which the error occurred. By Peeking these locations you can dispose of the error and return the program to the input line for the user to try again. It's as simple as

```
GOTO 256*PEEK(187)+PEEK(186)
```

I often use Poke 703,0 to create a Graphics 0 screen with a four-line text window. The window is used for inputs, then #6; is used to print accepted entries on the main screen. It is well worth paying attention to the minor details of handling inputs. All your clever programming counts for nothing if the user keeps being dropped out of the program.

By the way, has anyone found a way to use Input without getting the ? prompt?

Input routines.

Listing 1.

```
10 REM *** LISTING 1 ***
15 GRAPHICS 0:REM CLEAR SCREEN
20 POKE 752,1:REM SUPPRESS CURSOR
25 PRINT "HELLO":REM DO SOMETHING
30 PRINT "Press space bar to continue"
35 POKE 764,255
40 IF PEEK(764)=255 THEN 40
50 PRINT "HELLO AGAIN":REM CONTINUATION
55 GOTO 30:REM LOOP FOREVER
```

Listing 2.

```
10 REM *** LISTING 2 ***
15 GRAPHICS 0:POKE 752,1
20 PRINT "Type in some letters"
25 CLOSE #1:OPEN #1,4,0,"K:"
30 GET #1,LETTER
35 POKE 702,64:REM DISABLES CAPS LOWR
40 POKE 694,0:REM DISABLES INVERSE KEY
45 IF LETTER<65 OR LETTER>90 THEN 30
50 REM CHECK IT'S A CAPITAL
55 PRINT CHR$(LETTER);
60 GOTO 25:REM LOOP FOR ANOTHER LETTER
```

Listing 3.

```
10 REM *** LISTING 3 ***
15 REM (Accepts numbers only)
20 GRAPHICS 0:POKE 752,1
25 PRINT "Type in a NUMBER"
30 PRINT "and press RETURN"
35 PRINT
40 TRAP 85:PRINT "ENTER ONE":INPUT N1
45 PRINT
50 TRAP 85:PRINT "ANOTHER":INPUT N2
55 PRINT
60 TRAP 85:PRINT "& A THIRD":INPUT N3
65 PRINT
70 PRINT "THANKYOU!"
75 POKE 752,0:END
80 REM TRAP ROUTINE
85 TRAP 40000:PRINT "THAT'S NOT A NUMBER"
90 GOTO 256*PEEK(187)+PEEK(186)
```

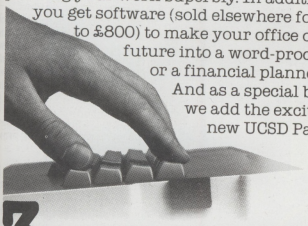
DOUBLE DENSITY OSBORNE AND PRAXIS

£1599 + VAT

THE OFFICE OF THE FUTURE TODAY



1 The heart of this office of the future is the powerful new "double density" Osborne 1 portable computer with 64k memory, two 200k disc drives and built-in monitor. The Osborne is linked to an Olivetti Praxis 30 11cps daisy-wheel printer/typewriter for printing your work superbly. In addition you get software (sold elsewhere for up to £800) to make your office of the future into a word-processor or a financial planner. And as a special bonus we add the exciting new UCSD Pascal.



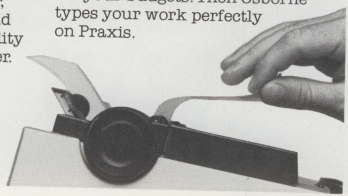
2 Your Osborne and Praxis are a remarkable combination. The machines are so portable you can carry them both home instead of working late. Plug them together slip the Wordstar/Mailmerge disc into the drive and you have a word-processor with twice the capacity of earlier Osbornes. Change discs for Supercalc and you have the power of a dozen clerks for your budgets. Then Osborne types your work perfectly on Praxis.



3 The Olivetti Praxis 30 is a new style electronic typewriter with its own memory, automatic erase, and a double keyboard which gives you 14 extra characters. Use your Praxis on its own as a prestige easy-to-use typewriter, or plug it into your Osborne and use it as a high quality computer printer.





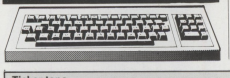


O-COMPUTERS
A member of the C/WP Group
104-106 Rochester Row, London SW1
Telephone: 01-828 9000

● Circle No. 200

TANDY FORUM

by John Wellsman



I HAVE BEEN READING this column ever since it started and it has been in some very good hands, but I have been surprised that there has been so little about the Model II. Are the users of this first-class analytical engine shy? Are they bashful about confessing that they use a machine costing more than £50, or a disc bigger than a saucer? Please let me hear from you — I know you are out there somewhere. And let's not neglect the Colour and Pocket buffs; Genie users are very welcome too.

I would like these pages to be a source of help and ideas to all Tandy computer users, no matter what machine they use, what their degree of progress is or what they use their machines for, and look forward to your interesting programs and letters.

Ticker tape.

```
10 CLEAR 1000: ON ERROR GOTO 310:CLS
20 PRINTTAB(25);"TICKER TAPE"
30 PRINT@400,CHR$(191):PRINT@430,
   CHR$(191)
40 FOR I=464 TO 494: PRINT@I,CHR$(143);:
   NEXT
50 FOR I=336 TO 366: PRINT@I,CHR$(188);:
   NEXT
60 PRINT@901,CHR$(143)
70 PRINT@576,""
80 PRINT"ENTER MESSAGE NO COMMAS PLEASE
   UP TO THE ' "CHR$(143)"' "
90 INPUT"*";M$
100 PRINT@576,STRING$(62,32)
110 PRINT@640,STRING$(255,32)
120 M$=STRING$(30,32)+M$:
    M$=M$+STRING$(30,32)
130 GOTO 230
140 FOR T=1 TO 2
150 IF T=1 THEN PRINT@192,"MESSAGE
    READS:          ";
160 FOR I= 1 TO (LEN(M$)-29)
170 PRINT@401,MID$(M$,I,29)
180 FOR D=1 TO 20
190 NEXT D
200 NEXT I
210 FOR X = 1 TO 200:NEXT X:
    PRINT@192,"REPEATING:          ";
220 NEXT T
230 PRINT@192,"HOLD DOWN (ENTER)";
240 PRINT@153,"* MESSAGE *";
250 FOR D=1 TO 100: NEXT D
260 IF PEEK(14400)=1 THEN 140
270 PRINT@153,CHR$(143); STRING$(3,32);
    CHR$(143);
280 FOR D=1 TO 100: NEXT D
290 IF PEEK(14400)=1 THEN 140
300 GOTO 240
310 PRINT"YOU WENT PAST THE
    '"CHR$(143)"' TRY AGAIN"
320 PRINT"PRESS ANY KEY"
330 IF INKEY$="" THEN 330
340 RESUME 10
```

Ticker tape

The first program that I would like to present to you this month comes from Mark Lawson of Stonehouse, Gloucestershire. It is a neat little program which steps a message through a frame after the style of illuminated newscasts on the front of buildings. It is intended as a subroutine and has obvious applications to games. Except for renumbering I have made only one alteration, but it is an important one if you are writing programs which others have to copy. In line 270, you will see String$(9,32) which, as you know, specifies a nine-character space. In the coresponding position in Mark Lawson's program were two "quotes" with a blank space between them. This might be acceptable in some contexts, but in this case the space had to fit line 240. So if you expect others to read your programs, indicate the size of significant spaces with a String$.

Line 170 produces the illusion of movement. All that happens is that the first 29 characters are printed @ 401, then the next 29 characters begining with the second character of the string and so on, but all are printed @ 401. It is, of course, the same effect that is produced with cine films.

In line 80, the user is instructed to avoid commas. Disc Basic users can avoid this restriction by using LineInput in line 90, while level II users might like to use the following little subroutine which will enable them to input any printable character. Substitute the Input in line 90 with Gosub 500 and add:

```
500 I$ = INKEY$: IF I$ = "" THEN 500 ELSE IF
    I$ = CHR$(13) THEN RETURN ELSE PRINT
    I$
510 M$ = M$ + I$: GOTO 500
```

As with a normal Input it is terminated by pressing Enter: but do not forget the semicolon at the end of line 500.

This is quite a useful routine in other respects. A normal Input is always followed by a Carriage-return. The VDU display will be corrupted if you have two Inputs on the same line, but when using the subroutine no Carriage-return is produced.

Comma separator

The following is a tip passed to me by Douglas Boote of Bramhall, Cheshire. Though it is a small point, it has never occurred to me or to most other programmers whose programs I have seen. It concern the use of Then and/or Goto. The Tandy Level II manual is rather vague on the subject of how optional these two words are; their main use is as separators when ambiguity would result from their absence. To quote two examples:

```
20 IF A = B THEN (or GOTO) 100
```

or

```
20 IF A = 30 THEN 100
```

If Then or Goto were omitted the computer would read the first example as

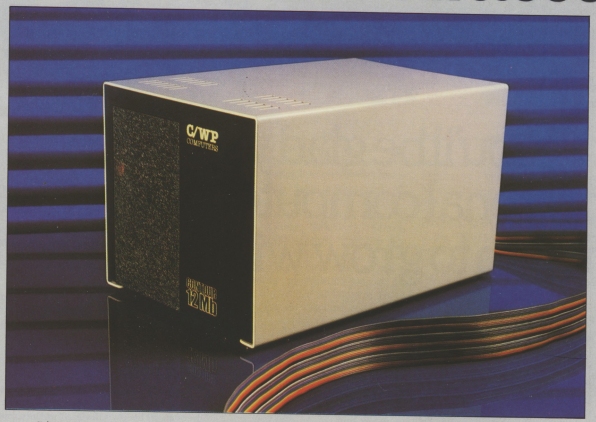
```
IF A = B1 00
```

regarding B1 as a variable, and in the second example, it would read

```
IF A = 30100
```

(continued on page 161)

GOODBYE TO FLOPPIES C/WP INTRODUCES A HARD DISC FOR £995.



C/WP have done it again. We proudly announce the C/WP CONTOUR, a range of British-made high technology 5-inch Winchester discs at prices starting below £1000.

Suddenly your micro-computer has come of age. One little box, not much larger than a floppy disc drive, stores up to 21 million characters. That size costs £1995 and stores the equivalent of more than 160 floppy discs, or 35 full-length books. And in a maximum of around a fifth of a second the C/WP CONTOUR finds any piece of information your computer asks for.

C/WP CONTOUR is available now for your APPLE II, Pet, IBM Personal, Sirius, Superbrain and many other CP/M and S100 machines. On APPLE the C/WP CONTOUR supports DOS 3.3, Pascal and CP/M operating systems.

Write or telephone for full details of this great price breakthrough. Now you can afford the luxury of a Winchester.

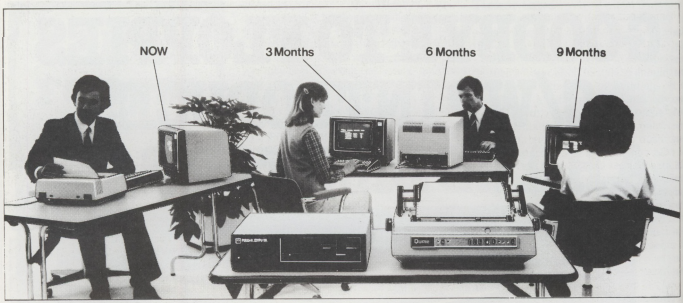
C/WP CONTOUR PRICE LIST	
3Mb (formatted)	£995
6Mb (formatted)	£1195
12Mb (formatted)	£1595
21Mb (formatted)	£1995
Tape streamer back-up (21Mb 4min)	£1495
All prices exclude VAT	

C/WP FOR BIG VALUE IN HARD DISCS

C/WP

C/WP Computers
108 Rochester Row, London SW1P 1JP
Telephone: 01-630 7444

● Circle No. 201



You'll be glad you chose a personal computer with power enough to grow with your needs.

The ICL Personal Computer with power to grow as you need it.

Choosing the wrong personal computer can work out very costly, because though they grow to meet your needs, they just don't grow enough.

The new ICL Personal Computer gives you more.

It's a versatile, professional personal computer. It can start with a single Visual Display Unit, naturally, and it has a wide range of functions to meet your increasing requirements. And it can grow larger than most other personal computer systems, because its capacity for additional hardware is greater.

Starting at £2,895 with one VDU

The ICL Personal Computer provides a range of options enabling you to have a system tailored to meet your changing needs.

For example, by adding a fixed-disc, you can have eight times the original storage capacity, and support up to 4 VDUs. And there is an extensive range of Personal Computer hardware.

Wide range of integrated accounts and other application software available, providing limitless possibilities.

So your secretary can do her word processing, you can do your forecasts, your accountant can do the invoicing, and your programmer can do his own thing, all at the same time. Thats what makes ICL Personal Computer more than just a personal computer.

And because ICL is Europe's leading computer company, with thousands of satisfied users in over 80 countries worldwide, **we can offer ICL Trader Point service and maintenance back-up that's second to none.**

What more could you ask for, apart from a demonstration?

ICL

trader point

To: **Johnson microcomputers** Johnson House · 75-79 Park Street · Camberley · Surrey

Please send me further information on the new ICL Personal Computer.

Name Position

Company Name & Address

Telephone

Type of Business

Peachtree Software

Johnson microcomputers

Johnson House · 75-79 Park Street · Camberley · Surrey
Telephone 0276 20446

Robophone Answering 24 hrs. Prestel page No. *200632
Mailbox No. 027620448

48 Gloucester Road · Bristol · Telephone 0272 422061
113 Stratford Road · Shirley · Birmingham B90 3AY
Telephone (021) 745 3246

● **Circle No. 202**

(continued from page 158)

This is probably obvious to you, but have you realised that a simple comma will substitute for Then or Goto? Its only function is to inform the computer when the definition of the conditional statement has ended.

Printer/screen switch

Here is another subroutine which switches the video and printer addresses. It was sent by Gordon Grant of Radcliffe, Manchester. Have a look at page D/1 of the Level II Basic reference manual which gives the Level II memory map if you want to understand how it works.

If you type it in and Run it just as it stands — making sure that your printer is on-line — the printer will type out

```
READY
```

and nothing will happen on the screen. In fact, you may well think that it has hung up. But all is well, except that every key that you press on the keyboard will go to the printer and not to the screen. If you type a command such as List or Print, whose effect should appear on the screen, it will go to the printer and, conversely, if you type a command such as LPrint the effect will appear on the screen and not go to the printer.

The result of running the routine is permanent and remains in effect in Dos and probably for System tapes, though I have not tried it. Script is not affected; if you return to Dos without rebooting, the switch is still present.

There are two ways out of the switch-round. One is to boot or reset, the other — well, look hard at the listing and figure it out for yourself. If you are really stuck, drop me a line — with an SAE please — and I will send you the three-word solution.

I must confess that I cannot think of many uses for this routine. The only one that comes to mind is to implement it before using a program whose output is normally to the screen and you want hard copy. Even then, remember that every bit of screen display will go to the printer.

Advice for all

I have just come back from attending a day-long meeting of the National TRS-80 Users' Group in Southall in West London. The group regularly holds meetings in all parts of the country at which members can bring their own systems and display their latest creations or acquisitions and chew the fat with all and sundry. It also arranges lectures, and dealers are often provided with display space. This meeting was unusual in that it was jointly shared with the British Apple Users' Group.



Model II buffs, where are you? We welcome programs, tips and advice from all Tandy users.

Computer enthusiasts are usually fiercely loyal to their brand and regard anything else as rubbish, but on this occasion not a drop of blood was spilt — in fact, the Apple people are quite nice guys really, when you get to know them.

The great value of these meetings is that you meet people, get new ideas and always learn something new. I would strongly recommend everyone, especially beginners, to join their respective group, whatever machine they have. Most national groups have their own local monthly meetings. TRS-80 uses should contact Brian Pain, 40a High Street, Stony Stratford, Milton Keynes, Buckinghamshire for further details.

The TRS-80 Users' Group is holding a weekend seminar at Milton Keynes on Saturday and Sunday, 29-30 January. There will be instruction on machine code, Dos, word processing, compilers and hard discs. The fee for the Saturday will be £5.50 and for Sunday £3.50. Brain Pain has full details.

On the subject of giving help, I would like to offer my support to any beginners who cannot find a solution to their particular problems. This offer must be confined to beginners with simple problems; sadly it cannot become a general consultancy offer. Please enclose an SAE.

We shall not usually be reviewing hardware in this column, but I was very interested in seeing the new little colour printer that Tandy has just brought out. It uses ordinary 4.5in. paper rolls and will print in four colours. It can be used for ordinary text of 40 or 80 characters per line, or graphics. It uses replaceable ink cartridges with a resolution of five steps per millimetre. Although I have yet to use it, it strikes me as being very good value at £149 including VAT.

A little tip for Disc Basic users which will allow them to use a Tab value on the printer above 64. First define

```
DEFFNX$(Y) = STRING$(Y – PEEK(16539), 32)
```

Then instead of Tab(70) use

```
FNX$(70)
```

Another little tip about the very valuable Print Using function. If you want to list percentages, define a Using string as

```
££.££%
```

to put the % symbol at the end of the value without you having to tack it on every time. You could also use p or c to indicate pence or cents.

Micro word processor

The Inkey$ function can be put to a wide range of uses. E R Hill of Keighley, West Yorkshire has sent this little program which can be described as a micro word processor. But if you have a Model I, then you must have a disc version with Newdos or LDos. Again do not miss the semicolons at the end of lines 40 and 60 or you will end up in a mess.

The instructions are:

BACKSPACE — backspaces and erases
TAB — moves forward eight spaces
DOWN — moves to start of next line and erases
ENTER — has same effect
SHIFT DOWN O — cursor off
SHIFT DOWN N — cursor on
SHIFT BACKSPACE — backspaces without erasing
SHIFT DOWN Y — advances cursor without erasing
SHIFT DOWN Z — moves cursor down without erasing
SHIFT UP — moves cursor up without erasing
SHIFT DOWN — moves cursor to upper-left corner; it does not work with Model I

E R Hill reminds us not to fill the screen, otherwise scrolling problems will occur. To print with Model III use

```
SHIFT DOWN *
```

with Model I, use JKL.

Printer screen switch.

```
10 K=16413: REM VIDEO DCB
20 l=16421: rem PRINTER DCB
30 FOR M=0 TO 7
40 N=PEEK(K+M)
50 POKE K+M, PEEK(L+M)
60 POKE L+M, N
70 NEXT
```

Micro word processor.

```
10 CLS
20 PRINTCHR$(14)
30 A$=INKEY$
40 IF A$=CHR$(9) THEN PRINT"
50 IF A$=CHR$(31) THEN 10
60 PRINTA$;
70 GOTO 30
```

Software for CP/M™

MICROPRO		£
WORDSTAR	MICROPRO's comprehensive word processing system	250.00
MAILMERGE	Added power to WORDSTAR for mailing lists, standard letters, etc	60.00
SPELLSTAR	Dictionary on a disk for WORDSTAR spelling checking	120.00
DATASTAR	MICROPRO's data entry, validation and retrieval system	170.00
SUPERSORT I	Sorting, extracting and merging at high speed from MicroPro. Includes Relocatable version for inclusion in your own software	120.00
CALCSTAR	MICROPRO's spread sheet and financial modelling system. Combine with WORDSTAR to get impressive end results.	150.00
WORDMASTER	Video text editor for programmers and simple Word Processing	60.00

MICROSOFT		£
BASIC-80	MICROSOFT's popular and powerful BASIC Interpreter (MBASIC)	150.00*
BASIC Compiler	Compile your BASIC-80 programs for speed and protection	190.00*
FORTRAN-80	Fortran compiler to ANSI X3.9 1966 except COMPLEX data	210.00*
COBOL-80	The COBOL compiler for microcomputers. (BASIC, FORTRAN and COBOL compilers include MACRO-80, LINK loader, LIBrary manager and CREF utilities.)	310.00*

MISC		£
CBASIC-2	COMPILER SYSTEMS widely used compiler/interpreter for BASIC	94.00
CB-80	CBASIC compatible compiler	310.00
PASCAL/M	SORCIM's PASCAL	120.00
SUPERCALC	SORCIM's spread sheet and modelling system	170.00
MILESTONE	Project Management and Scheduling from Organic Software	160.00
dBASE II	Relational Database Management from Ashton Tate	380.00
dUTIL	Programming aid for dBASE II	50.00
MICROSTAT	Statistical program library from ECOSOFT for (and needs) BASIC-80	150.00
PLI-80	Digital Research PLI Compiler	310.00
BT-80	Record Retrieval for PLI-80	125.00
MAC	Digital Research 8080 Macro Assembler	57.00
SID	8080 Symbolic Debugger	47.00
ZSID	Z80 Symbolic Debugger	63.00
DESPOOL	File Print Spooler for CP/M	31.00
TEX	Tex editor	63.00
SPELLBINDER	Lexisoft's Wordprocessing and Office Management System	275.00
PRO PASCAL	Z80 True Pascal Compiler	190.00

All products are available in 8" SD, SS, Superbrain 5" SS, North Star Horizon QD format except those marked * which are not available in North Star format.

IBM PC SOFTWARE
NOW AVAILABLE - Please ring for full details

All products are supplied complete with full originators documentation.
Please send large s.a.e. for full details. **TRADE ENQUIRIES WELCOME**
Ordering Instructions: Cash with order. Specify disk format. Add £3.00 per item P&P. Add 15% VAT

BARCLAYCARD VISA ACCESS

the soft option (UK) LTD

PO BOX 11 CRANBROOK KENT TN17 2DF Tel. (058 080) 310

● Circle No. 203

BBC BYTES

by John Harris



Circuit diagrams

TOM WORSTER of Glasgow has sent me a listing which, if your interests include designing electronic schematic diagrams, may save you quite a bit of effort. For the rest of you the listing is well worth a browse for the quality of the program design and the useful code techniques employed.

The listing as shown uses the ADC but alterations are given at the end of the listing for keyboard control. If you use these the controls become:

@ — move cross-hair up
] — move cross-hair right
/ — move cross-hair down
; — move cross-hair left

though previously steady cross-hairs will flicker a little.

The procedure ProcPrint is hardware dependent and you will probably need to amend it for your specific printer control character set. If anyone sends me an enhancement to the listing to permit the saving and reloading of the screen contents to tape or disc with rescaling and positioning on retrieval, to allow the construction of a circuit library, I shall be very happy to print it.

Single-character commands are:

Q — foreground white, for drawing
A — foreground black, for erasure
O — remove cursor for 30 seconds or until key depression

Circuit design.

```
  10MODE 4
  200PROCinit
  250COLO,1
  30 PROCmenu
  401F X1%()Y% THENPROCset:X1%=X%:Y%=Y%
  501F Y1%()Y% THENPROCy1:Y1%=Y%:PROCy
  60 T=INKEY(1)
  701F I=32 THENPROCset
  751F I=78 THENPROCint
  801F I=76 THENPROCline
  851F I=82 THENPROCrect
  861F I=67 THENPROCcir
  901F I=79 THENPROCcurs:A=INKEY(3000):PROCcurs :
  951T ADVAL(3)<50000 THENPROCcurs ELSE100
  971F ADVAL(3)>50000 THENPROCcurs ELSE97
  1001F I=87 THENPROCletter
  104IF I>47 AND I<58 THEN ON I-47 GOSUB 1000, 2000, 2500, 3000, 3500, 4000, 4500, 5000
, 5500, 6000
  105IF I=81 THEN SCOL=0 :
  106IF I=65 THEN SCOL=0, 0
  110IF I=80 THEN PROCprint
  1200GOTO30
  150DEFPROCcurs:PROCx:PROCy:ENDPROC
  200 DEFPROCpos:tX=96+20*INT(ADVAL(1)/(2.5*536)):tX=20*INT(ADVAL(2)/(2.5*512))
:ENDPROC
  300DEFPROCx:MOVE X1%,0:?_OT2,0,1024:ENDPROC
  400DEFPROCy:MOVE 0,Y1%:?_OT2,1280,0:ENDPROC
  500DEFPROCline:PROCcurs:MOVEBR,BX:DRAW X1%,Y1%:PROCcurs:ENDPROC
  600DEFPROCint:COLOUR1%=1:Y1%=-1:ENDPROC
  700DEFPROCrect:R%=X1%:B%=Y1%:ENDPROC
  800DEFPROCrect:PROCcurs:MOVEBR,B%:DRAW BR,Y%:DRAW X1%,Y1%:DRAW R%,B%:DRAW BR
,B%:PROCcurs:ENDPROC
  900DEFPROCcir:LOCALA,Z,P,J,%
  910INPUTTAB(0,0)Z.A:Z=2*PI/Z
  920R=SQR((X1%-BX)^2+(Y1%-BX)^2)
  930P=BX%((Y1%-BX)/R):F=X1%(BX *HEN P=3!-P
  935PROCcurs
  940MOVE X1%,Y1%:FORJ=P+Z TO 2*PI+P STEP Z
  950IFR>1 THEN DRAW BX+R*COS(J), BX+R*SIN(J):GOTO960
  955MOVE BR,BX:PLOT85,BX+R*COS(J),BX+R*SIN(J)
  960NEXT:PROCcurs:ENDPROC
  1000DEFPROCletter:LOCAL A$,C,D:C=40*BX/1280:D=32-(32*BX/1024):INPUTTAB(0,0)A$:P
ROCcurs:PRINTTAB(C,D)A$:PRINTTAB(0,0)"";:PROCcurs:ENDPROC
  1100DEFPROCprint
  1110PROCcurs:LOCAL I,J,%,Z%,X%
  1112*FX5,2
  1113*FX8,7
  1114VDU2
  1115PRINTCHR$(28)
  1120FORI=0TO1280STEP4
  1130FORJ=0TO1024STEP4
  1135X%=I
  1140FORX=0TO8
  1150PRINT(J,I+X)=(I*HENZ%=1 ELSEZ%=0
  1160X%=2*X%+Z%
  1170NEXT
  1180PRINTTAB(0,0):CHR$(X%);:NEXT
  1190PRINT"6"
  1200NEXT
  1210PRINTCHR$(29)
  1215VDU3
  1217PROCcurs
  1220ENDPROC
  2000PROCcurs
```

(listing continued on next page)

Map generator

D C McMillan of Belfast has sent me a routine which may be made part of either a games or educational program requiring a map of Great Britain and/or Ireland to be displayed on the screen. The resolution in mode 4 is as fine as possible for that mode, and should you ever get a second processor would be even finer in mode 0.

He includes a control around the routine to input Size and Offset parameters; sizes of 3, 3 and 8 respectively fill the screens with options BI, GB and IR, and while smaller or larger sizes are selectable definition falls off either way. To increase the definition of the outline the map may be redrawn with one of the co-ordinates offset by one point.

Circuit-diagram command set.

Function	Press spacebar at	then	at
straight line	start of line	L	end of line
rectangle	one corner	R	diagonal corner
polygon	centre	C	one vertex, see note 1
text inclusion	first letter	W	immediately, then type text and Return
diode	anode	1	cathode
non-polar capacitor	centre first plate	2	centre second plate
resistor	beginning	3	end
dot	centre	4	immediately
arrowhead	base	5	point
earth	where wire comes in	6	immediately
chassis	where wire comes in	7	immediately
electrolytic capacitor	centre of + ve	8	centre of –ve
transistor	centre of base	9	emitter quadrant, see note 2
loudspeaker	centre of top	0	immediately

Note 1 — then enter n, m where n is the number of vertices, and m = 1 for empty, m = 2 for filled.
Note 2 — then enter 1 for inward-pointing arrow.

Gladiator 83

Different people will describe a given program in different ways. I thank Mark Beerling of Margate, Kent for the following games program, even though my wife monopolised the machine all weekend with it, and give you his own description unabridged, being incapable of bettering it myself.

You have control of a tank in an arena. You are in gladiatorial-style combat with invisible crabs that move randomly towards your tank to crush it. The crabs can only be seen in a radar pulse and can be destroyed via a plasma bolt fired from the tank.

The screen folds round on itself at the bottom and far left only; this makes a good

(continued on next page)

(continued from previous page)

escape route. As you destroy them the speed of the crabs increases and a new sheet of crabs is released when you destroy the last crab in the old sheet.

The edit keys are used to control the tanks as follows:

↑ — move up
→ — move right
↓ — move down
← — move left
Copy — fire plasma bolt
Space bar — radar pulse

The program may be changed as follows to make the game different:

25 VDU 19,1,0,0,0,0,

will make the crabs visible and the game becomes a simple crab shoot. But to even things up you might like to increase the speed of the crabs by

140 IF TIME>400 PROCatmove:TIME = 350 + SC

Making the Crabs move randomly increases the difficulty of the game, done by

185 M% = RND (NT + 1)–1

Consider also taking A% = 5 out of 790 and removing C% = 1 from 860.

(listing continued from previous page)

```
 20051IF X%=X%+0 THEN PX=(Y%-BX)/2 ELSE PX=(X%-BX)/2
 20101IF PX#>1X THEN MOVE X%-PX,Y%:GCOL0,X%-PX,Y%:MOVE X%,Y%:MOVE PX-PX,BX:D
LOPX5 PX=PX:PX=SGN(PX)*20
 20200MOVE X%,Y%-PX:DRAW X%,Y%+PX:MOVE X%,Y%:MOVE PX,Y%-PX:DRAW PX,Y%+PX
 20308PROCcurs
 20409RETURN
 25009PROCcurs
 25201F X%=BX+0 THENMOVE BX-22,BX:DRAW BX-32,BX:MOVE X%-32,Y%:DRAWX%+32,Y%:
GOTO2540
 25309MOVE PX,BX-32:DRAW PX,BX-32:MOVE X%,Y%-32:DRAWX%,Y%-32
 25409PROCcurs:RETURN
 30009PROCcurs
 30101F X%=BX:0 THEN 3035
 3012MOVE BX-16,BX
 3015FOR I%=0 TO Y%-BX STEP 32+SGN(Y%-BX)
 3020DRAW BX-16,BX+I%:DRAW BX+16,BX+I%+16*SGN(Y%-BX)
 3030NEXT:GOTO3060
 3035MOVE BX,BX-16
 3040FOR I%=0 TO X%-BX STEP 32+SGN(X%-BX)
 3050DRAW BX+I%,BX-16:DRAW BX+I%+16*SGN(X%-BX),BX+16
 3055NEXT +
 3060PROCcurs:RETURN
 3500PROCcurs
 3510MOVE BX+4,BX+4:DRAW BX+4,BX-4:DRAW BX-4,BX-4:DRAW BX-4,BX+4
 3520PROCcurs:RETURN
 4000PROCcurs
 4010MOVE-BX,BX+16:MOVE BX,BX-16:PLOT85,X%,Y%
 4020PROCcurs:RETURN
 4500PROCcurs
 4510MOVE BX-26,BX:DRAW BX+26,BX
 4520MOVE BX+20,BX-8:DRAW BX+20,BX+8
 4530MOVE BX+8,BX-16:DRAW BX-8,BX-16
 4540PROCcurs:RETURN
 5000PROCcurs
 5010MOVE BX+40,BX:DRAW BX-40,BX
 5020FOR I%=BX+40 TO BX+40 STEP 16
 5030MOVE I%,BX:DRAW I%-16,BX-16
 5040NEXT:PROCcurs:RETURN
 5300PROCcurs
 5320IF X%=BX+0 THEN MOVEX1%-32,Y1%:DRAWX1%-32,Y2%:MOVEBX-32,BX:DRAWBX+32,BX:DR
AWBX+32,BX-32:DRAWBX-32,BX+32:DRAWBX-32,BX:GOTO5340
 5330MOVEBX,BX-32:DRAWBX,BX+32:DRAWBX+32,BX:DRAWBX-32,BX:DRAWBX,BX-32:MOVE
X1%,Y1%-32:DRAWX1%,Y1%+32
 5340PROCcurs:RETURN
 6000PROCcurs
 6010MOVEBX,BX+32:DRAWBX,BX-32:DRAWBX+4,BX+32:DRAWBX+8,BX+32
 6020MOVEBX,BX
 6030IF X1%<BX THEN PX=60 ELSE PX=-60
 6040DRAWBX+PX,BX-PX:MOVEBX,BX:DRAWBX+PX,BX+PX
 6050IF (ST%=1 OR ST%=2) THEN PX=20*SGN(0 E.SE PX):PX=20
 6060PX=PX*SGN(BX-X1%):IFX%=BX+SGN(Y1%-BX)
 6070IF BX<(Y1% THEN 6075 ELSE IF BX(Y1% THEN MOVEBX-32,BX+12:GOTO 6080 ELSE MOVE
BX-32,BX-12:GOTO6080
 6075IF BX(Y1% THEN MOVEBX+32,BX+12 ELSE MOVEBX+32,BX-12
 6080PLOT 1,BX,BX
 6100PROCcurs:RETURN
 6500PROCcurs
 6510MOVE BX-16,BX
 6520DRAW BX+16,BX
 6530DRAW BX+16,BX-60
 6540DRAW BX-16,BX-60
 6550DRAW BX-16,BX
 6560MOVE BX-16,BX-20
 6570DRAW BX-60,BX
 6580DRAW BX+60,BX-60
 6590DRAW BX-16,BX-40
 6600PROCcurs :RETURN
```

```
  4 FX 11,0
  5 FX 12,12
  7 ON ERROR GOTO 10000
 20 T=INKEY(1)
 25 IF T=66 OR T=59 OR T=47 OR T=95 THEN 900close
 30 REM
200 DEFPROCbos
210 IF T=59 AND XX=15 THEN XX=XX-16
220 IF T=95 AND XX<1245 THEN XX=XX+16
230 IF T=47 AND YY<15 THEN YY=YY-16
240 IF T=66 AND YY<1024 THEN YY=YY+16
250 ENDPROC
10000 *FX 11,0
10001 *FX 12,0
```

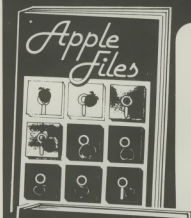
Map generator.

```
 10REM          BYAQS
 20REM        D C McMillan
 30REM          10/8/82
 40MODE4
 50DIM XS(280),YS(280)
 60INPUT TAB(0,0)"SIZE "SIZE
 70FOR LX=1 TO 379
 80READ XS(LX)
 90XS(LX)=XS(LX)*SIZE
100NEXT LX
110FOR LX=1 TO 379
120READ YS(LX)
130YS(LX)=YS(LX)*SIZE
140NEXT LX
150INPUT TAB(0,1)"START CO-ORDS "XI%,YI%
160INPUT TAB(0,2)"BI_GB OR PR "A$
170MOVE XI%,YI%
180IF A$="IB" PROCli+180TO 220
190IF A$="GB" PROCgb+180TO 220
200IF A$()"BI" THEN PRINT TAB(0,3) STRING$
(15," ");GOTO160
210PROCbi
220PRINT TAB(0,1) STRING$(25," ")
230INPUT TAB(0,1)"NEXT CO-ORDS "XI%,YI%
240GOTO170
250DEFPROCgb
260FOR LX=1 TO 261
270PLOT 1,XS(LX),YS(LX)
280NEXT LX
290ENDPROC
300DEFPROCbi
310PROCgb
320PLOT 0,-85+SIZE,62+SIZE
330PROCli
340ENDPROC
350DEFPROCli
360FOR LX=262 TO 379
370PLOT 1,XS(LX),YS(LX)
380NEXT LX
390ENDPROC
400REM          X CO-ORDINATES
410REM          G B
420DATA5,1,5,2,9,10,6,2,9,7,12,-1,3
430DATA10,-1,4,5,2,11,10,6,3,2,5,1
440DATA9,-2,-8,-1,-4,-7,-2,-5,-7,7
450DATA5,4,5,-1,-3,4,2,4,-2,4,4,2,0
460DATA-5,-10,-8,-3,-3,-2,4,2,-1,-3
470DATA-3,-1,0,11,2,6,-6,2,-7,6,-6,-4
480DATA-6,0,-1,-5,-3,-2,-7,-3,-9,-4
490DATA-8,-5,-7,3,3,-6,-3,-5,5,7,-5,2,-3
500DATA-1,3,4,-3,-7,-1,-3,-13,-4,-1,3
510DATA-5,-8,2,-6,-7,-5,14,1,-7,-16,-5
520DATA-5,-5,0,-4,1,-3,3,-4,1,-2
530DATA-2,2,0,-2,0,3
540DATA0,0,-2,-1,-2,-2,-5,-1,4,-1,5
550DATA5,-5,-2,1,-3,-1,-3,-1,6,-1,3,0
560DATA8,-2,-1,3,4,4,-7,5,0,-8,0
570DATA-2,-3,3,4,1,2,2,5,0,2,9,4,10
580DATA-6,-3,-5,-2,1,5,3,-1,2,2,5,2
590DATA-3,1,-2,-1,4,-2,-2,-2,-2,2,-3
600DATA-6,-1,-10,-1,-9,5,7,-1,-1,-2,-5
610DATA-10,-7,-7,0,-2,-1,4,0,5,1,5
620DATA5,-3,0,6,4,2,1,8,0,3,1,4,6,1
630DATA-8,5,7,-1,-7,-8,-8,-1,2,-9,-1
640DATA-5,-5,-2,-7,-6,-1,5,1,2,0,2
650REM          Y CO-ORDINATES
660DATA7,2,11,2,1,5,2,1,5,8,4,9,3
670DATA8,0,5,-1,6,-2,2,-1,1,-1,1,-2
680DATA2,4,1,2,4,-1,1,1,2,-1,-4,-4,5
690DATA0,-1,0,-1,1,-1,-1,-2,0,-7,-6,-3,
-5,-2,4,-3
700DATA7,-1,-1,-6,-4,-5,1,-4,-3,-2
710DATA3,7,-3,-6,-1,2,-1,-6,-3,-2,0
720DATA10,-5,-4,-3,6,-1,-4,-2,-5,-1
730DATA4,3,4,1,10,-6,-8,2,-4,-7,8,9
740DATA2,-4,-7,-1,-4,0,-4,-1,-7,0,7
750DATA-7,0,4,1,6,-6,1,10,-4,8
760REM          Y  CO-ORDINATES
770REM          G B
780DATA2,3,1,4,1,-5,6,7,2,-5,0,3,-1
790DATA2,3,-3,0,-3,3,-4,0,0,2,-1,5,3
800DATA9,-1,1,1,2,0,2,-1,1,1,0,4,3,0
810DATA3,-1,3,2,0,4,9,10,7,3,0,-2,1
820DATA-2,4,6,3,0,-1,-2,1,-4,0,1,3,3
830DATA12,0,2,5,9,15,7,0,12,0,4,-3,3
840DATA7,4,5,-1,-3,0,3,7,0,1,5,5
850DATA7,0,-1,2,-4,-4,2,3,1,3,3,0,3,0
860DATA15,7,1,-4,1,4,-3,-4,-1,-4,-2,-3
870DATA-2,1,-1,-5,-1,-3,-2,-5,0,-8,-2,2
880DATA0,-5,-1,-2,0,-4,-2,-2,-3,2,-8
890DATA-5,-1,-3,-8,-7,-7,0,4,7,10,8
900DATA-7,-7,-4,8,-2,-1,-6,-6,-4,-11
910DATA-8,4,-1,-12,0,4,-2,-5,-6,-2
920DATA2,6,0,-3,0,-10,0,-2,-7,-5,-3
930DATA-2,3,1,-1,-3,-2,-1,-5,-1,-2
940DATA-5,-4,3,-1,-2,2,-1,-3,-4
950DATA-7,-2,2,-6,-5,-6,-4,-3,1,-5
960DATA-2,0,-2,-2,0,-3,-2,-1,-1
970DATA-5,0,1,-2,-1,-3,0,2,2,-1,1,7,-1
980DATA-2,-4,-6,0,2,-1,-3,-1,0,-8,-5
990DATA-1,-4,-6,-6,0,1,-2,-4,-3
1000REM          I R
1010DATA2,-1,2,1,-1,2,4,2,-1
1020DATA2,-2,4,9,2,12,12,1,3,2,3,2,6
1030DATA5,-2,2,5,0,9,1,-8,2,8,1,-2,5
1040DATA4,0,-6,7,0,5,2,-4,3,-7,-4,-4,1,
7,-2
1050DATA-6,5,1,-1,-7,-3,-4,-1,-7,-2
1060DATA-1,-3,-2,-3,-1,-1,-3,-3,-14
1070DATA1,-2,-6,-4,-1,-2,0,-2,-5
1080DATA-2,-5,1,-1,-7,0,-4,-3,-5,-8
1090DATA-2,-2,-4,1,-1,0,-4,-1,1,0
1100DATA-5,0,-3,-6,-3,2,-4,3,-7,-4,2
1110DATA-2,-8
```

Gladiator.

```
10MODE5
20VDU23,0,10,39,0:0:0:
30VDU19,0,1,0,0,0,19,2,6,0,0,0,19,3,4,0,0,0
40VDU23,251,254,48,120,127,127,120,48,254,23,250,127,12,30,254,254,30,12,127
50VDU23,252,129,189,255,255,189,153,153,24,24,153,153,189,255,255,189,
129,23,255,66,60,153,126,24,126,129,0
60ENVELOPE1,2,2,-2,2,3,5,3,30,-5,-2,-1,100,60
70ENVELOPE2,4,0,0,0,5,2,3,10,-5,0,-1,100,70
80MODE0,60:PLOT6,1280,601A=136:*FX4,
90DIM TX(9):SC=0:MX=0:YX=15:YX=15:*FX11,15
100PRINT TAB(1,31)"SCORE" ;SC;:NT=1:C%=250:PROCmove
110PROCsetup
120REPEAT
130R=INKEY(0)
140IF TIME)400 PROCatmove:TIME=250+SC
150PROCinput
160UNTIL DX=NT+1
170GOTO110
180DEFPROCatmove
190REPEAT
200MX=MX+1:IF MX)NT MX=0
210UNTIL TX(MX)(4000
220HX=TX(MX):DIV:00:VX=TX(MX)-HX*100
230TX%=HX+SGN(XX-RND(3)+2-=1):TY%=VX+SGN(YX-RND(3)+2-VX)
240TX%=FNSB(TX%,19):TY%=FNSB(TY%,29)
250AX=POINT(FNX(TX%),FNY(TY%))
260IF AX=1 ENDPROC
270IF AX=2 PROCdead
280VDU17,1,31,HX,VX,32,31,TX%,TY%,255
290TX(MX)=100*TX%+TY%:SOUND0,2,150,2
300ENDPROC
310DEFPROCdead
320SOUND&10,-15,100,2:SOUND0,2,100,2
330VDU17,2,3,1,TX%,TY%,129,30,19,19,0,0,0:*FX4,0
340END
350ENDPROC
360DEFPROCinput
370 IF A=-1 ENDPROC
380 IF A=32 PROCrd
390IF A=139 PROCfire
400PROCmove:*FX15,1
410ENDPROC
420DEFPROCmove
430IF A(136 OR A)139 ENDPROC
440COLOUR2
450IF CHX()A+114 CHX=A+114:VDU31,XX,YX,CHX:ENDPROC
460TX%=XX:TY%=YX
470XX=XX- (A=137) + (A=136):XX=FNSB(XX,19)
480YX=YX- (A=138) + (A=139):YX=FNSB(YX,29)
490IF POINT(FNX(XX),FNY(YX))=1 PROCdead
500VDU31,TXX,TYX,32,31,XX,YX,CHX
510ENDPROC
520DEFPROCrd
530PROCang:SOUND1,1,190,3
540MOVE FNX(XX),FNY(YX)
550PLOT 0,FNRX(RNG+30),FNRY(ANG+30)
560PLOT82,FNRX(RNG-90),FNRY(ANG-90)
570PLOT86,FNX(XX),FNY(YX):SOUND&11,0,0,0
580ENDPROC
590DEFFNY(BX)=BX*64+32
600DEFFNY(BX)=(32-BX)*32-16
610DEFFNRX(BX)=1280*COS(RAD(BX))
620DEFFNRY(BX)=1024*SIN(RAD(BX))
630DEFPROCang
640IF CHX=251 ANG=0
650IF CHX=250 ANG=180
660IF CHX=252 ANG=-90
670IF CHX=253 ANG=90
680ENDPROC
690DEFPROCfire
700PROCang:SOUND1,1,10,10
710TX%=XX:TY%=YX:BX=0
720REPEAT
730BX=COS(RAD(ANG)):TX%=TX%+BX
740BX=SIN(RAD(ANG)):TY%=TY%-BX
750XX=AX+1:TX%=FNSB(TX%,19):TY%=FNSB(TY%,29)
760DX=01VDU17,3,31,TX%,TY%,42
770BX=100*TX%+TY%
780FOR CX=0 TO NT
790IF TX(CX)=BX VDU 31,TX%,TY%,255:TX(CX)=5000:SC=SC+1:PRINT TAB(8,31)SC;:AX=5
:SOUND &10,-10,100,8
800IF TX(CX)=5000 DX=DX+1
810NEXT
820VDU 31,TXX,TYX,32
830UNTIL AX=5
840ENDPROC
850DEFFNSB(BX,CX)
860IF (BX)CX) OR (BX(1) CX=1 ELSE CX=BX
870=CX
880DEFPROCsetup
890FOR BX=0 TO 29:VDU 17,3,31,0,BX,240,31,BX/1.5,0,240:NEXT
900NT=NT+2:DX=01T[ME=0:IF NT)9 N"=9
910FOR CX=1 TO NT STEP 2
920TX(CX)=3+CX:TX(CX-1)=200+CX
930NEXT
940ENDPROC
```

NEW BOOKS from Prentice-Hall International

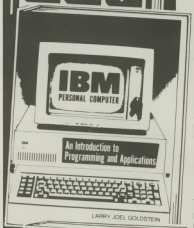


Apple Files

David Miller

A step-by-step guide for programmers with a knowledge of BASIC, this book shows you how to create your own files on the Apple. Sequential and random access files are explained with program examples from home, business, education and hobby applications. For advanced programmers the text includes up-to-date information on DIF files, EXEC files, Binary files, tape files and RWTS.

☐ **£11.95 420 pages 8359-0191-2**



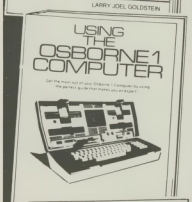
IBM Personal Computer

An Introduction to Programming and Applications

Larry and Martin Goldstein

For owners, users and potential buyers of the IBM Personal Computer, this book ranges from switching on the machine to programming in BASIC and applications in business, word processing, games and graphics.

☐ **£11.95 312 pages 89303-111-9**



Using the IBM Personal Computer

T. G. Lewis

Topics covered in this handbook include word processing, spread sheet calculation and data management functions. The book provides a brief vocabulary guide, instructions for VisiCalc or SuperCalc, and programming tips with examples and illustrations.

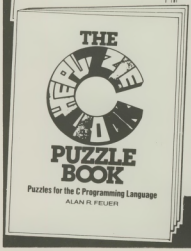
☐ **£11.95 c. 250 pages 8359-8138-X**
Due in January

Using the Osborne 1 Computer

T. G. Lewis

All the key operating functions are explained in this guide to uses of the Osborne 1 in word processing, programming and databases. A primer on BASIC, instructions for VisiCalc or SuperCalc, and illustrated information on using Wordstar, Easywriter and the CP/M operating system are included.

☐ **£11.95 224 pages 8359-8141-X**



A UNIX Primer

Ann and Nico Lomuto

Written for the first-time user, this introduction stresses problem solving. Realistic case studies illustrate the subjects covered which include basic skills, efficient editing, advanced formatting features and advanced concepts.

☐ **£15.95 c. 272 pages 13-938886-9**

The COMAL Handbook

Len Lindsay

Over 100 sample programs and procedures are provided in this guide to COMAL (acronym for Common Algorithmic Language), the language developed for use with Commodore products and CP/M based systems.

☐ **£10.35 c. 320 pages 8359-0878-X**
Due in January

The C Puzzle Book

Alan Feuer

A workbook to be used with **The C Programming Language** (Prentice-Hall, £15.95), this book contains programs that explore many different aspects of the language, as well as guidelines for writing successful C programs.

☐ **£10.35 174 pages 13-109926-4**

Implementing BASICs

How BASICs Work

William and Patricia Payne

The structure, functions and capabilities of the BASIC language are explained, as well as how to use the stack-oriented method to develop table-driven software. Specific techniques used in microcomputer language design and implementation are included.

☐ **£11.95 210 pages 8359-3044-0**

Prices and publication dates are correct at the time of going to press, but may be subject to change.

Book Orders

These books can be ordered from your usual bookseller, or in case of difficulty from:

Department 30,
Prentice-Hall International,
66 Wood Lane End, Hemel Hempstead,
Hertfordshire, HP2 4RG, England.

Please mark the number of books you wish to order in the boxes beside each title and return the advertisement to the address above.

Name _____

Address _____

_____

_____

_____

I enclose a cheque/P.O. for £_____. Please add £1.00 per book for postage and packing. Payment should be made out to **INTERNATIONAL BOOK DISTRIBUTORS.** Please allow 28 days for delivery.

PC1

Prentice-Hall International

● **Circle No. 204**



Match routine.

```
1000 K=LEN(B$):FORI=0TOLEN(A$):J=1
1010 IFMID$(A$,I+J,1)<>MID$(B$,J,1)THENNEXT:L=0:RETURN
1020 J=J+1:IFJ<KTHENL=I+1:RETURN
1030 GOTO1010
READY.
```

Line counter.

```
1 B=4^5+1

2 B=256*PEEK(B+1)+PEEK(B):C=C+1:IF B<>0
  THEN PRINT CHR$(145) C : GOTO 2
```

Fast machine code

PROGRAMS THAT INTERACT with the user through screen displays are required to do several things extremely quickly, writes Mike Lake. They should go to a particular location on the screen ready to output a value or message in that position; they should also get input from the user in such a way that the user is typing information into a particular part of the screen just as if he/she was entering information on a preprinted form. If they are accessing files, they need to be able to read records from disc quickly, and this presents two further problems; being able to read data at high speed, and being able to do quick record searches.

While some micros at least have built-in Basic commands for printing to a particular screen location, the Commodore Pet range of micros do not have instructions to deal with any of these problems. The screen position is normally selected through a Basic subroutine that prints a number of cursor-downs followed by a number of cursor-rights.

The input problem is particularly awkward since using the normal Basic Input statment causes a return to Ready mode if the user merely presses Return. When inputting data from disc the Basic Input # command has several major limitations. In particular, it can only input a maximum of 80 bytes each time it is used and it will terminate on a carriage-return. The Get # command can be used but is extremely slow. Basic is painfully slow when it comes to searching strings for other strings, for example when looking up someone's name in a string containing many names, as would be the case in an index file.

The four small assembler routines will solve these problems. They occupy 218 bytes and can be placed wherever convenient providing the addresses on lines 38, 40, 51, 79 and 83 are changed. If you do not have the Commodore Assembler Develoment Package then the hex listing may be used to enter the code through the monitor.

The Basic program in listing 999 demonstrates the use of the routines. The use of the variable names LC, IN, GT and FI means that any progams that use the routines can be quickly changed if you relocate the machine code elsewhere in RAM.

The command

SYS LC,X,Y,

will locate the cursor on line X in column Y. If immediately followed by a Print then the output will occur at this position.

The command

SYS IN,X,Y,A$

will locate the cursor on line X column Y and will wait for input. The value input will be placed in the variable used, in this case A$. If Return is pressed immediately, the value of ST will be set to 1, otherwise it will be 0.

The command

SYS GT,1fno,A$,length

will input from the file whose logical file number is supplied. A string of the length specified will be placed in the named variable. If end-of-file occurs then ST will be set and location zero will contain the number of valid characters in the string — the Left$ function will extract the correct characters.

The command

SYS FI,A$,B$

will find the first occurrence of the string B$ in the strings A$. The position of the B$ within A$ — the offset — will be returned in location zero.

A combination of the last two commands makes it extremely easy to build index files on disc. Each entry in the index would contain a key field followed by a record numbr in the data file. Each block of the index may be read using the SYS GT command and then searched using the SYS FI command for the required key.

Line counter

A QUICK TWO-LINER from David Barratt of Blackpool, Lancashire, counts the number of lines in a Basic program.

Match routine

ONE COMMAND available on the larger Basic compilers but absent on micro Basics is the Match command, writes Quentin King of Horsham, West Sussex. It is used to find if one string is present within another; if it is, its position is returned. Match is particularly useful for Adventure games where the command string must be compared with a vocabulary of words.

This compact Basic subroutine performs the same task. It tests if B$ is part of A$ and if so, L returns its position; if not so, L is set to zero. The routine uses I,J,K and L.

Though written for the Pet, this program should adapt to most micro Basics.

Fast machine code listing 1.

```
 5   POKE 52,0: POKE 53,120: CLR: RUN10:     REM *** PROTECT CODE. ***

10   DIM A$(10) : LC=30720: IN=LC+20: GT=LC+67: FI=LC+132

20   FOR X = 5 TO 14

30   SYS LC,X,10 : PRINT "ENTER STRING";X-4

40   SYS IN,X,30,A$

50   IF ST <> 0 THEN 40

60   A$(X-4) = A$

70   NEXT

80   FOR I = 1 TO 10

90   PRINT A$(I)

100  NEXT

110  DOPEN#1,"TEST",D0,W:          REM *** CREATE TEST FILE ***

120  FOR I = 1 TO 50

130  PRINT#1,"THIS IS TEST RECORD NUMBER";I

140  NEXT

150  DCLOSE

160  DOPEN#1,"TEST":               REM *** READ BACK FILE ***

170  SYS GT,1,A$,100

180  IF ST = 0 THEN PRINT A$; : GOTO 170

190  PRINT LEFT$(A$,PEEK(0))

200  DCLOSE

210  A$="THE RUNAWAY TRAIN CAME OVER THE HILL AND SHE BLEW"

220  B$="TRAIN"

230  SYS FI,A$,B$

240  PRINT PEEK(0)
```

(continued on page 169)

CHILTERN ELECTRONICS

HIGH STREET, CHALFONT St. Giles, BUCKINGHAMSHIRE
Telephone: 02407 71234 Telex: 262284





Our new Computer Shop offers the largest range in Europe of Computer Peripherals

MOTOROLA 9in MONITORS

Once again we can offer these beautiful little monitors at fraction of usual price. Ideal for a micro — Mains in, standard composite video, and very wide bandwidth for 80ch/1 or more.

Free with each unit, a 5 volt 3amp regulated psu, mains input.

ONLY £34 + VAT
Carriage £7.50
With technical manual.

NEW 12in GREEN SCREEN

A brand new 12 inch green screen monitor of the highest professional specs. Bandwidth better than 15MHz. Very high engineering standard.

Mounted in attractive anodised aluminium case.

Mains/Composite video inputs. Extra PSU for keyboard.

Original cost £300 +
OUR PRICE
NEW £80 + VAT
Carriage £12.50

KEY-EDIT VIDEO DISPLAY

A beautiful 12 inch Green screen monitor and unencoded QWERTY keyboard all mounted in compact attractive VDU case.

Built to highest standards for mainframe systems — mains/composite Video inputs.

Video bandwidth better than 14MHz.

A real bargain, these are almost new.

£100 + VAT

DECWRITERS LA35/6

Now at last you can add a professional printer terminal to your micro at a price of a cheap import. These famous printers cost £1000+ from manufacturer. RS232 serial 300 baud. Print speed 60ch/sec U/L case.

Almost new ex-demo with integral stand.

£220 + VAT

Also available with keyboard.

£300 + VAT

ASCII KEYBOARDS

Professional 84 key keyboards from mainframe systems. Inductive switch keys. Full ASCII set, with parallel TTL output.

Numeric and cursor control clusters. Full circuits included.

£30 + VAT

A few available brand new with case for £45 + VAT. Postage £4.

DISK DRIVES FOR APPLE II only £185+VAT

Yes it's true!! Brand new 'Applemate' floppy disk drives at over £100 saving on original product. Made to identical high standards. Fully guaranteed. Disk controller card for Apple II only £29 + VAT.

Add £3 postage for drive, 80p for controller.

DRT 5 Mb DISK DRIVES

These are the later version of the famous Series 30. Capacity is increased to 5.6Mb per cartridge, exchangeable.

Standard interface, RK05 compatible.

Usual price £3000 +
Our price brand new
ONLY £420 + VAT

DRI 3029 PSU +/– 15V for above drives, new.
£50 + VAT
Carriage extra

DAISY WHEEL PRINTERS

Bargain of the year? We have a few Diablo Hy Type daisy printers that usually cost over £1200, but less outside plastic case. Brand new condition, complete with all electronics.

ONLY £300 + VAT
Carriage £10

ODDS AND ENDS

Centronics Aphenol 36w plugs.
£10 for 6, £100 for 100.

RS232 25way Cannon pls with cable top.
Male or female. £10 for 5

Teletype paper rolls, and paper tape rolls, £2.

New reels certified Mag Tape full size £8.

Add VAT and postage.

REGULATED POWER SUPPLIES

LAMBDA All 230v input.

5 volt 5.8 amp	£12
5 volt 10 amp	£15
12 volt 10 amp	£20
12 volt 15 amp	£25
24 volt 14 amp	£25

LOW COST BARGAINS
5 volt 3 amp £8 + £2 postage.
5 volt 6 amp £10 + £3 postage.

Lowest prices in UK!
ADVANCE SWITCHMODE

5 volt 10 amp	£25
5 volt 20 amp	£40
5 volt 60 amp	£40
5 volt 100 amp	£60

DISK DRIVE PSU
New DRI 3029 Out +/–
15 volts 8 amp reg. £50

Tran.500 VA 230/110V
Brand new, cased. £12

Please add 15% VAT. Phone for carriage costs.

Solartron CD1016 Scopes 10MHz only £50 + VAT

Thousands of one-off bargains also availabe for callers — we are open 6 days a week 9-5pm. We also stock full range of DEC systems and spares from PDPII/03 to VAX II/780, all available immediately ex-stock. Please phone for details or ask for our catalogue.

For further information on any of above items or carriage cost call Chris Kinsey on 02407 71234.

● Circle No. 205

(continued from page 167)

Fast machine code listing 2.

```
LINE#  LOC   CODE        LINE
00001  0000               ;*****************************************
00002  0000               ;*  LOCATE, INPUT, FIND AND GET ROUTINES FOR CBM 8032  *
00003  0000               ;*                MIKE LANE 1982                       *
00004  0000               ;*****************************************
00005  0000               ;
00006  0000               CHKCOM = $EFF5          ;CHECK FOR COMMA IN BASIC STATEMENT
00007  0000               FRMEVL = $D098          ;FORMULA EVALUATION ROUTINE
00008  0000               GETADR = $C92D          ;PRODUCE VALUE IN RANGE 0 - 65536
00009  0000               CURPOS = $E067          ;POSITION CURSOR
00010  0000               INLIN  = $A4E2          ;INPUT A LINE TO INPUT BUFFER
00011  0000               PTRGET = $C12B          ;FIND VARIABLE ROUTINE
00012  0000               INPCON = $BC09          ;ASSIGN INPUT TO A VARIABLE
00013  0000               SPACE  = $C59E          ;GENERATE SPACE FOR A STRING
00014  0000               STRDTB = $C7B5          ;RETURNS LENGTH AND ADDRESS OF STRING
00015  0000               SETIO  = $FFC6          ;SET I/O DEVICE
00016  0000               RSTIO  = $FFCC          ;RESET NORMAL I/O DEVICES
00017  0000               GETIO  = $FFE4          ;SET BYTE ROUTINE
00018  0000               RETADD = $1F            ;RETURN STRING ADDRESS
00019  0000               STATUS = $96            ;STATUS BYTE
00020  0000               INTADD = $11            ;INTEGER VALUE RETURN AREA
00021  0000               TEMSTR = $D9            ;TEMPORARY STORE
00022  0000               CURCOL = $C6            ;COLUMN POSITION OF CURSOR
00023  0000               CURLIN = $D8            ;SCREEN LINE OF CURSOR
00024  0000               LENGTH = $52            ;LENGTH OF STRING RETURNED HERE
00025  0000               ADD    = $5F            ;STRING ADDRESS RETURNED HERE
00026  0000               POINT  = $A4            ;POINTER TO STRING DESCRIPTOR
00027  0000               COMMA  = $2C            ;COMMA
00028  0000               BUFFER = $0200          ;INPUT BUFFER
00029  0000               WORK   = $90            ;WORK AREA - THREE BYTES
00030  0000               OK     = 0              ;GOOD RESULT FLAG
00031  0000               FAIL   = 1              ;BAD RESULT FLAG
00032  0000               ;
00033  0000               BEGIN  = $7800          ;START OF CODE
00034  0000               ;***** LOCATE THE CURSOR ROUTINE - CALL:  SYS LOC,X,Y *****
00035  0000               ;
00036  0000                      * = BEGIN
00037  0000
00038  7800               LOC    JSR VALIN        ;GET FIRST COORDINATE
00039  7803               85 D9                   STA TEMSTR       ;PUT INTO TEMPORARY STORAGE AREA
00040  7805               20 37 78                JSR VALIN        ;GET SECOND COORDINATE
00041  7808               85 C6                   STA CURCOL       ;PUT INTO CURSOR COLUMN VALUE
00042  780A               78                      SEI              ;MASK OFF INTERRUPTS
00043  780B               A5 D9                   LDA TEMSTR       ;RETRIEVE LINE VALUE
00044  780D               85 D8                   STA CURLIN       ;PLACE IN CURSOR LINE VALUE
00045  780F               20 67 E0                JSR CURPOS       ;POSITION CURSOR
00046  7812               58                      CLI              ;ALLOW INTERRUPTS
00047  7813               60                      RTS
00048  7814               ;
00049  7814               ;***** INPUT A STRING ROUTINE - CALL:  SYS IN,X,Y,A$ *****
00050  7814               ;
00051  7814               IN     JSR LOC          ;FIRST POSITION CURSOR
00052  7817               20 F5 BE                JSR CHKCOM       ;FIND COMMA
00053  781A               A9 2C                   LDA #COMMA       ;STORE A COMMA
00054  781C               8D FF 01                STA BUFFER-1     ;IMMEDIATELY IN FRONT OF INPUT BUFFER
00055  781F               20 E2 A4                JSR INLIN        ;GET A LINE OF INPUT INTO THE BASIC BUFFER
00056  7822               A0 00 02                LDA BUFFER       ;GET FIRST CHARACTER FROM BUFFER
00057  7825               F0 08                   BEQ EMPTY        ;NO CHARACTERS ENTERED
00058  7827               ;
00059  7827               20 09 BC                JSR INPCON       ;PLACE CHARACTERS INTO CORRECT VARIABLE
00060  782A               A9 00                   LDA #0%          ;INDICATE VALUE PRESENT
00061  782C               85 96                   STA STATUS       ;PLACE IN STATUS BYTE
00062  782E               60                      RTS
00063  782F               ;
00064  782F               A9 01          EMPTY    LDA #FAIL        ;NO VALUE PRESENT
00065  7831               85 96                   STA STATUS       ;PLACE IN STATUS BYTE
00066  7833               20 2B C1                JSR PTRGET       ;PUSH THE TEXT POINTER BEYOND THE VARIABLE NAME
00067  7836               60                      RTS
00068  7837               ;
00069  7837               ;***** GET A VALUE FROM THE BASIC STATEMENT AND PLACE IN ACCUMULATOR *****
00070  7837               ;
00071  7837               20 F5 BE       VALIN    JSR CHKCOM       ;FIND COMMA
00072  783A               20 98 D0                JSR FRMEVL       ;EVALUATE EXPRESSION FOUND THERE
00073  783D               20 2D C9                JSR GETADR       ;CONVERT TO INTEGER
00074  7840               A5 11                   LDA INTADD       ;LOAD ACCUMULATOR WITH LOW ORDER BYTE
00075  7842               60                      RTS
00076  7843               ;***** READ DATA FROM FILE - CALL:  SYS GET,LFNO,A$,LENGTH
00077  7843               ;
00078  7843               20 37 78       GET      JSR VALIN        ;GET LFND FROM BASIC STATEMENT
00079  7846               48                      PHA              ;BUFFER IT
00080  7847               20 F5 BE                JSR CHKCOM       ;FIND COMMA
00081  784A               20 2B C1                JSR PTRGET       ;SKIP POINTER TO STRING NAMED IN BASIC STATEMENT
00082  784D               20 37 78                JSR VALIN        ;GET LENGTH FROM BASIC STATEMENT
00083  7850               20 9E C5                JSR SPACE        ;SET UP SPACE FOR THE NEW STRING
00084  7853               ;
00085  7853               A0 00                   LDY #0           ;FOR INDEXING
00086  7855               A5 5E                   LDA LENGTH       ;GET LENGTH OF STRING TO BE READ IN
00087  7857               85 00                   STA WORK         ;BUFFER IT FOR CHECKING ON INOUT
00088  7859               91 A4                   STA (POINT),Y    ;STORE IT IN STRING DESCRIPTOR
00089  785B               C8                      INY
00090  785C               A5 5F                   LDA ADD          ;GET POINTER TO RAM AREA FOR STRING
00091  785E               91 A4                   STA (POINT),Y    ;PUT ADDRESS INTO STRING DESCRIPTOR
00092  7860               85 01                   STA WORK+1       ;STORE POINTER FOR INDIRECT INDEXING
00093  7862               C8                      INY
00094  7863               A5 60                   LDA ADD+1        ;SAME FOR HIGH BYTE OF ADDRESS
00095  7865               91 A4                   STA (POINT),Y
00096  7867               85 02                   STA WORK+2
00097  7869               ;
00098  7869               68                      PLA              ;RETRIEVE LOGICAL FILE NUMBER
00099  786A               AA                      TAX
00100  786B               20 C6 FF                JSR SETIO        ;SET FILE READY FOR INPUT
00101  786E               ;
00102  786E               A0 00                   LDY #0           ;FOR INDEXING
00103  7870               A5 96          GETIT    LDA STATUS       ;CHECK STATUS: NON ZERO FOR END OF FILE
00104  7872               D0 08                   BNE GETFIN
00105  7874               20 E4 FF                JSR GETIO        ;GET A BYTE FROM FILE
00106  7877               91 01                   STA (WORK+1),Y   ;STORE IN RAM AREA
00107  7879               C8                      INY
```

(listing continued on page 171)

IMAGINE IT...

NEW

NOW WITH DUAL HI-RES GRAPHICS



CAPTURE IT.

Completely Redesigned. Now, the Grappler+.
The original Grappler was the first graphics interface to give you hi-res screen dumps from your keyboard. The new Grappler+ with *Dual Hi-Res Graphics* adds flexibility with a side-by-side printout of page 1 and page 2 graphics.

Interfacing the Grappler+ to a wide range of printers is easy as changing a dip switch. 4K of exclusive firmware makes the Grappler+ the most intelligent, full-featured Apple® Printer Interface made. And, the Grappler+ is Apple III compatible.*

The imitations are many, so insist on the #1 Apple Graphics Interface on the market. Insist on the Grappler+. Available now at most Apple dealers.

*Requires additional software driver.
**Requires graphics upgrade.

©Orange Micro, Inc. 1982



ACTUAL APPLE II PRINTOUT USING GRAPPLER AND EPSON MX100

With The Grappler™+ Printer Interface



CPM is a registered trademark of Digital Research, Inc.
Apple is a registered trademark of Apple Computer, Inc.

The Grappler+ Features:
• Dual Hi-Res Graphics • Printer Selector Dip Switch • Apple III Compatible* • Graphics Screen Dump • Inverse Graphics • Emphasized Graphics • Double Size Picture • 90° Rotation • Center Graphics • Chart Recorder Mode • Block Graphics • Bell Control • Skip-over-perf • Left and Right Margins • Variable Line Length • Text Screen Dumps.

The Grappler+ also works with Pascal and CPM.

The Grappler+ interfaces with the following printers:
• Anadex • Centronics • Datasouth • Epson** • NEC • C-Itoh • Okidata**

The original Grappler is available for IDS 460, 560, Prism, Microprism.

Orange Micro Inc.
3150 E. La Palma, Suite G
Anaheim, California 92806
U.S.A.
Tel: (714) 630-3620
Telex: 183511 CSMA
Foreign Dealer Inquiries Welcome

● Circle No. 206

(listing continued from page 169)

```
00109  787A  C4 00          CPY WORK        ;FINISHED
00110  787C  D0 F2          BNE GETIT
00111  787E                 ;
00112  787E  84 00          GETFIN STY WORK     ;PUT LENGTH READ INTO WORK AREA
00113  7880  20 CC FF           JSR RSTIO      ;RESET NORMAL I/O DEVICES
00114  7883  60                 RTS
00115  7884                 ;
00116  7884                 ;***** FIND ONE STRING IN ANOTHER - CALL: SYS FIND,F1$,F2$ *****
00117  7884                 ;
00118  7884  20 F5 BE       FIND   JSR CHKCOM      ;PASS COMMA
00119  7887  20 9B BD            JSR FRMEVL     ;EVALUATE EXPRESSION
00120  788A  20 B5 C7            JSR STRPTS     ;GET STRING ADDRESS AND LENGTH
00121  788D  85 D9               STA TEMSTR     ;STORE LENGTH
00122  788F  A5 1F               LDA RETADD     ;LOW BYTE OF ADDRESS
00123  7891  85 01               STA WORK+1
00124  7893  A5 20               LDA RETADD+1   ; HIGH BYTE OF ADDRESS
00125  7895  85 02               STA WORK+2
00126  7897                 ;
00127  7897  20 F5 BE            JSR CHKCOM     ;PASS COMMA
00128  789A  20 9B BD            JSR FRMEVL     ;EVALUATE FORMULA
00129  789D  20 B5 C7            JSR STRPTS     ;GET STRING ADDRESS AND LENGTH
00130  78A0                 ;
00131  78A0  C5 D9               CMP TEMSTR     ;COMPARE STRING LENGTHS
00132  78A2  F0 02               BEQ SAVEIT     ;SAME
00133  78A4  B0 2D               BCS NOGO       ;SECOND SHORTER THAN FIRST
00134  78A6                 ;
00135  78A6  85 DA          SAVEIT STA TEMSTR+1    ;SAVE LENGTH OF SECOND STRING
00136  78A8  38                 SEC
00137  78A9  A5 D9               LDA TEMSTR     ;GET FIRST STRING LENGTH
00138  78AB  E5 DA               SBC TEMSTR+1   ;SUBTRACT LENGTH OF SECOND STRING
00139  78AD  85 D9               STA TEMSTR     ;STORE THE DIFFERENCE
00140  78AF  E6 D9               INC TEMSTR     ;BUMP IT UP BY ONE
00141  78B1                 ;
00142  78B1  A9 00               LDA #0
00143  78B3  85 00               STA WORK       ;THIS WILL CONTAIN THE OFFSET IF FOUND
00144  78B5                 ;
00145  78B5  A6 DA          CMPSTR LDX TEMSTR+1    ;LENGTH OF SECOND STRING
00146  78B7  A0 00               LDY #0         ;FOR INDEXING
00147  78B9  B1 01          CMPCHR (WORK+1),Y  ;CHARACTER FROM FIRST STRING
00148  78BB  D1 1F               CMP (RETADD),Y ;COMPARED WITH CHARACTER FROM SECOND STRING
00149  78BD  D0 06               BNE NOMACH     ;NOT EQUAL
00150  78BF  CA                 DEX
00151  78C0  F0 15               BEQ MATCH      ;END OF COMPARES - MATCH FOUND
00152  78C2  C8                 INY
00153  78C3  D0 F4               BNE CMPCHR     ;BRANCH ALWAYS
00154  78C5                 ;
00155  78C5  C6 D9          NOMACH DEC TEMSTR     ;DECREMENT DIFFERENCE
00156  78C7  F0 0A               BEQ NOGO       ;NO MORE COMPARISONS NEEDED
00157  78C9  E6 00               INC WORK       ;INCREMENT THE OFFSET
00158  78CB  E6 01               INC WORK+1     ;INCREMENT THE INDEX INTO THE FIRST STRING
00159  78CD  D0 E6               BNE CMPSTR
00160  78CF  E6 02               INC WORK+2
00161  78D1  D0 E2               BNE CMPSTR     ;BRANCH ALWAYS
00162  78D3                 ;
00163  78D3  A9 FF          NOGO   LDA #255       ;SET THE OFFSET TO ZERO TO SHOW FAILURE
00164  78D5  85 00               STA WORK
00165  78D7  E6 00          MATCH  INC WORK       ;BUMP UP OFFSET BY ONE
00166  78D9  60                 RTS
00167  78DA                     .END

ERRORS = 00000

SYMBOL TABLE

SYMBOL VALUE
 ADD      005F    BEGIN    7800    BUFFER   0200    CHKCOM   BEF5
 CMPCHR   78B9    CMPSTR   78B5    COMMA    002C    CURCOL   00C6
 CURLIN   00D8    CURPOS   E067    EMPTY    782F    FRIL     0001
 FIND     7884    FRMEVL   BD9B    GET      7843    GETADR   C92D
 GETFIN   787E    GETIG    FFEA    GETIT    7870    IN       7814
 INLIN    B4E2    INPCON   BC09    INTADD   0011    LENGTH   005E
 LOC      7800    MATCH    78D7    NOGO     78D3    NOMACH   78C5
 OK       0000    POINT    004A    PTRGET   C12B    RETADD   001F
 RSTIO    FFCC    SAVEIT   78A6    SETIO    FFC6    SPACE    C59E
 STATUS   0096    STRPTS   C7B5    TEMSTR   0009    VALIN    7837
 WORK     0000
END OF ASSEMBLY
```

```
.m 7800 78DD
.: 7800 20 37 78 85 d9 20 37 78
.: 7808 85 c6 78 a5 d9 85 d8 20
.: 7810 67 e0 58 60 20 00 78 20
.: 7818 f5 be a9 2c 8d ff 01 20
.: 7820 e2 b4 ad 00 02 f0 08 20
.: 7828 09 bc a9 00 85 96 60 a9
.: 7830 01 85 96 20 2b c1 60 20
.: 7838 f5 be 20 98 bd 20 2d c9
.: 7840 a5 11 60 20 37 78 a8 20
.: 7848 f5 be 20 2b c1 20 37 78
.: 7850 20 9e c5 a0 00 a5 5e 85
.: 7858 00 91 4a c8 a5 5f 91 4a
.: 7860 85 01 c8 a5 60 91 4a 85
.: 7868 02 68 aa 20 c6 ff a0 00
.: 7870 a5 96 d0 0a 20 e4 ff 91
.: 7878 01 c8 c4 00 d0 f2 84 00
.: 7880 20 cc ff 60 20 f5 be 20
.
.: 7880 20 cc ff 60 20 f5 be 20
.: 7888 9b bd 20 b5 c7 85 d9 a5
.: 7890 1f 85 01 a5 20 85 02 20
.: 7898 f5 be 20 98 bd 20 b5 c7
.: 78a0 c5 d9 f0 02 b0 2d 85 da
.: 78a8 38 a5 d9 e5 da 85 d9 e6
.: 78b0 d9 a9 00 85 00 a6 da a0
.: 78b8 00 b1 01 d1 1f d0 06 ca
.: 78c0 f0 15 c8 d0 f4 c6 d9 f0
.: 78c8 0a e6 00 e6 01 d0 e6 e6
.: 78d0 02 d0 e2 a9 ff 85 00 e6
.: 78d8 00 60 aa aa aa aa aa aa
```

AutoWord

We'll drive you wild

with our range of quality disc drives and acclaimed support services.

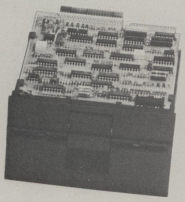


AutoWord

Boxed Drive Systems

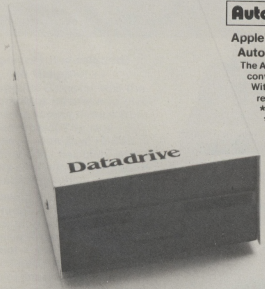
5¼"/8"/8" slim drives in quality boxes with PSU

Prices from £150



AutoWord

Disc Drive Sales 5¼ **Drives:** CDC 9408 SS 20ms STEP **£119**
CDC 9408 SS 5ms STEP **£159** CDC 9409 DS 5ms STEP **£219**
1MB Capacity! CDC 9409T DS 96TPI 5ms STEP **£269**
8" **Drives:** Shugart SA 800/1 SS **£319** Shugart SA 850/1 DS **£429**
We also stock at best prices: *Full range of Shugart spares
*Fully warranted 5¼" × 8" reconditioned Shugart drives
8" **Slim Drives:** Tandon TM848-1SS **£349** Tandon TM848-2 DS **£399**



AutoWord

Apple™ I and II users.

AutoWord: break down the Apple™ compatibility barrier!

The AutoWord Datadrive™ incorporating the unique PDS Inc.® drive interface, converts a standard interface drive to run on the Apple™ I and II.
With the interface Board disconnected the Datadrive reverts to standard application giving:
*** Improved reliability * Wide flexibility of drive use**
*** Greatly enhanced service ability**
Datadrive™ boxed 5¼" SS 40TK drive £240
Dealer Enquiries Welcome!

AutoWord

Disc Drive Repair

Have your floppies flopped?
AutoWord leads the field in across the range floppy disc drive repair.
Drive service charges from **£25**

All prices are exclusive of VAT



The AutoWord is spreading!

AutoWord Services Ltd., 164 St. Pauls Avenue, Slough, Berks. SL2 5ER Telephone: (0753) 78424/79599

*AUTOWORD SERVICES LTD. ARE SOLE U.K. DISTRIBUTORS FOR THE PDS INC. DATADRIVE

● **Circle No. 207**

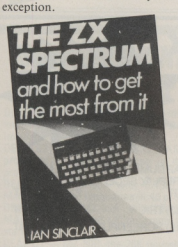
The Spectrum overlap

PUBLISHING BOOKS about home computers is one of the few remaining growth industries. About a year ago a number of publishers discovered that books on home computing can be very profitable — only one percent of ZX-81 owners needs to buy a copy for it to be a big seller.

As a consequence, a number of publishers were eagerly waiting for the launch of the ZX Spectrum. To publish the definitive Spectrum book would mean big money. As the launch of the machine grew closer a number of hopefuls were lined up on the starting grid with engines roaring, ready to go.

This end of publishing has never been known for producing a high-quality product. There is a definate "never mind the quality, feel the width" approach. Readers want information, not pretty books — or so runs the philosophy of the market.

One publishing house that subscribes firmly to these principles is Interface. There are a large number of Interface books which mainly back up the National ZX Users' Club. On the whole Interface books are rather scruffy items, the Spectrum book *Programming your ZX Spectrum* by Tim Hartnell and Dilwyn Jones is no exception.



The listings are reproduced directly from a Sinclair printer, making them tatty and difficult to read. At times they do not even line up down the page. However, at least you are guaranteed that the software has been tried on a real machine. The £6.95 price does seem expensive for such a poorly presented book, but Spectrum fans will find it of use. One thing that would improve the look of the book, and actually make it more useful, would be a contents list.

Easy Programming for the ZX Spectrum is the latest offering from Shiva. Written by Ian Stewart and Robin Jones, this book is one of the Shiva "friendly micro" series. The book is presented in a slightly more tempting manner than Interface's, complete with some highly unfunny



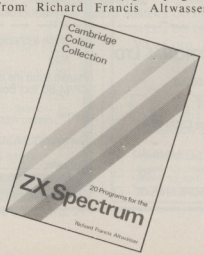
cartoons. My main complaint is that the book has been written in a style that makes the language in the Ladybird children's books look sophisticated. If you are an idiot with an odd sense of humour, then this is the book for you.

Computer Puzzles for Spectrum and ZX-81 comes from the same stable. As an idea it is fascinating, and also represents the best value of all the books I looked at.



In reality it is no more than a book of programs, 19 in all. Apart from the fact that the programs appear to have been written for the ZX-81 with changes for the Spectrum dropped in as an afterthought, I have no complaints.

The Cambridge Colour Collection is a thin volume of not very good programs from Richard Francis Altwasser.



Although Altwasser was responsible for the design of the Spectrum this book reveals nothing a reasonably bright person could not discover for themselves. If you want the programs, buying the cassette offered instead would be better.

Over the Spectrum from Melbourne House has the most imaginative name and design of any of these books. It scores points with me because of the colour photographs which show what a program should like when it is run. It had a few more programs that the other books and did include some serious software which will enable you to justify owning a micro in the first place.



The Spectrum Handbook by Tim Langdell is the best value all-round book. At £4.95 it contains a large number of useful hints and some utilities. It is especially good for people interested in graphics



Again the book uses Sinclair listings and there are sections at the end which deal with both serious programming and games. The only nagging doubt I have about this book applies equally to most of the others: Does it replace the manual? The justification is that some people will find the official manual difficult, but will understand the same information in a different format.

(continued on next page)

(continued from previous page)

Three rather disappointing books finish the survey, all from Granada Books. In *ZX Spectrum and How to Get the Most from it* by Ian Sinclair there is little that could not be found elsewhere. *The Spectrum Programmer* by S M Gee and *The Spectrum Book of Games* by Mike James, S M Gee and Kay Ewbank complete the list. Both of them are rather unremarkable works and warrant little mention. I was disappointed to realise that the final game in the second of these books, Spectrum Smalltalk, is remarkably like the Doctor program in John Krutch's *Experiments in Artificial Intelligence*.

None of the books in the survey is remarkably original and there is a great deal of overlap throughout. Three books have versions of Space Invaders, and there are at least two versions each of Galaxians, Othello, Nim, Maze and Life.

Bill Bennett

The ZX Spectrum and how to get the most from it by Ian Sinclair. Published by Granada, 130 pages, paperback, £5.95. ISBN 0 246 120185

The Cambridge Colour Collection, 20 programs for the ZX Spectrum by Richard Francis Altwasser. Published by Richard Francis Altwasser, 64 pages, paperback, £6.95. ISBN 0 9507658 2 1.

Computer Puzzles For Spectrum and ZX-81, by Ian Stewart and Robin Jones. Published by Shiva, 60 pages, paperback, £2.50. ISBN 0 9068 12 27 5.

Easy programming for the ZX Spectrum by Ian Stewart and Robin Jones. Published by Shiva, 140 pages, paperback, £5.95. ISBN 0 906812 23 2.

The Spectrum Programmer by S M Gee. Published by Granada, 140 pages, paperback, £5.95. ISBN 0 246 12025 8.

Programming your ZX Spectrum by Tim Hartnell and Dilwyn Jones. Published by Interface Books, 232 pages, paperback, £4.95. ISBN 0 907563 19 8.

Over The Spectrum. Published by Melbourne House books, 164 pages, paperback, £6.95. ISBN 0 86161 109 8.

The Spectrum book of Games by Mike James, S M Gee and Kay Ewbank. Published by Granada, 150 pages, paperback, £5.95. ISBN 0 246 12047 9.

The Spectrum Handbook by Tim Langdell. Published by Century, 216 pages, paperback, £4.95. ISBN 0 7126 0152 X.



CP/M-86 Tool Box for software developers

SPECIAL OFFER WORTH £845 FOR £500



FIVE FREE STANDING MODULES

(1) BASE
ASMTOA86, BASTOASC, CPN, DISKMAP, DUMP, DX, FILEDIT, FILM, GETFILE, MACTOA86, MAP, PROFILE, REPLAY, SECEDIT, SHUTTER, SNAP, TXTCPN, DIRECTORY EXTENDER **£249.00+VAT**

(2) SOURCERER **£149+VAT**
(3) TRX **£149+VAT**
(4) SCREENWRIGHT +KEYBASE **£149+VAT**
(5) SCREENPLOT **£149+VAT**

MANUAL ONLY **£25 (NO VAT)**

NB If all 5 modules purchased, a special price of £500+VAT for the complete set will apply plus a special Programmer's Document Case will be supplied FREE.
CP/M86 Toolbox is a product of Island Software

To:
EXPORT SOFTWARE INTERNATIONAL LTD
23 South Oswald Road
EDINBURGH EH9 2HH (Phone 031-667 6000)

PLEASE SEND ME: (tick appropriate box)

THE COMPLETE TOOL BOX (special price £500+VAT) ☐
(Plus my free Document Case worth £25)
or MANUAL ☐
BASE ☐ SOURCERER ☐ TRX ☐
SCREENWRIGHT ☐ SCREENPLOT ☐

I enclose a cheque for £_____ payable to ESI Ltd
or
Please send me more information on the CP/M-86 Tool Box ☐

Name: _____
Company: _____
Address: _____
_____

● Circle No. 174

SYMBFILE

Now available for Apple III



PROPRIETHY SOFTWARE CURRENTLY AVAILABLE FROM MAJOR SOFTWARE HOUSES

PACKAGE	SUPPLIER
TABS	TABS
ACCESS DATA BASE	SPIDER SOFTWARE
OMNIS	BLYTHE
ESTATE AGENTS	BLYTHE
MICRO PLANNER	DATALINK
MEDICAL	RAM COMPUTERS
PROGRAM PLAN	FARMPLAN
ROSTAR	PEGASUS
MICROFINESSE	P.E. CONSULTING
ACCOUNTING	VEGA
ACCOUNTING	M.B.C.
ADAM ACCOUNTING	C.C.C.
SOLICITORS ACCOUNTING	E.H. COMPUTERS
PROPERTY MANAGEMENT	ESTATE COMPUTERS
PROPERTY MANAGEMENT	FLETCHER DENNYS
VIDEO MANAGEMENT	IMPACT MICRO SYSTEMS
PASTEXT	PROGRAMVARHUSET
MATHEMAGIC	FERRARI SOFTWARE
GRAPHMAGIC	FERRARI SOFTWARE
ORBIT ACCOUNTING	VLASAK
SYSTEMATICS ACCOUNTING	SYSTEMATICS
JARMAN ACCOUNTING	JARMAN SYSTEMS
ZAROAX	COMPUTER SOLUTIONS
D.B. MASTER	STONEWARE
D.B.II	ASHTON TATE
TRAVEL PLAN	PRINTRONIC
DENTAL SOFTWARE	ATTAR
VIDCO LIBRARY	EVAN JACKSON
NEWSROUND	CRESSAGE
ACCOUNTING	CATEC

UNDER DEVELOPMENT

PACKAGE	SUPPLIER
PADMEDE ACCOUNTING	PADMEDE
FORMAT 80	ELITE SOFTWARE
PFS	SOFTWARE PUBLISHING CORP
PFS REPORT	SOFTWARE PUBLISHING CORP
PFS GRAPH	SOFTWARE PUBLISHING CORP
VISICALC	VISICORP
VISIDEX	VISICORP
VISIFILE	VISICORP

5¼" WINCHESTERS FOR APPLE II©

3, 5, 6, 12, 21 MB DRIVES NOW AVAILABLE
COLD BOOTING FACILITY
1 YEARS FULL WARRANTY

Symbiotic Computer Systems Ltd.

32 Elmwood Road, Croydon, CR9 2TX
Telephone: 01-683 1137/8/9 Telex: 893815

APPLE is a Trade Mark of APPLE COMPUTER INC.

● Circle No. 210

KNIGHTS GUARANTEE LOWEST PRICES ON SHARP AND ATARI

Deal S1 — SHARP 54K MZ-80A with BASIC + 24 programs including Geography, Arithmetic, Basic Tutorials, Startrek, Invaders, Breakout etc. **£419**

DEAL S2 — MZ-80A, BASIC, PASCAL language and 36 programs including all those in deal S1 + 12 PASCAL programs. **£429**

DEAL S4 — MZ-80A with BASIC, PASCAL, FORTH and MACHINE CODE languages + 40 programs. **£449**

DEAL A1 — MZ-80A with BASIC, PASCAL, FORTH, MACHINE CODE and 120 programs to get you off to a flying start. **£475**

DEAL B1 — MZ-80B, the 76K powerhouse with 64,000 point graphics, with BASIC, MACHINE CODE. **£747**

Deal B11 — MZ-80B system, printer, floppy disk, expansion unit, all cables, cards and manuals. **£1899**

DEAL 400 — ATARI 400 with BASIC, manuals etc — choose from 16 colours and eight brightness levels, 300x192 definition. + 63 Programs. **£199**

DEAL 800 — ATARI 800 with BASIC cartridge, four voice sound, superb ultra fast moving graphics with ATARI's dual processor system. + 63 programs. **£429**

DEAL AT3 — ATARI DISK UNIT — plugs straight into the 400 or 800 — great value at KNIGHTS GUARANTEED LOWEST PRICES. **£257**

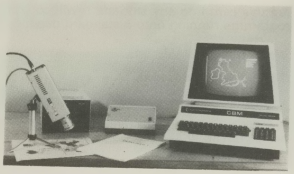
All our prices exclude VAT but include UK delivery by Securicor. No surcharge on ACCESS or VISA orders.

108 ROSEMOUNT PLACE, ABERDEEN AB24YW
TELEPHONE: 0224 630526

Knights T.V. & COMPUTERS

● Circle No. 211

MicroSight



MicroSight 2 (CID) £1990+Vat
MicroSight 1 (CCTV) £499+Vat
Vision Interfaces fron £99+Vat

For details contact:-

DIGITHURST

Digithurst Ltd.
Leaden Hill, Orwell, Royston,
Herts. SG8 5QH
Tel: (0223) 208926

● Circle No. 212

MORE FROM MICROSOURCE

MICROSOURCE was mainly APPLE orientated, but is now moving into other areas of computing and other computers. Since we are users of various computers and peripherals we are only too aware of the problems you have. This month therefore we are providing something else to help you with your EPSON printer:

EPSON OWNERS YOUR MANUAL PROBLEMS ARE SOLVED!!!

We know that there are very few EPSON owners who can understand the manuals they get with their machines. We know that the owners who do have enough insight to understand it are still bogged down and are not really using the printer to its full extent. It is one of the most sophisticated printers on the market, and has a number of features that even an experienced user can miss.
We are thus pleased to announce that we are have three tutorial manuals which lead you through the ins and outs of using your computer with the EPSON MX80, MX100 types I II or III. The manuals are based on examples for the APPLE and TRS80 with appendices for other computers.
Apart from standard manipulation of text, the manual has information on setting up procedures, maintenance, troubleshooting, etc., in the same easy to follow manner of the rest of the book. The book is laid out with the listings outlining the various operations, explained in detail.
If you don't understand the graphics options then you will after reading this. There are details on how to use the graphics on machines which do not have graphics as well as dumping the APPLE Hi-RES screens.
ALL MANUALS ARE A4 size over 100 pages.
The new TYPE III PRINTERS are covered in one manual — ask for the GRAPHTRAX VERSION (This is the USA trade name for the equivalent of TYPE III).

PRICE £14.50 + £1 p&p
MX 80 Printers are covered in the MX80 VERSION
PRICE £12.50 + £1 p&p
MX100 Printers are covered in the MX100 VERSION
PRICE £12.50 + £1 p&p

THE WILD CARD

Plug this card into any slot and it will copy the programme running onto a standard dos disk.

- **Works with any RAM card.**
- **No parameter list needed.**
- **Copy made with WILD CARD can be copied again and again with standard copy programme.**
- **Programme copied can be run without WILD CARD being present.**
- **Utility included for the programmer.**
- **Copies most 64K programmers.**
- **Requires 48K + RAM card, single disk drive.**
- **Cost £99 plus VAT total £113.85.**
- **Dealer enquiries invited.**

WRITE FOR FULL DETAILS or ring (0727) 72917

DEALER ENQUIRIES INVITED

ALL PRICES INCLUDE VAT UNLESS SPECIFIC MENTION IS MADE. ALL PRICES INCLUDE P&P

MICROSOURCE
Tel: Park Street (0727) 72917

1 Branch Road,
Park Street
St. Albans.

● Circle No. 213

Don't spend more than £500 on a Local Area Network until you know about Clearway



Clearway

The best low cost local area networking device

Clearway brings the benefits of Local Area Networking to you **at very low cost.** So if you're thinking about a networking system be sure to find out more about Clearway, the low cost solution that anybody can install.

Available from Johnson Microcomputers, Camberley (0276) 20446, Oxford (0865) 721461, Bristol (0272) 422061

Mail the coupon now for full information

Real Time Developments Limited, Lynchford House, Lynchford Lane, Farnborough, Hampshire GU14 6JA. Telephone: Farnborough (0252) 546213 Telex: 858893 Fletel G

I am interested in Clearway – the low cost Networking System, please send me details

Name.....

Position.....

Address.....

.....

.....

Telephone.....

Send to: Real Time Developments Limited,
Lynchford House, Lynchford Lane,
Farnborough, Hampshire GU14 6JA.
Telephone: Farnborough (0252) 546213
Telex: 858893 Fletel G

8301PC

● Circle No. 214

Unexpected responsibility

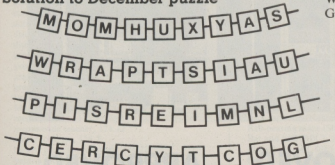
by Nigel Bateman

OWING TO the unexpected illness of his boss, the organisation of six stall at the 1983 Microcomputing Exhibition is left to Peabrain. There are to be five salesmen demonstrating five computers, each with a certain memory rating; four of them have appropriate printers. Additionally there is to be a hot-dog salesman plus wares.

Peabrain does have his boss's notes: how does he position them?

Salesmen: Dave, Fred, Jeff, Joe, John, Steve.
Computers: Axion, Furvon, Govon, Jincon, Zincon.
Memory: 1K, 5K, 10K, 16K, 48K.
Printers: Letta, Linka, Spella, Writa.
Notes — John is four from Dave. Letta is next to Gobon. Axion is next to John who is next to Furvon. Steve is two from 16K. Spella is other end from 10K. Hot-dog stand is as close to middle as possible. Largest K is next to smallest K. Fred is at one end. Joe is next to man whose name begins with J. Steve is next to hot-dogs. Gobon is next to a machine with double its memory. Jeff has the cheapest products — cash only. Furvon memory is one of the two smallest and has no printer. Linka is next stall after hot-dogs. PC

Solution to December puzzle



What is the message?
Greetings is the clue to our seasonal puzzle.

PRACTICAL COMPUTING WISHES YOU MERRY XMAS

BACKUP YOUR WINCHESTER ONTO A FLOPPY

with our CP/M*-based utility program CLIP

- **As fast as PIP and simpler to use**
- **Compresses text or data to less than half size**
- **Backs up larger files by splitting onto multiple floppies, recreated when copied back**

Price £75.00 + vat, post free in U.K.

CP/M Formats include ICL/RAIR, VECTOR, SUPERBRAIN/ SIGNET, IMS, XEROX, NORTH STAR/COMART, TELEVIDEO, NEC, Z80-APPLE, OSBORNE, 8" IBM and others.

CLIP is a development of our **E40** file compression utility, with many file handling features too. CLIP (**C**ompressed **L**ibrary **I**nterchange **P**rogram) does all that the name implies. It takes care of most of the chores in building an ordered file library, and can make automatic notes of its own operations. For completeness, it handles uncompressed files too, so that the powerful file-handling capacity is available for every task. Use CLIP with all-floppy systems as well. CLIP your files and clip your costs.

* CP/M is a trademark of Digital Research

Write or call for further details

KEELE CODES LTD
University of Keele, Keele, Staffordshire, U.K. Tel: (0782) 629221 Telex: 36113
24-hour telephone service: Access accepted.

● Circle No. 150

commodore Anadex Ltd. Sirius 1 Qume

NorthStar apple II SYSTIME

OUR NEW PREMISES



APPROVED

for
Commodore
Apple II
North Star Horizon
ACT Sirius I
Systime

APPROVED

by
Local Government
Central Government
National Laboratories
Maritime Research
Universities
Schools

APPROVED

by
Accountants
Importers/Exporters
Retailers
Manufacturers
Printers
Surveyors

APPROVED SUPPLIERS TO THE UNIVERSITY OF LONDON PURCHASING GROUP

WE WILL GET YOUR APPROVAL

Why? Because Micro-Facilities know that whether you are a large establishment or a small business you are going to need **help** and good **service.** We believe, and our hundreds of satisfied customers seem to agree, that the service we give is second to none.

Our service starts right from your initial contact. We will meet with you to discuss your requirements and your **business,** without blinding you with computer jargon. We will arrange for you to have a demonstration of one or more computers from our range together with programs to suit your particular needs. If a ready-made program is not suitable then we can analyse, design and program your particular procedures (we have nearly twenty years experience of doing this).

As a further service we are able to arrange both **leasing** and **financing** of your computer equipment.

Our service does not stop when you have purchased your system; to ensure the smooth transfer of your work we **train** you and your staff to use the computer and its programs in your own environment. As additional security we offer full **maintenance contracts.** Above all we will be available to give you genuine **after sales service.** Not for just one week or one month but everytime it is wanted.

Please contact us to discuss your problems and requirements, we offer you a lot more, but only charge the same. Our ability will give you peace of mind and confidence that the job will be done properly.

Tenders from Local Authorities, Education and Government Departments welcomed.

Micro-Facilities Limited 7-9 Church Road Egham Surrey TW20 9QL
Telephone: Egham (STD 0784) 31333

MICRO FACILITIES

● Circle No. 217

Annual index, 1982

compiled by Nigel Martin

ENTRIES refer to articles published in *Practical Computing* during the year by page number, issue number; an asterisk signifies a correction to an earlier entry. A cumulative index for volumes 1-4 appeared on page 153 of the January 1982 issue of *Practical Computing*.

Acorn Atom, animated graphics, 160,*12*
  edit insertion aid, 160,*12*
  EPROM programmer, 152,*6*
  machine-code debugging, 139,*1*
  Print At routine, 144,*8*
  screen-noise routine, 139,*1*
  determinant evaluation, 133,*3*
  machine-code assembler, 133,*6*
  real-time clock, 136,*5*
Acorn Computers, 62,*10*
Animation, computer-drawn, 104,*5*
APL, 91,*8*
Apple, ampersand command-handling routine, 174,*12*
  Apple III graphics, 174,*10*
  Apple tree, 174,*12*
  assembler source lister program, 150,*6*; *37,*8*; *37,*10*
  BSave parameter finder, 149,*6*
  cash display 158,*5*
  compilers 85,*10*
  computed Gosub command, 174,*12*
  data-tabulation routine, 143,*3*
  disc-map program, 141,*1*
  disc patcher, 135,*8*
  grandfather clock, 142,*3*; *45,*6*
  graphics, *45,*2*
  graphics and text, 117,*1*
  graphics printout routine, 135,*8*
  Immediate command, 174,*12*
  Macro command, 174,*10*
  menu routines, 125,*4*
  morse-code teacher, 174,*12*
  music routines, 156,*5*
  Newed program recovery, 174,*12*
  paint a picture, 141,*3*
  Petcout control-characters utility, 133,*8*
  pie-chart program, 135,*2*
  Print Using routine, 139,*7*
  RAM test, 141,*1*
  screen-character read routine, 143,*3*
  screen-dump routine, 157,*5*; 173,*10*
  speeding execution, 133,*2*
  Saturn's rings program, 173,*10*
  Space Invaders modification, 141,*3*
  Step and Trace commands, 133,*2*
  starburst, 136,*9*
  text editor-formatter, 133,*9*
  Toolkit bug, 141,*3*
  two-pass assembler, 133,*7*
Apple Stock, 127*8*
Arithmetic, multiple precision, 93,*2*
Art and graphics, 107,*7*
  Gino, 127,*5*
  polygon drawing, 89,*4*
  relativity, 125,*8*
  routines, 75,*2*
  shape manipulation, 116,*3*
  spirals program, 128,*5*
  Texrec, 116,*3*
  two-dimensional rotation program, 111,*6*
  audio-visual editing, 83,*1*

BBC, character sizes, 160,*10*
  hyperbolic functions, 149,*8*
  Letter Writer, mini word processor, 167,*12*
  machine-code disassembler, 167,*12*
  memory control, 85,*12*
  music function, 149,*8*
  paged graphics, 93,*10*
  perspective graphics, model A, 143,*7*
  polygon program, 143,*7*
  program append tip, 37,*8*; 33,*9*
  random number from assembler, 157,*9*
  sound, 127,*5*
  strange sound, 125,*8*
  teletext colour tips, 149,*8*
  Teletype interface, 167,*12*
BBC Basic, 119,*6*
Branksome School, 79,*2*
Brighton Polytechnic, 101,*5*

CP/M, 77,*2*; 90,*6*
  MBasic crash recover tip, 157,*8*
  file copier, 117,*7*
  file-size routine, 155,*5*
  paging text files, 157,*8*
  password program, 105,*8*; 153,*10*
  printer-initialisation routine, 149,*7*
Cloze testing program, 79,*6*
Comal, 85,*2*
Computer-aided design, 70,*4*
Cryptanalysis, 85,*9*
Curry, Chris, 62,*10*

Data structures, 141,*10*
  transmission, 108,*9*
Disc, CP/M Erase utility, 128,*1*
  hard 109,*6*
DNA code simulation, 86,*1*
Drunken Duncan, 85,*2*; 43,*5*;43,*7*;37,*8*

Education articles, 102,*1*; 109,*2*; 79,*2*; 101,*4*; 109,*5*; 69,*6*; 79,*6*; 137,*12*
Equation solving, 125,*6*
Ergonomics, 126,*7*
Expert systems, 167,*6*

Farming, 94,*4*
File-creation program, 81,*2*
Forth, factorials program, 151,*9*
Fuel-economy program (ZX-81), 147,*5*

Games, Airlander (Pet), 147,*10*
  Alien Blaster, 116,*8*
  Backgammon (Nascom), *151,*6*
  Ball-bearing maze (Sharp), 142,*9*
  Bat and ball (BBC), 160,*10*
  Biorythms (MZ-80K), 149,*12*
  Bloodstream, 134,*3*
  Breakout, 150,*5*
  Cricket (ZX-81), 152,*9*
  Cylindrical Life (TRS-80), 150,*5*
  Dodgeball (Pet), 160,*8*
  ESP tester, 153,*2*
  Eights, 85,*8*
  Fighter (BBC), 149,*8*; *35,*10*
  Galactic Chess, 168,*9*
  Galaxy Invaders (Apple), 148,*6*;*139,*7*
  Ghost-ship Attack (ZX-81), 127,*3*
  Grand Prix (ZX-81), 127,*3*
  Grandstand Park Race, 83,*4*
  Hunt (ZX-81), 157,*6*
  Kaleidoscope, 119,*4*
  Labyrinth, 97,*3*
  Lem (ZX-81), 158,*6*
  Letter Shuffle (Apple), 157,*5*
  Logic Puzzle (ZX-81), 146,*5*
  Lunar Lander (TRS-80), 141,*6*
  Mammoth Maze, 93,*3*
  Martian Invasion (ZX-81), 158,*6*
  Maze (Pet), 140,*6*
  Maze Monster (ZX-81), 183,*10*
  Missile Dodger, (ZX-81), 127,*3*
  Monopoly, 114,*12*
  Obstacle (ZX-81), 158,*6*
  Othello, 118,*4*
  Patience, 97,*1*
  Pelmanism (TRS-80), 158,*10*
  Pig (Pet), 147,*7*
  Ping-pong (ZX-80), 135,*1*
  Plakoto (Acorn Atom), 143,*8*
  Rat Maxe, 102,*6*
  Road Race (TRS-80), 147,*3*; *43,*6*
  Shoot-Out (UK101), 160,*12*
  Spitfire (ZX-81), 136,*4*
  Strikeout (ZX-81), 125,*3*
  Submarine (ZX-81), 183,*10*
  Superzap (ZX-81), 157,*6*
  Ten-pin Bowling (ZX-81), 157,*6*
  Vitesse (ZX-81), 136,*4*
  Whitehall, 93,*5*
  Wordsquare, 133,*1*
  Zombies (ZX-81), 145,*5*
Gino-2D, 127,*5*
Golf handicap program, 157,*10*
Graphics; three-dimensional, 77,*4*
  Gunnislake Primary School, 109,*2*

Handicapped; helping the, 101,*5*
Hard-disc systems, 109,*6*
Hash coding, 127,*9*
Hypercubes, 97,*4*

IT 82, 103,*2*
Information Technology, 141,*12*
Ink-jet printers, 117,*6*
Integral evaluation, 78,*10*
Ivybridge motors, 84,*6*

Language recognition, 70,*6*
London University, 103,*3*

MBasic, line copy and renumber tip, 157,*8*
MZ-80K, music program, 120,*3*
  floating-point numbers 149,*12*
  Get tip, 111,*2*
  text readability, 149,*12*
Machine code, 167,*5*
  intelligence, 77,*8*; 85,*8*
Mail-order catalogue program (TRS-80), 127,*4*
Medical diagnosis, 117,*9*
Microcomputer software market, 207,*12*
  under £200, 80,*12*
Micromarket, 84,*5*
Micromouse, 147,*1*; 149,*2*; 149,*3*; 143,*4*; 161,*5*; 159,*7*; 132,*10*; 130,*12*
Microtan 65, disassembled program, 181,*10*
Microtan II, hex byte to decimal routine, 176,*10*
Monte Carlo methods, 78,*10*
Morse-code recognition, 85,*8*
Multiple-precision arithmetic, 93,*2*
Multiplication of large numbers, 143,*1*
  tables program, 109,*5*

Nascom, hard-copy graphics output, 152,*5*
  Zeap to Naspen transfer, 120,*3*
Networking, Pet file transfer, 156,*2*

One-minute exercise program, 82,*2*

Paged graphics,93,*10*
Palumbo, Jacques, 110,*6*
Patsy Program aptitude-test system, *43,*6*
Payroll programs (Pet) , 148,*4*
Pet, ASCII codes, true, 149,*9*
  cash register, 180,*12*
  cassette-file bug, 117,*4*
  chaining programs, 165,*10*
  character-call routine, 143,*2*
  cursor flash-speed routine, 136,*6*
  disc-directory routine, 136,*6*
  disc string storage, 143,*1*
  error instruction routine, 165,*10*
  Get tip, 167,*10*
  graphics data routine, 165,*10*
  Input routine, 143,*1*
  Interex, 144,*9*
  line-clear routine, 142,*5*
  machine-code loading in Basic, 180,*12*
  machine-code monitor, 117,*5*
  machine-code sort, 142,*5*
  mailing-list program, 135,*3*
  neat layout, *43,*6*
  network file transfer, 156,*2*
  networking, 106,*1*
  Note Writer program, 141,*2*
  perpetual calendar, 180,*12*
  Petvoice, 140,*5*
  Poke tips, 165,*10*
  pools-dividend calculator, 180,*12*
  Print facility, 143,*1*
  printing with descenders, 118,*4*
  quick formatter, 159,*8*; *37,*10*
  reverse-video Rem statements, 166,*10*
  ROM remover, 160,*8*
  screen print, 118,*4*; 141,*5*
  screen-print program, 141,*2*
  Simpson's rule integration, 147,*7*
  tabulation routine, 143,*2*

(continued on next page)

(continued from previous page)
trace routine, 141,2
typewriter program, 135,6; 167,10
variable cursor-flash speed, 166,10
variable-dump routine, 162,7
Wordpro, 129,10
Polynomial solving, 120,4
Portable graphics, 43,1
Prestel, Seaview '82, 53,6
Price-list program for carpet warehouse, 155,3
Primary-school mathematics, 102,1
Printers, ink jet, 117,6
Privacy, 93,9
Program proving, 105,8
Programmer aptitude testing system 108,3
Programming, adaptive, 110,1
technique, 124,10

QERA, *155,5; *45,6

RML 380-Z, hex file to Basic converter, 141,7
screen-print program, 119,3
shuffle routine, 149,12
user-defined characters, 142,9
Random number methods 78,10
Records, sport and business program, 70,2

Reviews — Books,
A Primer on Pascal, 163,5
Apple Pascal Games, 165,9
Basic Programming on the BBC Microcomputer, 165,9
Computer Software Protection, 163,8
Computers in Farming, Milestone or Millstone?, 163,5
Data structures using Pascal, 163,6
Database analysis and design, 149,1
DON'T (or How to Care for Your Computer), 147,2
49 Explosive Games for the ZX-81, 165,9
From Chips to Systems, 157,7
Fundamentals of Interactive Computer Graphics, 125,8
How to Buy the Right Small Business Computer System, 189,10
How to Program and Interface the 6800, 149,1
More TRS-80 Basic — A Self-Teaching Guide, 147,2
My Micro Speaks Basex (and loves it), 165,9
Pet Basic: Training your Pet Computer, 157,7
Pet/CBM Basic, 185,12
Pet Graphics, 189,10
Pet Interfacing, 163,6; 185,12
Programming Your Microcomputer in Basic, 151,3

Simple Pascal, 163,5
16-bit Microprocessors, 151,3
Software Metrics, 151,3
Starting Forth, 163,8
The Basic Conversions Handbook, 185,12
The Basic Handbook, 147,2
The Home Computer Handbook, 157,7
The Joys of Minis and Micros, 163,5
The Pet Index, 185,12
The Pet Personal Computer for Beginners, 185,12
Think Again, 189,10
TRS-80 Interfacing: Book 1, 149,2
Using Microcomputers in Business, 163,8
Using the Radio Shack TRS-80 in Your Home, 151,3
Using the Unix System, 189,10
various titles on computer graphics, 90,4
Reviews — Games Software,
Adventure programs, 89,3
Atari, Air-Strike, 133,12
Centipedes, 133,12
Missile Attack, 133,12
Battle of Midway, 183,7
D-Day, 179,3
Eastern Front, 183,6
Galactic Empire, 177,1
Hannibal, 187,8
Starfighter, 187,5
Tanktics, 177,2
Zork, 175,4
Reviews — Hardware,
ACT Sirius 54,3
Acorn Atom, 63,1
Advantage, North Star, 55,6
Alphatronic, 56,2
Arfon light-pen, 69,5
Arfon speech module, 61,2
Atari 800, 74,7
BBC Micro, 57,1
BBC/Spectrum comparison, 111,10
California Computer Systems, 45,10
Clearway network, 61,9
Dragon 32, 48,10
Eagle II, 54,12
Gemini video card, 69,3
HP-83, 54,4
IOSL high-resolution board, 65,2
Kontron PSI-80, 71,3
NewBrain, 46,9
Oki IF-800, 58,4
Osborne, 54,2
PBM-1000, 54,5
Pearcom, 58,6
Qume Sprint 9, 91,7
Ricoh RP-1600 printer, 61,3
Rodime Superbrain conversion, 61,6
Sharp PC-1500, 48,8
Sinclair Spectrum, 66,7
Softy-2, 69,1
Sord M-23, 84,7
Superbrain II, 54,9
Televideo 802, 54,8
TMK 330, 62,12
Vic-20, 62,1
Video Genie I and II, 61,5
Reviews — Software,
Anagram sales ledger and stock-control system, 84,3
Aplus Basic, 77,3
Apple compilers, 85,10
Apple shape manager, 77,3
Chemdata, 69,6
Corp database, 78,1
GraForth, 66,12
Graphpac, 61,8
Hornet, 62,4
Janeplus, 69,6
MBasic, 71,5; 62,6; 96,7
Mars, 67,2
Micro-Simplex, 71,12
Oasis, 70,8
Pet Power, 99,7
Soundchaser, 54,10
SuperCalc, 77,5
Superfile, 69,9
Vic Wordcraft, 77,12
Role play, 78,9
Russian Revolution, 137,12

Sales promotion, 107,8
Satellite tracking, 104,3
Sharp MZ-80K, Z-80B, upgrade, 151,6
firmware, 141,9
polynomial roots program, 141,7
printer interface routine, 151,6
Sharp PC-1211 shopping-check program, 154,7
Simpson's rule program, 147,7
Sinclair, Clive, 54,7
16-bit chips, 213,10
6502, register-exchange routines, 128,2
Slide-projector control, 94,2
Sorcerer, graphics, 111,2; *43,5
Sorting, batcher/bubble, 106,4
shell sort, 108,4
Speech synthesis, 116,10
Speed-reading program, 80,2
Star signs program (TRS-80), 148, 5
Statistics, Fisher's two-sample randomisation test, 125,5
Markov language analyser, 123,1
time series, 88,9
Stress calculation program, 142,5
Structured programming, 104,7; 120,8; 96,9
Superboard, character retrieval, 127,2
equation-entry routine, 133,3
large characters, 151,7
monitor select, 139,5
OK suppression, 128,2
Superbrain, terminal emulation, 163,9

TRS-80, animation, 151,8
binary clock program, 128,4
cassette data files, 157,10
data pointer finding, 144,6
fireworks, 150,5
flashing-cursor routine, 133,1
formatted listing, 153,7
function insert routine, 127,4
keyboard graphics characters, 156,12
LList/LPrint tip, 133,1
memory-size modification routine, 144,3
perpetual calendar, 156,12
picture-drawing routine, 154,7
program name find, 144,6
screen print, 150,5
space-orbit program, 151,8
tape-load tip, 133,1
telephone bill program, 152,8
user-defined characters, 144,6
Tachistoscope program, 101,4
Tax calculator program (ZX-81), 125,3
Tax liability program, 86,6
Telesoftware, 55,1; 53,2; 107,3; 130,5; 125,7
Time-into-words program, 141,9
Tower of Hanoi, 193,9
Town planning, 78,9
Transmission protocols, 108,9

UK 101, character generator tip, 134,4
check-sum loader tip, 127,2
error-message remedy, 133,3
extra Basic commands routine, 133,4
function-input routine, 176,10
Getkey routine, 139,1
loop and subroutine exit routines, 176,10
random characters, 134,4
Save command, 160,12
scroll stopper, 139,5
string list routine, 127,2
Unix, 159,3
Users' groups index, 187,9

Video Genie, cassette word processor, 159,9
printer tip, 112,2
string array Save routine, 125,2
unknown-tape loader program, 145,6

Wordpro, 129,10
WordStar, word count program, 163,9

Z-80, picture drawing, 130,1
Z-80B upgrade, 151,6
ZX-80, clock program, 120,2
Inkey routine, 136,1
Print At usage, 135,4
ZX-81, atomic orbitals program, 119,2
autorun, 128,3
card-shuffle routine, 136,4
circles program, 160,6
command exchange routine, 141,8
data scroll, 117,2
Data tip, 160,6
digital exercise, 147,5
down scroll routine, 135,1
energy-management programs, 120,2
Fast and Slow modes, 152,9
Fast Fourier transform, 171,12
format subroutine, 125,3
Garrulous Godfrey, 147,5
hex assemble/disassemble routine, 142,8
hex loader, 141,4
histogram plotter, 135,4
income tax program, 142,8
Invaders tip, 135,1
large characters, 135,1
line draw program, 135,4
matrix inversion, 145,7
message display, 146,5
money print, 141,4
monitor interface, 120,2
multiplication tables program, 128,3
music synthesiser, 136,1
natural logs routine, 117,2
< > tip, 145,5
number routines, 136,1
physics calculations program, 141,8
Pilot interpreter, 171,12
Print tip, 160,6
quadratic regression, 145,7
Read Data routines, 136,4
Read Data program, 128,3
ROM tester, 117,2
Renumber routine, 145,5
screen inverter routine, 135,1
scroll tip, 135,1
sketch-pad program, 127,3
telephone bill program 152,9



McCombo Stars in any System

The McCombo is a compact stand alone microcomputer that can connect to virtually any standard computer terminal, printer, typewriter, tape punch, modem or plotter.

It has four RS232 ports plus a centronics port. With McCombo you no longer need to accept the limitations of a complete system. Choose the best peripherals and build the system to suit your needs exactly.

McCombo software is designed for full compatability with CP/M 2.2 Software including 'Word Star Word Processing' with accounting, inventory, purchasing, labour reporting, sales/mkt. systems, scientific applications plus hundreds of other CP/M 2.2 programs.

ZYTEK

DEALER ENQUIRIES WELCOME!

ZYTEK INTERNATIONAL PRODUCTS LIMITED,
2 Ganton Street, London W1V 1LJ.
Telephone: 01-734 9462/3/4.

● **Circle No. 219**

MAKE YOUR SMART TERMINAL SMARTER.

Automatic Date/Time Entry. Simply install the SLC-1 Time Machine between your computer and terminal and it will automatically log the correct date and time of each transaction into your computer. The SLC-1 Time Machine will save you money, both in reduced operator time and the elimination of costly human errors.

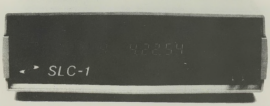
The Time Machine contains a precision 24-hour clock and a 100-year self-correcting calendar that automatically adjust for leap years. Time and date functions include: hours, minutes, seconds, day, month and year.

But the SLC-1 is more than a clock. It constantly monitors the output from any computer and provides instant responses to a number of user-defined key phrases. This makes it ideal for use with unattended process control or data acquisition systems. And since the Time Machine is a 6502 microprocessor system, it adds computing power to any terminal.

The Time Machine is easily installed without modification to your operating system. Both RS-232 and 20mA current loop serial link are provided. And because it's battery-supported, the time will always be correct, even after a power failure.

The single quantity price is only £550. Ten-digit display option, £80. For more information or literature on the SLC-1 Time Machine, contact John

Birkwood Assoc.,
Wyvern House,
49 Station Rd.,
Billingshurst, West
Sussex, RH14 9SE.
Tel: (040381) 3813.



GET INTO THE TIME MACHINE.

DIGITAL PATHWAYS

● Circle No. 220

Sigma Technical Press
The UK Software Publisher

Z80 INSTANT PROGRAMS
Machine Code Routines for Nascom and Other Z80 Systems (2nd Fully Revised Edition)
by **J. Hopton**
The first edition of this book, which was approved by Nascom Microcomputers Limited, was a sell-out. It has now been completely revised with the following features:
All of the programs now work under the NAS-SYS monitor, which is the monitor for both NASCOM-1 and NASCOM-2 machines.
All of the programs are now listed with mnemonic, as well as pure machine codes.
All the programs start after address OC80, to fit the Nascom systems and terminated well before OFFF, allowing ample space for the stack.

0905104 19 6 198pp Nov'82 £7.50

THE VIC FOR CHILDREN
by **A.D.J. Noble**
The VIC 20 computer from Commodore is aimed at the younger user, perhaps working with their parents to explore what computing is all about. Now that microcomputers are finding their way into schools, parents should also find that this book — with a VIC 20 — will also provide valuable out of school education.

0905104 02 0 approx. 140pp Dec'82 £5.95

PRACTICAL PASCAL FOR MICROCOMPUTERS
by **R. Graham,** *Manchester Polytechnic*
Unlike other Pascal books, which are concerned with general aspects of the language for all computers, this book is uniquely concerned with Pascal implementation for popular microcomputers.

0905104 17 X approx. 170pp Nov'82 £6.50

THE SINCLAIR SPECTRUM IN FOCUS
by **M.R. Harrison,** *Software Sciences Ltd.*

0905104 28 5 approx. 160pp Dec'82 £6.25

WILEY COMPUTER BOOK MONTH — FEBRUARY 1983
A wide range of Computer Books and Software on display at leading Bookshops and selected Computer Stores throughout the UK
(Checklist of titles available from Wiley)

Marketed by
John Wiley & Sons Ltd.
Baffins Lane, Chichester
Sussex PO19 1UD, England

● Circle No. 221

>NEXT MONTH

>WORD PROCESSING

While many people have special uses for computers, almost everyone can profit from one feature — word processing. In the February issue of *Practical Computing* we'll be looking at the advantages and disadvantages of various approaches and the merits of particular products.

One of the in-depth reviews will compare eight different WP programs — including WordStar, Format 80 and Letter Perfect — running on the Apple II.

>REVIEWS

Amont the equipment on the test bench this month:

- Victor 9000; a 16-bit micro better known in its Sirius 1 form
- LVL disc drives for the BBC micro
- Adcomp X-80P; a low-cost dot-matrix printer which can draw graphs

>AND MUCH MORE!

With special features on eight-colour graphics in Teletext mode on the BBC micro, and "Computing for Accidents", plus all the regular departments, you will not want to miss the February issue of

Practical Computing

On sale at W H Smith and all leading newsagents after January 19.

COST CONSCIOUS!

Heralding the beginning of a new age of low cost Word Processing Computer Systems

SMITH CORONA TP-1

- Dedicated Computer Printer
- Microprocessor Controller
- Serial, Parallel or IEEE Interface
- Lowest cost purpose-built Daisywheel



£485 + VAT

BYTEWRITER

- Keyboard Printer
- Lift off facility
- Built-in self test
- Rigid carrying case



£485 + VAT

DISCOM TRADING COMPANY
Dresden House, 51 High Street
Evesham, Worcs. WR11 4DA
Telephone (0386) 3591

Further Information Please

Name _____

Address _____

_____

_____

_____

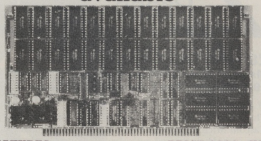
Telephone _____

discom

● Circle No. 222

64K S-100 STATIC RAM BOARD

Cheapest professionally manufactured board available



FEATURES

1 IEEE 696-S100 Compliance Slave D8/16M24 T100 or T150
2 8-16 Bit Data
3 2K Deselect
4 24 Bit Addressing
5 Bank Select
6 **32K EPROM and RAMS** on same board. No increase of access time to the RAMS
7 Phantom
8 Power Consumption 800mA Typ.
9 Fully Socketed
10 Full Ident./ Comprehensive manual
11 A version of the same board can be supplies with on board battery

PRICE £299+VAT
Fully Assembled and Tested

CONTACT:
MICROBUS DESIGNS LTD.
111 Wellington St.
Thame,
Oxon OX9 3BW.
Telephone 084 421 5270

Trade enquiries welcome

Trade prices on request

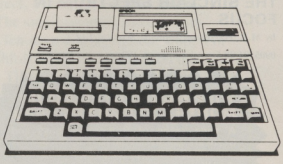
● Circle No. 276

A Truly Portable Computer

FROM

G.M.T. COMPUTERS LTD

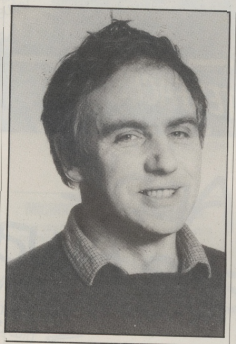
EPSON **HX-20** PORTABLE COMPUTER



GMT Computers Limited are stockists of **Hx-20** hardware and software.
To obtain a **Hx-20** complete with portable carrying case send your cheque for £411 + VAT **£477.65** including postage and packing and leave the rest to us.
Prices for optional extras, e.g. micro cassettes, available on request.
Want more details? Phone us on **01-947 7234** and ask for either Stuart Costigan or Barry Abbott.
GMT Computers Limited are at Newport House, 22 Hartfield Road, Wimbledon SW19 (2 minutes walk from Wimbledon Station).

● Circle No. 277

Hic, hic, hurrah



by Peter Laurie

IMPATIENT PEOPLE in our odd trade often complain of the difficulty of selling microcomputers to otherwise conspicuous consumers. "Why", they ask plaintively, "will people buy cars and central heating and holidays abroad — which all cost as much as or more than a nice computer and are not nearly as much fun — and yet they won't buy micros?" It is a reasonable question, bearing in mind that everyone in the civilised world knows that microchips are the best thing since sliced cotton wool.

Well, we are happy to bring you a brand-new economic concept that explains this and, possibly, much more. The name of this concept — write it large — is HIDDEN INTELLECTUAL COST, otherwise known as Hic for the hiccup it causes in potentially prosperous industries.

The essence of the matter is that everything you buy has a cost in cash and a second hidden cost in the time it takes you to get used to it. The cost depends very much on your previous experience, reaching right back into your childhood education. A clothes peg takes a negligible amount of time to understand for a nicely brought-up 20th-century westerner, but it might have presented a considerable Hic to a Stone Age tramp whose laundry day consisted of falling in the river.

A motor car has a considerable Hic, but it is one that we are brought up to accept and we are willing to pay for the pleasure and convenience of being licensed killers on the road. Many things have much lower Hics than they otherwise might because they conform to general rules that we are taught in school. Say you need a manual on 68000 machine code. Imagine that there are two versions available, one in English and one in Russian. For us non-Russian speakers, the second has a quite unacceptable Hic — we would have to spend two or three years learning Russian before it was of any use. The cost of learning English we paid, without being able to argue about it, at an early age.

How much does a Hic cost? A simple way of calculating it is to take the time spent in getting over it multiplied by the Hiccer's hourly rate. The cost of getting to grips with a new gramophone might be half an hour. The cost of a video recorder, if you have never seen one before, might be a couple of hours.

We ought to charge Hic time at our potential customer's hourly income, plus overheads, plus profits he would have been earning had he not embroiled himself with our little delight. In the micro business, trying to sell systems to professional people, we ought to allow something like £10,000 a year salary, plus another £15,000 for overheads and profits.

This ingredient puts a very different complexion on the cost of a micro. Suppose it takes our man a month, full time, before he has the thing mastered and working. It puts the cost up by about £2,000, and makes quite a difference to a machine that costs, say, £3,000.

This extra cost is in retrospect. What matters is what the poor fellow thinks it is going to cost him before he buys. If he is sensible he allows a 50 percent risk that none of it will work. That puts the Hic up to £3,000, effectively doubling the cost of the machine. This is bad enough for vendors of hardware. Their prices are at least comparable with the hidden costs. The seller of software is in a much worse position because his products are cheaper but not less complicated. The Hic in his case can be not just double the cost of his product, but multiplied to such stratospheric heights that its cash price tag becomes almost negligible by comparison.

Take, as a horrible example, a word-processing package costing £300. Although its proud owners claim that it can be mastered in a matter of hours — and they'll produce some smiling lady who conceals a Nobel Prize mind beneath a Fawcett-Majors hairdo to prove it — in real life it may take several weeks to get the full benefit of the thing. The cash cost of the package is then only 10 percent of the total cost. It is not surprising that people hum and ha about buying software. If they were realistic they would often not "buy" the product even it it were given away.

What can be done about Hics? One obvious solution is for buyers to shape up and learn some basic ideas. I well remember the two or three months of agony it took me back in the summer of '79 — ah, those long, green-phosphor days! — to understand what a file was and what might go wrong with it. The trouble was one had to learn in the dark by making it go wrong and then laboriously trying to find an answer. It was rather like the blind men touching up the elephant and arguing about what they had found.

Imagine if the motor industry had to educate its customers about cars in the same way. You put them into an invisible but very expensive sort of something that you cannot really explain, and send them off to the M1 to deduce from the wounds left on other customers' carcases what makes it go and stop, and what other beasts inhabit this invisible world.

The difficulty of selling cars under those conditions would make BL's troubles seem like a holiday. Cars would not become a marketable item until people developed second sight, and that is rather the position we are in now. We are waiting for the spread of computer literacy to bring people at large an understanding of the invisible concepts inside micros. Until they have, it is going to be hiccy and sticky selling micros.

Apple computer

A fresh new 48K Apple II will only cost you:

£499

(While stocks last!)

WHILE STOCKS LAST!

LOWEST U.K. EPSON PRICES!

UNBEATABLE VALUE

MX80T (Type 3).....£290
MX80F/T (Type 3).....£315
MX100F/T (Type 3).....£420
Other printer prices on application

VISICALC

ALL LATEST PACKAGING VERSIONS!

Visicalc	£98
Visitrend/plot	£131
Visidex	£126
Visifile	£120
Visischedule	£150

Disk Drives



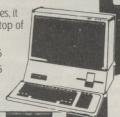
Apple disk drives at these amazing low prices!

With Controller **£270**
Without Controller **£220**

Apple III

At these prices, it must be the top of the crop!

128K 1995
256K 2495



INTERFACES

Parallel Printer Card	£70
Serial Printer Card	£105
Pascal Card	£105
Eurocolour Card	£70
IEEE 488 Card	£241
Z80 System (Microsoft)	£184
80 Col System (Videx)	£199
16K RAM Card	£48
32K RAM Card	£150
128K RAM Card	£350

Monitors



Haga
Denshi
12" Green Screen Monitor.

£90

Apple Take Away

All prices plus 15% VAT

Daisywheel Printers

TEC 40cps	£995
TEC 55pcs	£1295
Ricoh 1600	£1195
Ricoh Flowriter	£1575
Diablo 630 RO	£1595

Bits'n'Bytes



Numeric Keypad	£75
Joystick (TKC)	£24
Paddles	£15
Cooling Fan	£50
Voltage Stabiliser	£170
Acoustic Coupler	£200
10 BASF 5.25" disks	£18
Listing Paper	£14
Locking Disk Box	£20
Printer Ribbons	POA
Daisywheels	POA

DATABASE

PFS	£40
PFS Report	£40
DB Master 3	£104
DB Utilities	£47
Data Factory 5	£195
Datastar	£99
Supersort	£95
dBase II	£348
Access	£179

Software

Mathemagic	£46
Graphmagic	£46
Maths/Graphmagic (Pack)	£68
Microfinesse	£350
Micromodeller	£560
Apple Project Manager	£137
Order Tracking System	£28
Hand Holding Basic	£59
Personal Finance	£43
Applesoft Compiler	£110
Locksmith 4.1	£65
DOS Tool Kit	£41
Pascal Tutor	£60
Pascal Programmer	£60
Pilot	£84

Vlasac Orbit Accounting Modules are fully integrated, however, to use this facility, a third disk drive with controller and a pascal card are necessary.

General Ledger	£295
Sales Ledger	£295
Purchase Ledger	£295
Stock Control	£295
Payroll	£295
Auto Invoicer	£150

TABS MODULES ON REQUEST

Word Processing

Applewriter	£39
Applewriter II	£85
Wordstar 3.0	£125
Mailmerge	£47

Mail Order

BARCLAYCARD VISA Buy it with Access

We accept both Access and Barclaycard, subject to a 5% surcharge. Telephone orders are welcome on:

01-278 3838

Delivery Please add 1.5% to your order for UK delivery charge. Securicor delivery by arrangement.
All goods are normally despatched same day.
All goods are normally carried in stock, however, please confirm before collecting.
We are open from 9.30 to 5.00 on Mondays to Saturdays.

DRAGON 32 £173

NEWBRAIN A £199
(MODEL AD £229)

FULL RANGE OF SOFTWARE AND PERIPHERALS IN STOCK;

PLEASE PHONE FOR LIST.

ATA SYSTEMS

4 ALBION HOUSE, 1 BACK HILL, LONDON EC1
01-278 3838/01-278 5285

● Circle No. 225

Every computer needs a

CHATTERBOX!

"OK Spock, you win this time..."

NEW!

for

ZX81 SPECTRUM

NASCOM VIC PET BBC APPLE TRS80 IBM, CRAY, ETC. (Please state)

SAVE £££s

ONLY £49!



At last! Genuine phonetic synthesis at a sensible price. Gives your computer an *unlimited* vocabulary (nothing more to buy!). Self contained speaker/amplifier, Sinclair connector etc, **PLUS** Expansion socket for BIG EARS **AND** Monitor socket for Music Board. Full instructions, technical notes and programme examples supplied with this outstanding educational unit.

DEALER ENQUIRIES WELCOME

As seen on BBC TV "Computer Programme"

✻ BIG EARS ✻

"TOPO GIGI SFT! Right!"

SPEECH INPUT FOR ANY COMPUTER £49

Hugely successful Speech Recognition System, complete with microphone, software and full instructions.

BUILT TESTED & GUARANTEED ONLY

PLEASE STATE COMPUTER: UK101, SPECTRUM, ATOM, NASCOM2, Vic 20, Micron, ZX80/81, PET, TRS80, M2BDK, APPLE II, BBC MICRO

NEW: FAST MACHINE CODE FOR ZX SPECTRUM £7.40

ZX81/SPECTRUM

MUSIC SYNTHESISER (STEREO) + 16 LINE CONTROL PORT



Play 3-part music, sound effects, drums etc. Full control of attack, decay and frequency. Input/Output lines provide control and monitor facility for Home Security, Robot Control, Model Railway, etc. Works with or without 16K RAM.

Add keyboard to make a real performance polyphonic synthesiser! Full instructions/software included.

AMAZING VALUE AT ONLY £19.50 (KIT)

Extra 23 way connectors at £2.60 £25.50 (BUILT)

THE COMPOSER

Music Programme for above synthesiser. Enter and play 3 part harmony. Includes demonstration tunes. Recommended £7.40



COLOUR MODULATOR RGB in, PAL/UHF out (not for ZX)	**KIT £15** **BUILT £20**
SPECIAL OFFER **SPEECH OUTPUT CHIP SX-01** **Phoneme Speech Processor**	**I.C. £18** **DATA £0.60**

Prices add VAT at 15% to all prices. All enquiries S.A.E. please. Barclay/Access orders accepted by telephone.

WILLIAM STUART SYSTEMS Ltd

Dower House, Billericay Road, Herongate, Brentwood, Essex CM13 3SD, England. Telephone: Brentwood (0277) 810244

● Circle No. 226

OSBORNE 1

- praxis daisywheel £425
- NEC/Epson/OKI £call
- Monitors + cable £ 99
- OSBORNE £call
- Games for Osborne from £19

We specialise in Osborne & hold large stocks of above.

CALL FOR SUPERB PRICES

FRASER ASSOCIATES

Buckingham (0282) 6087

● Circle No. 227

BRAIN SURGEON

Anita Electronic Services (London) Ltd are specialists in the repair and service of Superbrain I and II and associated printers including Apple silent type, Centronic, Anadex, NEC, QUME, Ricoh and Empson.

We also specialise in the repair of Commodore and Apple computers.

We offer a fast on-sight service or alternatively repairs can be carried out at our workshops should you wish to bring in your machine.

Maintenance contracts are available at very competitive prices. Trade enquiries welcome.

For further information telephone or write to:

MR D. WILKINSON
Anita Electronic Services Ltd.,
15 Clerkenwell Close,
London E.C.1.
01-253 2444

● Circle No. 228

MICROCOMPUTER INSURANCE

Comprehensive cover at a reasonable premium:

- All Risks Cover (incl. Transit) — up to £8,000 for £20
- Increased Cost of Working — to reinstate lost data
- Breakdown & Derangement — alternative to maintenance agreement

Write with details of equipment to:

Geoffrey Hoodless & Associates
Freepost (no stamp required)
Woking
Surrey GU21 3BR
Tel: Woking (04862) 61082 (24 hrs)

● Circle No. 229

POLYGON I

S100 High Resolution Graphics

Features:
IEEE 696 512 × 512 graphics
Latest dedicated controller for high speed operation and ease of use.
512 diagonal can be drawn in 700 us.
Can display 85 × 57 characters using built in character generator.
Characters may be:
straight or tilted
written horizontally or vertically
characters may be scaled by a factor of 1 to 16 (independently for X and Y)
IO mapped controller does not take up user memory space.
Light pen facility. S.A.E. for details.

Bare Board, Prom & doc.	£35.95
Monochrome A&T	£210.00
Colour (4bits/pixel) A&T	£310.00

Please add £1.50 p&p and 15% VAT to total

DATA SYSTEMS CONSULTANTS, 43 SIMONBURN AVE., FENHAM, NEWCASTLE UPON TYNE. NE4 9UA. **0632-741723**

● Circle No. 230

BBC SOFTWARE

EDUCATIONAL — 1 (5-9 years) A/B £8.05
EDUCATIONAL — 2 (7-9 years) A/B £8.05
Hours of fun and learning for children. Animated graphics will make children enjoy maths, spelling, clock, memory games etc.
GAMES OF LOGIC AND CUNNING A/B £9.20
For children and adults alike.
SUPERLIFE B £9.20
Fast machine code version in a large universe.
UTILITIES A/B £8.05
An assortment of useful procedures:— date conversion, input and validation routines, graphic routines, sorts and many more.

***** SPECIAL OFFER *****
Any 3 cassettes for £20.70

Add 50p p/p per order.
Please state whether Model A or B and quote reference PC12.
Cheque/PO to GOLEM LTD, 77 Qualitas, Bracknell, Berks, RG12 4QG. Tel. 0344 50720.

● Circle No. 231

: GO FORTH & ✻ ;

Complete DIY Forth kit
Installation manual £10
How to do it + model + definitions + editor.
Source code listing for one processor £10
6502, 6800, 6809, 8080/Z80, 8086/8088, 9900, 1802, Apple][
Manual + one listing £19
Ready to run
Lab Micro systems Z80 FORTH for CP/M ..... £45+VAT
includes editors, assemblers, utilities, and games; good documentation; 8" or 5" formats.

FORTH on disc for most machines incl. PET, TRS80, FLEX, CP/M, IBM, and more ..... from £50

MicroProcessor Engineering Ltd.
21 Hanley Road Shirley
Southampton SO1 5AP
Tel: 0703 775482

● Circle No. 232

STILL *the lowest prices anywhere*

FLOPPY DISK DRIVES

5¼" TANDON + CDC
Shugart Compatible

SINGLE SIDED–DOUBLE DENSITY **£95**
DOUBLE SIDED–DOUBLE DENSITY **£165**

ENCOTEL

ENCOTEL SYSTEMS LTD, 7 IMPERIAL WAY CROYDON AIRPORT IND EST, CROYDON
Tel: 01 686 9687/01 680 6040 (6 lines)
Telex: 895192 ENCO G.

● Circle No. 233

Connaught Computing Ltd.

Video Genie + Molimerx
Superbrain + Graffcom + Micropro
Systime 5500 Business Systems

for price list send SAE to —

CONNAUGHT COMPUTING LTD,
FREEPOST,
FLEET, ALDERSHOT,
HANTS GU13 9BR
(no stamp needed)

Tel: Fleet (02514) 22618

● Circle No. 234

SHOPWINDOW

CAN YOUR MICRO READ THIS?

5 000201 460790

Bar-code identification for . . .

PET/CBM APPLE BBC

Bar-codes give a speedy and error free means of data entry and provide a foolproof method of identification for any item or document. Typical uses include stock control, libraries, filing systems, security & checkpoint verification, point of sale terminals, spare parts identification, etc., etc. Many organisations are adopting bar-coding as a way of introducing computer techniques into the work environment. Already most grocery products are bar-coded at source and many other areas of industry and commerce are following. Bar-codes will soon be commonplace.

Our system contains all the hardware & software needed to implement a bar-code system on your computer now. Software to print bar codes on an Epson printer is included. More information on request . . . please state your micro & area of interest.

Price £199.00 + VAT

Special systems can be designed . . . contact consultant Lee Allen.

LOWEST PRICES IN UK

EPSON MX80 FT3



Epson, Seikosha, Dragon, NEC, TEC, Microline, Qume, Diablo, BMC, Sanyo, Anadex, Centronics, Mannesmann, Tally etc. etc. . . All these famous name computer products and more at guaranteed lowest UK prices. Most can be delivered to your door within 24 hours. Send SAE for full lists or phone for a quote.

ALTEK (PC) 1 Green Lane Walton-on-Thames, Surrey
Please phone before calling (093 22) 44110

● Circle No. 235

PROTEK

22 Sussex Street, London SW1V 4RW Tel: 01-834 3602

5MByte MSC 9800D WINCHESTER DISC

Fully compatible with HP1000L, 9835/45, 9826/36, 9825T, 85/86/87 and 125.

- Emulates two HP9895 systems
- Small 17x25x30cm/6¾"x10"x12"
- Lightweight (less than 9kg/20lbs)
- Low Cost – Fast Delivery

HEWLETT-PACKARD SPECIALISTS

● Circle No. 237

TPS80 — VIDEO GENIE SOFTWARE LIBRARY

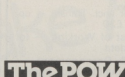
25 Super programmes, machine code Arcade games, simulations, competetive games, Adventurers, Dungeons & Dragons, Puzzles & Ball games; plus a few Education & Business programmes. Including Amazing 3D Mazes, Trap It, Gambling Machine, Star Wars, Breakout & Corridors of Doom, to name just a few. All 25 on one C48 cassette for only £8.95 inclusive or send a s.a.e. for full details.

J. T. WILSON. (DEPT. PC), 9 Cotswold Terrace, Chipping Norton, Oxon. Tel. 0608-3059

● Circle No. 238

The POWER BANK

system compatible Sine wave output



Plug your home computer, VDU and Printer into the POWER BANK and forget about a disabling break in the electricity supply. This unit will continue to run your system in the event of a mains failure . . . WITH NO INTERRUPTIONS TO YOUR WORK!

Well when running business. This unit will of course suppress MAINS SPIKES and SURGES! Batteries included (socket for Mec 120 V.A. and 250 V.A. output) on its available

Power Testing (Sales) Ltd

65a Shenfield Rd. Shenfield, Brentwood, Essex CM15 8HA
Tel Brentwood (0277) 233188 Telex 24224586

● Circle No. 239

I.C. DESIGNS

I.C.D. SOLVES YOUR INPUT/OUPUT PROBLEMS

Full range of standard I/O boards
Ideal for industrial control with commercial and educational applications.
Compatible with all micros.
Pet Apple TRS80 Sharp NASCOM, ATOM, etc.
48 bit Parallel I/O Dual Bi-directional Serial RS232 16 Channel 8 bit Analogue A.O
Prices from **£76.**
Dealers enquiries welcome.

64 EDWARD ST., MIDDLETON, MANCHESTER.

● Circle No. 241

DISKETTES AT UNBEATABLE PRICES

WABASH diskettes 5¼" SSSD £13.50 per box
8" SSSD £16.00 per box
VERBATIM 5 ¼" SSSD £17.50 per box
8" SSSD £23.00 per box
Prices exclude VAT at 15%.
Postage and packing free. Send for price list to:

Marlowfield Limited
Hesketh Bank House, 7-11 Yellow House Lane, Southport, PR8 1ER.
Telephone: (0704) 36082

● Circle No. 242

KENT MICROCOMPUTERS LTD.
57, Union Street, Maidstone. 0622 52784

Ricoh RP 1600 Printer	$ 750
Paper Tiger 445 Printer	$ 275
Kode-43 Printer (teletype)	$ 595
9" Hitachi B/W V.D.U.	$ 70
Megastor 8" Drive DS/SD & Interface for Apple II	$1,150
Apple III with extra D/Drive	
Silent Type, Pascall Visicalc III & Business Basic	$2,450
Apple II Graphics Tablet	$ 200
Adler P2/64 Alphatronic	$1,800
Adler DRH80 Printer	$ 500

All prices excluding V.A.T. 8 for collecting from our premises.

● Circle No. 243

Mr. RETAILER (c)

POINT OF SALE SYSTEM

ACCESS COMPUTERS
2 Rose Yard, Maidstone, Kent ME14 1HN
Telephone (0622) 58356

DISTRIBUTORS ENQUIRIES WELCOME

On Entry of Stock No. Receipt is printed, Stock updated, VAT updated and years bookeeping updated.
Complete system. Special introductory Price: Computer 64K + 700K + Printer + **MR. RETAILER(C) £2999 + vat or MR. RETAILER(C) £975 + vat**

● Circle No. 236

BUSINESSMEN

use your
ZX 81 OR ZX SPECTRUM
To advertise your product or service in shop window or on the printer . . .

Multigraphics 4x in lower case ZX81 (16K). **£6.90**
A superbly user friendly program giving you full control of the ZX81 graphics functions. You can print 2 sizes of text (lower case in 2 sizes) leaving it wherever you wish on screen. Add your logo using the 8 Directional on sketch pad. Make any area of screen flash. SAVE your display on tape etc. etc.
Price includes 20 page illustrated manual.
Spectro Graphics (16-48K) Spectrum . . . **£6.90**
Amazingly versatile 8 sizes of text, hi-res and hi-res sketch pads. Place boxes, circles, triangles any size any where on screen, fill and paint areas with colour, make them bright or flash. Create your own characters . . . SAVE display, characters . . . Just too many features to describe here. Manual included.
Send S.A.E. for further details. All inclusive prices. Goods despatched promptly.

Dept PC, Bridge Software 36 Fernwood, Marple Bridge, Stockport, Cheshire SK6 5BE

● Circle No. 240

calcsheet78

financial planning and modelling for the CBM 8032 and CBM 8096

NOT JUST ANOTHER SPREADSHEET PROGRAM BUT A COMPREHENSIVE SUITE OF PROGRAMS

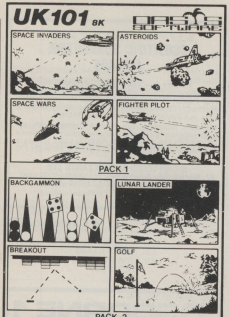
IT WILL sense automatically if you have a 32K or 96K machine
IT WILL create **dt** (TM) data transfer files which can be accessed directly via the **calcsheet78(TM)** or word processing programs (eg Wordstar).
IT INCLUDES a specimen VAT spreadsheet which will calculate tax paid and received and how much tax due to or from the Customs for each quarter.
IT INCLUDES examples of invoicing and book-keeping using the spreadsheet.
Concise, comprehensive manual supplied
All this for just £75 inc VAT (plus £1 p&p)
Manual only £5 plus 50p p&p (deductible if **calcsheet 78(TM)** is ordered subsequently)
Also available: **USING VISICALC**, a simple guide to the world's most famous spreadsheet program (£5 plus 50p p&p)
Available soon: **VICtory over 8^A^5^1^C**, a programming manual for the VIC20 user.
(£2.50 plus 50p p&p if ordered now, £4 plus p&p if ordered after publication)

ESSENTIAL SOFTWARE
4 Fanshaw Avenue, Barking, Essex

● Circle No. 244

SHOPWINDOW

UK101 8K



EACH PACK £9.50 ANY TWO PACKS £14.50
ANY THREE PACKS £18.00 ALL FOUR PACKS £19.50
CEGMON AND WEMON NOT SUITABLE - - - SORRY!

These four packs (16 games in all) offer the UK101 user an enormous variety of excellent games. As well as fast smooth 6502 machine code programs such as Asteroids, Invaders, Gobble Man and more, brain teasers like the 3D Maze, Rubik Cube Simulator and difficult to beat Backgammon; there are a wealth of classics including Real Time Star Trek, Lunar Lander, Golf and Jackpot.

Promptly delivered and sensibly priced, each tape has a 12 months guarantee. You can't miss this fantastic offer.

WRITE OR PHONE YOUR ORDERS TODAY!

ACCESS ORDERS TAKEN BY PHONE 24 HRS A DAY

Dealer enquiries welcome

24hrs

Lower North St., Cheddar, Somerset. Tel. Cheddar 515265

● Circle No. 245

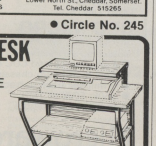
VDU DESK

TEAK LAMINATE FINISH

Assembly in seconds without tools

Other sizes

TRADE ENQUIRIES WELCOME



£37.97 + VAT WITH TWO SHELF

FOR 24×24 line

OFCO LTD

65 TREDEGAR SQ LONDON E3 5AE

Tel:01-981 7301

● Circle No. 246

INSURE YOUR COMPUTER

Impact damage, Fire & Theft Insurance for your Computer, Equipment:

£1 to £1,500 cover ..... £8.00 p.a.* £10 (excess) x/s

£1,500 to £2,500 ..... £16.00 p.a. £15 x/s.

For details:

KGJ Insurance Brokers, 6 Hagley Road, Stourbridge, West Midlands, DY8 1QC Tel (03843) 5333/2545

● Circle No. 247

LOW COST HIGH QUALITY SOFTWARE FOR 32K COMMODORE PET

PURCHASE & SALES CONTROL £80 + VAT
Including new datesort routine. Runs both purchase and sales ledgers to provide a chronological list of receipts and/or payments. VAT calculation from either the net or the gross amount (e.g. on petrol receipts) or VAT amount keyed in. Provides due for payment report at any time and purchase or sales analysis for any period with totals for net, VAT, gross and 99 analysis codes.

INVOICE PRINT £80 + VAT
An add-on for PURCHASE & SALES CONTROL to print invoices laid out according to your own instructions, which you key in on the first run.

STOCK CONTROL £60 + VAT
Stock lists with purchase and selling valuations, re-order list and list of goods needing re-ordering.

NOMINAL LEDGER £60 + VAT
Trial balance, profit & loss, balance sheet and 20 other reports from 1000 nominal accounts.

ADDRESSES £60 + VAT
Select addresses by categories from your mailing list and print labels in pairs. (Labels also available).

Don't be put off by the low prices! Write or phone for details.

Electronic Aids (Tewkesbury) Ltd., Mythe Crest, The Mythe, Tewkesbury, Glos. GL20 6EB. Tel. (0386) 831020 or (0) 284003

northern computers offer even more

Software
Disk Drive
Printers
Second Hand Computers
Tape
Recorders
Books

Apple II
Apple III
BBC micro computers
Acorn Atom
VIC 20
Newbrain
Prestel adaptors

ALL ACCESSORIES SALES AND SERVICE

Easy parking off the M56 (Junc. 12)

Liverpool
Frodsham
Chester.

northern computers

Tel: Frodsham (0928) 35110

micro computer systems for all applications

Churchfield Rd., Frodsham, Cheshire WA6 6RD

● Circle No. 249

2 into 1 . . .



. . . WILL GO!

With this passive signal combiner. This simple unit plugs into the back of your TV and provides 2 aerial sockets. All YOU have to do is to change channels from your TV programme to your computer/video game.

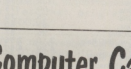
Send £5.50 to: (incl. p&p)

Knights Microsystems 191 French Street, Lower Sunbury, Sunbury-on-Thames, Middlesex.

● Circle No. 250

Computer Case

UK101 Nascom and Many others



Super board Tangerine etc.

Dealer Enquiries Welcome
5¼" drives or 8" Welcome

All Single Board Housing problems are over. Your existing and future expansions will find a neat home for tofe. The case will house two 5¼" drives if require for 8" drives. For fuller details and photo enclose S.A.E.

B.B.C. DISK DRIVES from £135

DRIVES FOR NASCOM, UK101, TANDY, VIDEO GENIE, etc. Standard Shuggart Interface allows Drive use on many other Micros.

5¼" 40 TRACK DD £290

BARE DRIVES AND DOUBLE SIDED DRIVES AVAILABLE

Mail Order Only

27 Wycombe Rd London N17

Viewing by arrangement

Silent COMPUTERS 01-801 3014

24 hour ansaphone

● Circle No. 251

ASHFORD COMPUTER CENTRE

Most makes of Micros and Accessories supplied. Courses in Computer Programming for the Complete Novice. Free Computer Club most Sundays 10 am — 3 pm. Micro Hospital £25.00 + parts repairs most Micros.

NO REPAIR — NO CHARGE

Write or ring for details

2 STATION PARADE, CLARENDON ROAD, ASHFORD, MIDDLESEX TW15 2RX

Telephone: ASHFORD (Middx) 44955

● Circle No. 252

SHOPWINDOW

RGB COLOUR MONITOR

ONLY £99.95 + CARR + VAT

We have on offer a limited quantity of 22" colour monitors with free isolating transformers.

The VMC 22 colour monitor features a 22" Mullard 110°C CRT and is designed to meet the high reliability and performance standards associated with the games and colour graphics industries.

For shipping purposes the CRT and scan coil assembly are separate from the chassis. The lugs of the CRT allow it to be mounted in a standard 22" colour TV cabinet or a unit of your own design. The unit is assembled by plugging the wires from the chassis to the tube, and soldering the input connector, power connector and isolating transformers.

A comprehensive instruction sheet, and manual with circuit board diagrams will be supplied with each unit.

RAM BARGAINS

	1 of	25-99	100+
4118 – 200ns.	.80	.75	.68
4116 – 250ns.	.75	.70	.55
2114 – 300ns.	.85	.80	.75
2114 – L – 200ns.	.95	.87	.83
4516 – 100ns. BBC Ram.	3.10	2.95	2.80
4164 – 200ns.	4.80	4.60	4.20
6116 – 150ns. C.MOS	4.20	3.95	3.50
2716 – 5V – 450ns.	2.40	2.15	2.00
2716 TRIPLERAIL	6.00		
2732 – 450ns.	3.95	3.75	3.25
2532 – 450ns.	3.95	3.75	3.25

Other IC'S available.* Add 50p p&p + VAT @10%.

ATHANA FLOPPIES

Minis with free plastic library case and hub rings.

S/S S/D	£17.95 for 10
S/S D/D	£19.95 for 10
D/S D/D	£23.50 for 10
S/S 77 TRACK	£26.50 for 10
S/S 96 TRACK	£28.50 for 10
8" DISCS.	
S/S S/D	£15.50 for 10
S/S D/D	£24.50 for 10
D/S D/D	£25.50 for 10

All other discs available. Add 85p p&p + VAT@10%.

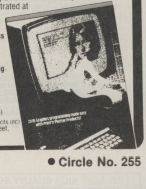
See us at the Northern Computer Fair, Belle Vue, Manchester – Stand 426. Govt – Educational – + Official Orders Welcome.

OPUS SUPPLIES
10 Beckenham Grove
Shortlands, Kent.
01-464 5040 01-464 1598 VISA

● Circle No. 253

"ZX GRAPHICS PROGRAMMING MADE EASY"

Full Colour A4 Manual. 24 pages packed with ZX Graphics Programming techniques and ideas for games and 'serious' Programs. Written in 'easy to understand' language and illustrated at every stage.



Ideas include:
Information Graphics
Sketch Pads.
Saving your 'Art'.
Making serious programs interesting.
Graphics Stringing.
ZX Printer Graphics

£1·50
(INCLUDING U.K. POSTAGE)

Print 'n' Plotter Products (PC)
19 Borough High Street,
London SE1 9SE.

● Circle No. 255

SCIENTIFIC SUBROUTINE LIBRARY

Volume 2 — LINEAR PROGRAMMING
Reduction of a Simplex Tableau; Integer Programming; Partial Integer Programming; Inverted Matrix Method; Conversational Linear Programming System; Least Cost Mix Problem.

Manuals including full source listings with implementation notes and documentation — Volume 2B (BASIC) £25, Volume 2P (PASCAL) £30. Software in CP/M (8" SSSD) or DEC RX01 (RT-11), Formats £75 + VAT.

MICRO LOGIC CONSULTANTS LTD.
57, Station Rd., Southwater, Horsham, W. Sussex.
Telephone 0403 731818

● Circle No. 258

ESSEX & SUFFOLK

SUDBURY
COLCHESTER
CLACTON-ON-SEA
CHELMSFORD
LONDON

YOUR LOCAL ONE STOP COMPUTER SHOP

CALL IN AND BROWSE AT YOUR LOCAL STORE AND SEE:

APPLE from	£689	Printers from	£129.95
ATARI from	£89	Disk Drives from	£199
BBC from	£260	Cassette Recorders from	£19.95
COMMODORE from	£139	Monitors from	£69.50
NEC from	£589	Joysticks from	49p
TANDY from	£78	Disks from	£1.99
TI 99/A from	£179	Software from	99p
VIC 20 from	£147.99	Avalon Hill War Games on cassette from	£9.52
VIDEO GENIE from	£173.60	Accessories & Books	

WE ARE AN AUTHORISED SERVICE CENTRE FOR ALL THE ABOVE MACHINES

EMPRISE PROVIDES FULL SUPPORT SO THAT YOU GET 100% ENJOYMENT FROM YOUR COMPUTER.

All our products can be hired on a try before you buy basis and membership of our computer club is free if you buy your computer from EMPRISE (Normal Price £20)

All prices are subject to VAT and refer to current stock

EMPRISE
CALL US NOW (0206) 865926
56 EAST STREET COLCHESTER ESSEX CO1 2TQ
TEL (0206) 865926

● Circle No. 256

OSBORNE 1

- praxis daisywheel £425
- NEC/Epson/OKI £call
- Monitors + cable £ 99
- OSBORNE £call
- Games for Osborne from £19

We specialise in Osborne & hold large stocks of above.
CALL FOR SUPERB PRICES

FRASER ASSOCIATES
Buckingham (0282) 6087

● Circle No. 259

supercharge your SUPERBRAIN

- **Speed up disk operations by 400%**
- **Cut copying time by up to 75%**
- **Communicate with other Micros**
- **Customise your favourite Word-processor**
- **Get BDOS errors under your control**
- **Program with Block Graphics**
- **Copy screens to memory or printer**
- **Chain COM files from BASIC**
- **Write unbreakable security routines**

SeeDee Software tune-up kits start at £30.00



Full details from:
COMPUTER FACILITY
0734 867855
32 Redlands Road, READING, Berks.

● Circle No. 254

SEARCHING FOR BEST PRICE

FOUND BEST PRICE . . . GO TO ORCHARD

PET		**RRP**
C2N	CASSETTE	£55
4016	16K	£550
4032	32K	£695
8032	32K	£885
8096	96K	£1195
DISK DRIVES		
2031	170K	£395
4040	343K	£695
8050	1M	£885
8250	2M	£1299
9060	5M	£1995
9090	7.5M	£2499
PRINTERS		
4022P	80COL BIDIR	£395
8023	136COL	£885
8300	DAISY	£1395

Our own transport delivers nationwide weekly. All you need is our *Best Price* Quotation. Contact us now! For super service.

Our price is unprintable. Contact NOW for best price quotation.

If you know what you want why wait?

ORCHARD COMPUTER SERVICES
ORCHARD HOUSE, 21 ST. MARTINS ST., WALLINGFORD, OXON.
TEL. WALLINGFORD (0491) 35529

● Circle No. 257

MICROWARE
(London Ltd)

COMPLETE DISC DRIVE
SUB SYSTEMS

For Tandy; Video Genie; Nascom

AND ALL POPULAR MICROS

SINGLE UNITS **£175**
DUAL UNITS **£295**

BBC MICRO
SINGLE UNIT FROM £135

Includes PSU and attractive desk top cabinet
- Fully guaranteed CDC disc drives
- Cast aluminium chassis
- 5 mili sec track to track
- 250k; 500k or 1MB
- Industry compatible

Microware
(London Ltd)
637 Holloway Road, London N19
Tel: 01-272 6237
01-272 6398

● Circle No. 260

STOCKTAKING SALE

We'd rather sell them than count them!

DMB 6400 64K Memory Boards £280 each
XEBEC Winchester controllers £200 each
Morrow DMA Winchester Controllers 250 each
S100 Winchester sub-systems 6Mb & 12Mb from £995
Tandon TM100-2 Floppy disc drives £160 each

Also available — some good condition second-hand Horizons

New Products Available

Teac half-height 5¼" Floppy disc drives:
Double-sided 48 TPI £170
Double-sided 96 TPI £215
5Mb, 10Mb, 15Mb and 20Mb Winchester upgrades

Amazingly Low Prices

Sig Net microcomputer (2 quad floppies) £850

HOTEL MICROSYSTEMS LTD.
69 LOUDOUN RD.
LONDON NW8 0DQ
Tel: 328 8737

● Circle No. 261

EPSON TYPE 3 PRINTERS

Save £60-£80 (+VAT) on your superb new Epson Type 3 printer.

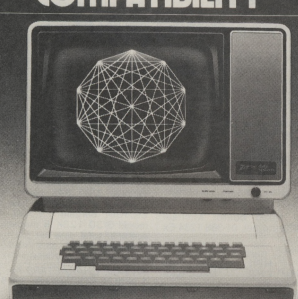
Full range of interfaces, cables and sundries available.

For FREE BROCHURE and special DISCOUNT OFFER write, stating your computer, to:

Datatech Ltd (PC), 3 Bramhall Close, Timperley, Altrincham, Cheshire, WA15 7EB.

● Circle No. 262

QUALITY, VALUE, PERFORMANCE & COMPATIBILITY



THE ZVM-121 VIDEO MONITOR

- Highly attractive prices available direct to OEM's/Dealers.
- Unmatched value through high quality and high volume manufacturing.
- Compatibility with the majority of popular microcomputers.
- High resolution video display with improved character definition.
- Versatile exterior controls facilitate display adjustments.

The ZVM-121 is a high quality, high resolution 12" monochromatic video monitor. Backed by massive resources and decades of experience in video electronics, Zenith Data Systems provides you with reliable products from a reputable source.

ZENITH data systems

BRISTOL ROAD, GLOUCESTER GL2 6EE
Telephone: (0452) 29451

● Circle No. 263

BBC 32K SOFTWARE File £7 a full function database. Facilities include search, sort, list, delete etc. Regression £5 two programs covering linear regression and non-linear regression with graphic display. Budget £5 budget programs to allow you to control your expenditure. All programs allow tape data storage, include sample data and are fully documented. Mr. A. Green, 14 Radway Close, Redditch, Worcs. B98 8RZ.

BBC LIFE. Machine code. 4 gens/sec. Built in examples: glider gun etc. Cassette £3.50. N. Martin, Mountjoy House, Stockton Rd., Durham DH1 3SD.

OHIO SCIENTIFIC Superboard II, metal cased, internal mains psu and Easicomp sound generator. Updated to CEGMON monitor, 32×48 char display, 2MKz clock, 8K RAM. Tape and RS232 I/O and sound output sockets. Switchable I/O and baud rates, 110/300/1200. Modulated uhf output. Assembler/Editor, Word Processor and Computer Terminal programs. £150. 0248-680034.

5 MBYTE removeable cartridge discs for Phillips 410 machine. 10 unused. £40 each. Phone 01-723 6305.

VIDEO GENIE 16K (1 year) + Aculab Floppy Tape (6 months). Ex. cond. £99 Aculab, £199 Genie incl. manuals. Evenings 01-445 3045.

EDUCATIONAL software e.g. TRS-80 Traffic 3-95 subsistance farming 3-95 BBC (A/B) Database 12-95. SAE for list J. Redgate, 114 Mosley Common Road, Tyldesley, Manchester.

PET 3032 (Bas ROMs) cassette, toolkit, Papermate, manuals £395; Rosemount, Romney Hill, Maidstone (37643).

VLASSAK "MEGASTOR" 8" Dual Disk Unit for Apple II. Interface Card and Master Disk included. Excellent condition £750. 0742-685450 Evenings.

NASCOM 2, 48K RamB, Epromboard, Vero case, Sys 3 and all firmware, manuals plus tapes. Imp printer with Imprint. Gemini programmer plus eraser. £500. Chester 382292.

PET 2001. 8K, Small Keyobard, Integral, Cassette, Programs Books and Manuals included. Accept £300 ono. Tel: 01-856 7419.

SUPERBOARD, 24K, Cegmon, Basic's 4, 5, X, screen kit (20 screen formats), Eprom board, P.S.U., ABS case, software, £275.00 ono. Phone St. Albans 34566.

S100-Godbout/IMS 8K Ram Boards £35; Cromemco 16K Eprom (2708) Board £35; Morrows S/density 8" Disk Controller Board CP/M £88; Micro Diversions 40×86 Video Board software £85; Tandon 5" 96tpi drive £190. Also Apple Serial I/O Board £60. Phone Crawley 515201.

BBC MODEL B software on cassette. Games Pack: Lander, Maze, Sea Battle — £3 all Hi-res, Hi-speed. Utilities Pack: 3 Drotate, Design, Graphplot £4. Cheques to C. Carr, 27 School Road, Hampton, Evesham, Worcs.

UK101 CASSETTES. Hi speed graphics. 13 new Basic commands. Selective fill, scroll in 4 directions etc. No Pokes. 6502 Emulator. Registers, memory, stack continuously displayed while assembler program runs in slow motion. £4.90 each. £8.90 both. State monitor. B. Beckett, 33 Lynwood Drive, Stalmine, Blackpool.

SHOPWINDOW

APPLE II + (48K), 16K Ramcard, DOS3.3 Disk Drive, NEC green screen Monitor, Epson MX80FT type II Printer (with Hi-Res Graphics), P. Interface (Grappler) and Software. Ideal for small Business. £1500 ono. After 6pm 01-390 5432.

SHARP-MAN, popular, fast machine-code game. Specify MZ80K or MZ80A, fantastic sound and graphics. Only £5. S. Swales, Kosikot, Nth. Killingholme, S. Humberside. Tel. Killingholme 40324.

CENTRONICS 702 printer. 120 cps with parallel interface and stand. Hardly used £495. Stevenage (0438) 57350.

EXIDY SORCERER 48K, single drive 370K, MBasic, SPELLBINDER wordprocessor + SPELLCHECK. As new, with manuals and original boxes. New value £2,000. To best offer received by end January at 6 Monmouth Road, London W2.

avideo genie, 16K, sound, books and software, £250 o.n.o. MX70 printer and cable, £275 o.n.o. 047 335300.

C.B.M. 3032. Toolkit, Pic Chip, ROM X, Superchip, Supermon, Extramon, Rabbit, Software, Games etc. cassette. £495. (0453) Dursley 2192.

APPLE II 48K Eur0plus. As new with lots of progs. — £550. Mr. Campbell, Mellor 2661 Ext 256.

PET/CBM ARCADE GAMES in machine code. Moreman, Frog Map, Space Scramble, Missile Control, Galaxyman, Dodgems, Defend, Kong. Very fast graphics, sound state Basic 2 (new Rom)/Basic 4 (9in/12in screen). £4 each, any 4 £12, all 8 £20. On cassette. I. Gray, 175 Pershore Rd., Evesham, Worcs.

HEWLETT PACKARD programmable calculator HP41C with financial pak and two memory modules £150. Also HP19C programmable calculator with integral printer £50. Saffron Walden (0799) 24244.

SHARP MZ80K Adventure and fun games, educational and business software at realistic prices. SAE, C. Trevena, 20 Rhosleigh Avenue, Sharples, Bolton.

HARDLY USED complete Apple/Tabs business system available, excellent value for £2300. Ring Marlow (06284) 73776 or 73074.

SHARP MZ80B two graphic ram cards, expansion unit, basic 80, disk basic, DP basic, K-B convertor, tool kit. Pascal cost £2063 incl. VAT. £1450 ono. High Wycombe (0494) 23786.

ATARI OWNERS — Clone allows you to make back-up copies of most m/c tapes. Supplied on cassette, £10.50 inc p&p. Williams, 16 Central Avenue, Canvey Island, Essex SS8 9QR.

6303 CMOS PROCESSOR — Fast Macro Assembler to run on 32K PET. Disc £15 also includes assemblers for 6502 and 6802/03 processors. SAE for details. M. J. Tyler, 2 Parkview Drive, Cashes Green, Stroud, Glos. GL5 4NQ. 04536-77257.

SHARP MZ-80K Microcomputer £350. 48K, Integral VDU + Cassette, + Free Programs. Manchester (061) 223 4764 (evenings).

PLAY noughts and crosses against the computer or with a friend. For 32K Pet. Send cheque/PO for £2.50 to Z. A. Knox-Hooke, 88c Hillfield Avenue, London N.8.

TRS-80 Daisywheel II users. New multistrike ribbons Half Price! £6.95 for 3 including VAT, 60p p&p any quantity. Cheque/PO to Streeten, 49 Madeira Park, Tunbridge Wells.

PET-32K, Basic 4, cassette £450. 8050 disc £700. Also cables, roms, programs. H. Melton 0908 670630.

COMMODORE 4032 with 4040 diskdrives for sale (includes toolkit chip, manuals, dustcovers). Very good condition. £800. Tel. 021 770 1345.

PRINTER Centronics 730 dot matrix impact printer with parallel interface. Used on Apple II at present. £220 ono. 01-367 5479.

MULTI USER North Star Horizon system with Soroc and ADM terminals. Brand new disk drives plus software £750 ono. Tel. 01-445 0745.

BBC Model B, super games pack. Comprising alien, cricket, punter, grandprix and plankman. All on one cassette for £6. Apply E. Horton, 83 Linton Close, Reddich, Worc. B98 0NB.

WANTED! Sinclair Spectrum Software. G. Mueller Westring 32 D-6086 Riedstadt 5 West Germany.

TRS-80 16K LVII Basic Adventure — "Stone Castle". £4.50 from C. Brown, 36 Lincoln Road, Enfield, Middx, EN1 1JS.

NASCOM Hobbit cassette system, basic upgrade, blank tapes £100.00. Sound Generator Board £15.00, Screen Control Unit £3.00. 01-550 8965.

PET 8K small keyboard, basic 2 roms, manuals. Many programs as new. Could possibly deliver. £200. Tel. Denbigh 3401.

NASCOM Games (program power) chess, backgammon, draughts plus graphics rom and adaptor £20.00. 01-550 8965.

RUBIK Reverse Solution. Microsoft Basic Listing £1.00. Nascom 2 cassette £2. Jolene, 2 Mill Cotts, Huttoft, Alford, Lincs. LN13 9RG.

APPLE II disc of 12 programs, £12, includes monster maze (rescue maidens before monster), Ski Run, Graph Trigonometric. Functions (all HGR), Music (create sub-routines) and Educational Wizardry — send disc and £6 for copy of 13th level characters. Visidex, £75, Hamsoft, 1532 Stratford Road, Hall Green, Birmingham, B28 9HA.

FOR SALE: Hardly used ALF II 9-voice music syntheiser, £60. Saving of £30 off RRP. All cables, software, and full documentation. Great sound, fantastic gift. Tel: Northwood 21638 (after 6pm).

WANTED S-100 video board, Michael Brown, 01-885 1832 (home), 01-368 1234 Ex 2884 (office).

FOR SALE: HP41C plus three memory modules + HPIL module plus HP82162A printer £250 — Newcastle Ponteland (0661) 23135.

CBM COMMODORE: 3040 dual floppy disk drives. 15 months old. They are under maintenance and have recently been serviced and include a pet DOS 1, as well as games and word processor programs. Available immediately. £400. Roxburgh International Ltd. 166 High Street, Hounslow, Middx. Tel: 01-570 5783.

VISICALC unused suit Apple II only £70.00. Disc Sargon chess program £5. Tel: Willenhall 66252.

NASCOM 2, 36K RAM, professionally built and boxed, Nasys 3, Naspen, Zeap assembler, Graphics ROM, Revas dissassembler, games software. £375. Tel: Kidlington 77893 (Home).

SPECTRUM SOFTWARE, five original games including Boxball, Demon Car, etc all for £3.95. D. Roberts, 27 Reabrook Ave., Shrewsbury, Salop.

BBC SOFTWARE FOR PHYSICS TEACHERS: OPTICS TAPE, full graphics showing ray tracing through triangular and rectangular prisms. All angles calculated and displayed, including internal reflection lenses; object and image, position, size, type, focual length etc., calculated and displayed.
MECHANICS TAPE, allows pupils to rapidly check their ticker tape calculations — graphs, both display and data drives projectiles — strobe photograph calculations etc.
GENERAL TAPE, TV pattern generator, cross hatch, dot and separate colour rasters. Income tax; calculations for 81/82 82/83. Program is easily updated for subsequent years. £5 per tape (includes p&p). SCI-BRYTE, 16 Dunvegan, Glenmavis, Airdrie.

ZX81/16K Demon-Driver. Fastest ZX game on the market. For info send int. post coupon to: Dane Kurth, 3292 Busswil, Switzerland.

SHARP software. MZ-80K, MZ-80A. Business, utilities, Games. SAE. 38 South Parade, Bramhall, Stockport.

VISICALC for PET/CBM 2001 & 8032 complete with disks, chip & manual. Unused bargain at £60. Tel: 0908 604396.

WANTED! Sinclair Spectrum software. G. Mueller, Westring 32 D-6086 Riedstadt 5 West-Germany.

CENTRONICS 779 printer, 60 cps dot matrix, parallel interface, manuals and 5 spare ribbons, any offers? Tel: 0628 24454.

FOOTBALL POOLS PREDICTOR FOR BBC micro, A or B. Uses unique mathematical and statistical forecasting methods. On cassette with full instructions, £4.99. MAYDAY SOFTWARE, 181 Portland Crescent, Stanmore HA7 1LR.

MZ-80K ARCADE GAMES including Scramble, Asteroids, Puckman, under £5. SAE Wallis Software, 48 Westbourne Road, Penarth CF6 2HF (0222-703749).

RAIR BLACK BOX CP/M used microcomputer. Rair maintenance transferable anywhere UK, Wordstar, Mailmerge, Datastar, Supersort, Spellstar, Calcstar, Diagnostics, BSTS, BSTAM, CBASIC, MBASIC, PASCAL MT+SPP, COBAL, PL/1, MACRO80, dBASE 2, Integrated Accounts Package includes: Stock Control, Invoicing, Sales LEdger, Purchase Ledger, Nominal & Management Accounts, Payroll. Choice of models: 3/20 64K twin floppy disk with hazeltine screen, total new list price over £8,500. Bargain £3,750. Plus VAT, or model 3/30 128K 5 megabyte 2 hazeltine screens, total new list price over £11,500 bargain £5,750 plus VAT. Tel: London, 01-989 0430 anytime.

INVERSE CHARACTERS for TRS-80 model 1 with HI-RES upgrade, £4.50. M. Gant, 8 Cults Gardens, Dundee.

VIC-20 WITH CASSETTE £150. Video Genie 3003 £195. ZX-81 £95 + Protos Keyboard £35 + Sound Box £15 + Printer £40 + 16K RAM £20. Gemini Multiboard with Disc Controller £295. Bracknell 84423.

WANTED PHOTOCOPIES Article Coordinate Drawing for KIM, May 1979, Issue of Practical Computing. Pay £10. Write for offer. Turchi Giovanni — Via MENOTTI, 7 — 41012 Carpi — Italy.

LINE PRINTER Tally 3000. 300 lines/min. Full ASCII-96 ch/set. Centronics interface. Good working order but damage to case hence bargain £485. 0202-885678.

HOW TO GET MORE FROM YOUR MICRO

Take a course at the Computer Training and Education Centre

BASIC	5 days
ADVANCED BASIC	3 days
CP/M* — *User level*	2 days
CP/M* — *Advanced Level*	2 days
DATASTAR*	1 day
PASCAL	3 days
WORDSTAR+ WORDPROCESSING	2 days
Z80 ASSEMBLER	3 days

All courses are in London. A wide range of hardware is available for practical work.
Contact The Courses Secretary, Computer Training & Education Centre Ltd, 102 — 108 Clerkenwell Road, London EC1.
01-251 4010/4019

CTEC
A professional organisation with first class training facilities in Central London

*CP/M is the T/M of Digital Research Corp.
+ Wordstar is the T/M of Micropro Corp.
*Datastar is the T/M of micropro corp.

● Circle No. 270

SOFTWARE
Try before you Buy

If you need software on a trial or short-term basis — you need ATLANTA RENTALS.

Famous names in our huge library of software include all Visicorp products Micromodeller, Desktop/Plan, Microfinesse, Microplanning, TABS, Padmede, Wordstar, Cardbox, Format-80, dBase II etc. etc.

We also provide the hardware — Apple II and Apple III, Sirius 1 and now the IBM, plus top quality printers, monitors, hard and floppy disk drives, sheet feeders, line plotters and all peripherals to complete the rental picture.

No capital expenditure, no membership nonsense, and no waiting. Fixed charges, full support and friendly people.

Rental hotline 01-729 1411

Atlanta Data Systems
350/356 Old Street, London, EC1V 9DT. 01-739 5889

● Circle No. 271

Advertisement Index

A&G Computerware	88
A-line Computer Systems	32
Acorn Computers	73
Acornsoft	84
Aimgram	150
Altos Computers	28
Apple Orchard	57
Applied Micros	54
Asco Business Systems	84
ATA (Albeta)	186
Atlanta Data	193
Autoword Services	172
B	
B.I.T.	142
Basys	32
BBC Publications	25
Beebug	58
BFI	92
BITS & P.C.s	85
Bristol Software Factory	148
Bromley Computer Consultancy	118
Butel Comco	12
Byteshop	42,43
C	
C/WP	155, 157, 159
Cambrian Software	94
Cambridge Computers	96
Chiltern Electronics	168
Chromasonic	60
City Microsystems	63
Clapp & Poliak	36
Comart	9
Commodore Computers	18, 19
Compsoft	97
Computech	98
Computer Aided Printing	80
Computers For All	72
Crystal Electronics	41
Ctec	193
Cumana	140
D	
Datalink	126
Datarite	92
Davinci	57
Digitek	IBC
Digithurst	175
Discom	184
DRG Business Machines	55
Dynatec Microsoftware	62
E	
Electronic Brokers	15
Encotel	24
Epson	76
Equinox	6
Euro Micro	BC
Exact Business Systems	23
Export Software	174
G	
Gemini Marketing	91
GMT Computers	184
GP Industrial	139
Graftcom	45
Gramma Winter	40,41
Granite Chips	132
Gt. Northern Computers	63
H	
Hal Computers	125
Honeyfold Soft	37
Hotel Microsystems	74, 75
I	
Icarus Superbrain	35
Intelligence U.K.	144
Interam	194
J	
John Birkwood	182
John Wiley	14, 70, 50, 183
Johnson Microcomputers	160
K	
Keele Codes	177
KGB Micros	30
Knights TV	175
L	
Lifeboat Associates	53
London Computer Centre	44
Lucas Logic	64, 65
M	
Maplin Electronics	46, 47
Microage	116
Microbus Designs	184
Microcentre	IFC
Microcomputer Applications	95
Microcomputer Products	122
Microfacilitys	178
Micropute	81, 90
Microsource	176
Microspares	88
Microwave (Ldn) Ltd	38, 39
Midland Computer Fair	59
Midlectron	56
Molimerx	130
N	
Nodeview Ltd	32
O	
O.E. Ltd	58
Orange Micro	170
Oric Products International	26, 27
Oxford Computer Systems	49
P	
Padmede	20
Pete & Pam	48
PMS Developments	132
Prentice Hall	166
R	
Real Time Developments	176
Research Machines	151
S	
Sinclair Research	10, 11
Sirton Computers	4
Slogger Software	84
Soft Option	162
Solidus International	150
Stemmos Ltd	94
Swan Packaging	41
Symbiotics	175
T	
Tandy Corporation	34
Technomatic	53
Telesystems	111
The Microcomputer Club	16
Thorn EMI	82, 83
Time Technology	143
Toshiba	61
Transam	133
Tycom	13
V	
Ventguard Ltd	58
W	
Watford Electronics	31
Wego Computers	51
Willis Computer Supplies	51
Z	
Zenith Data Systems	89
Zenith Data Systems	191
Zytek	181

HOW MUCH?

Includes £1000 worth of software.



THE MICRO DECISION

£1095*

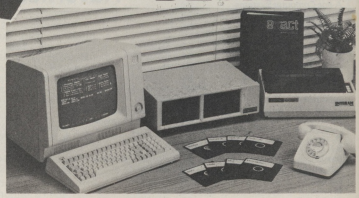
Yes! Only £1095 (or only £895 with one disk drive) will buy you the Morrow Designs Micro Decision. As advanced and sophisticated as those costing several times the price, the Micro Decision comes packaged with a comprehensive variety of software.

Micro Decision features:–

* 64K bytes of RAM
* Z80A processor at 4Mhz
* Two RS232C serial ports
* Floppy disc controller for up to 4 drives
* 200K bytes formatted per drive
* Format compatible with Osbourne, Xerox, IBM PC
* Compact; 16.7" wide, 5.3" high, 11.3" deep

Software supplied as standard:–

* WORDSTAR: *Word Processing System*
* CORRECT-IT: *Checks and corrects spelling*
* LOGICALC: *Financial modelling and forecasting*
* CP/M 2.2: *Disk Operating System*
* BASIC-80: *MicroSoft BASIC language*
* BAZIC: *North Star compatible BASIC*
* PILOT: *Programming learning language*
* MICRO MENUS: *Operators CP/M roadmap*



Add a suitable VDU and printer, and you have all the hardware and software you need. Example shown – complete business system with VDU, Printer and the Exact Accounting System, guaranteed for one year – £2295.

* Prices exclusive of VAT and carriage. Prices subject to change. Dealer enquiries welcome.

Return this coupon for further details of The Micro Decision.

Name Position

Address

Tel. No.

PC

INTERAM

Microcomputer Specialists

46 Balham High Road London SW12 9AQ Tel: 01-675 5325/6/7

● **Circle No. 272**

One Expander Card for apple leads to another....



In fact it leads to many others! Joining the amazing success of our PAL Encoder Card, these four new expander cards all featuring the unique 'Digitek Safety Tab' are ready to plug straight into your Apple Computer.

Pal Colour Encoder Card £105 This amazing card with it's on-board modulator, displays exceptional colour graphics to your TV.

16k Ramcard £91 Insert the card straight into slot Ø, and increase the memory capability of your Apple without having to remove any memory chips.

Z80 Expansion Card £110 Installing the Z80 into your Apple gives you two systems in one, which enables you to run the popular C.P/M operating system.

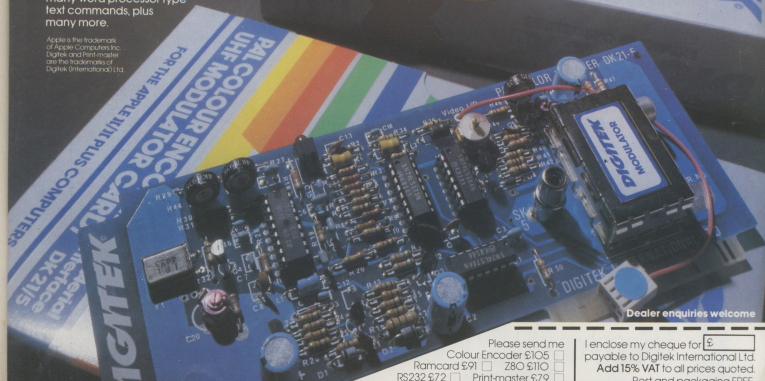
RS232 High Speed Serial Interface £72 The RS232 Interface Card incorporates 13 selectable Baud rates from 75 to 19,200.

Print-master Interface £79 The ultimate parallel interface for Apple to all popular dot matrix printers.

The PRINT-MASTER accepts Apple protocols, 15+ software commands and has on-board graphics dump capability to all popular graphics printers. No need to load clumsy software routines – it's all at your fingertips on the PRINT-MASTER – choice of inverse printing, double size picture, 90° picture rotation, many word processor type text commands, plus many more.

Apple is the trademark of Apple Computers Inc. Digitek and Print-master are the trademarks of Digitek (International) Ltd.





Dealer enquiries welcome

The people who are really into Apples.

DIGITEK

EXPANDER CARD SERIES

Please send me
Colour Encoder £105 ☐
Ramcard £91 ☐ Z80 £110 ☐
RS232 £72 ☐ Print-master £79 ☐
Further Information ☐

Name.....

Address.....

..... Post Code .....

I enclose my cheque for £ .....
payable to Digitek International Ltd.
Add 15% VAT to all prices quoted.
Post and packaging FREE
Telephone orders **0403 66550**

My card.....

Number is .....

DIGITEK (INTERNATIONAL) LTD. 37C WEST STREET, HORSHAM, WEST SUSSEX RH12 1PP

● Circle No. 273

The 16-bit Micro

EuroMicro™ SYSTEM Z100

with 8-bit compatibility and colour graphics

EuroMicro's new desktop computer system runs CPM-86 and CPM-80/CPM-85 programs. Manufactured for EuroMicro by Heath-Zenith, the Z100 offers:

From **£1,895**



All-In-One

Microprocessors
8088 for 16-bit power
8085 for 8-bit compatibility
Memory
128 Kb expandable to 768 Kb
Storage
320 Kb to 10 Mb (floppy and Winchester disk)
Operating Systems
CPM-85, CPM-86, MSDOS
Multi-user
Up to 8/10 terminals
Graphics
High resolution 640 x 500 pixel
Colour
High definition 8 colour pixel

Communications
2 RS 232 ports, expandable to 10, and 1 parallel port. (IEEE 488 available soon)
Signetics 3861 chip ensures hardware compatible communications with most mainframes
Expansion
IEEE S100 BUS/5 Slots
Power supply
300W switched mode; ensures high stability and regulation
Application Software
Word processing, financial modelling, business management, integrated accounting — all from leading software houses, including PEACHTREE

Exceptional desktop computer power with a flexible and expandable system to meet the business needs of today and tomorrow!



Low Profile

EuroMicro's ANSWER TO high performance AND flexibility

EuroMicro™ SYSTEM M8/16

- 8088 8MHz for CPM-86/MPM-86
- 8085 5MHz for CPM-80/CPM-85
- 10 MHz Static Memory
- IEEE S100/20 slots
- MPM-86
- CPM-86
- CPM-80
- Disk options 5" or 8" floppy or winchester
- Options include:
  IEEE488 interface
  ADDA
  EPROM blowing/emulation
  Colour graphics

WE'VE been quietly busy developing a range of computers that will allow rapid development of software for CPM-86. The EuroMicro M8/16 will support up to 7 CPM-86 users in an MPM-86 environment.
AND
For those who have an investment in CPM-80 software, we've thoughtfully provided a second processor to run CPM-80 programs as well.
IN FACT you can run any combination of up to 7 CPM-80 and CPM-86 tasks simultaneously, each user having their own environment.

A true Multi-user Multi-tasking Microcomputer housed in an attractive 20 slot Mainframe with many possible IEEE S100 options.

Ideal for the development of CPM-86 programs for the large number of table top computers based on the 8088/8086 processors.

From **£2,995**



For details call **01-341 2447**

EuroMicro™

EuroMicro Limited
EuroMicro House, Coleridge Lane, London N8 8ED. England
Telephone: 01-341 2447

Prices shown are exclusive of VAT

EuroMicro is the Trademark of EuroMicro Inc.

BACK NUMBERS ORDER FORM

Please send me the back numbers of Practical Computing detailed overleaf for which I enclose Cheque/PO for £....

Prices per copy (including post and packing) U.K. £1.50. Europe (excluding U.K.) £2. Elsewhere overseas (airmail) £2.50.

PAYMENT WITH ORDER ONLY

Name .....

Address .....

.....

.....

PRACTICAL COMPUTING
SUBSCRIPTION MANAGER
IPC BUSINESS PRESS
OAKFIELD HOUSE
PERRYMOUNT ROAD
HAYWARDS HEATH
SUSSEX RH16 3DH

AFFIX STAMP HERE

This card is valid for six months only

FREE READER ENQUIRY SERVICE

Please send me more information on the items circled below:

101	102	103	104	105	106	107	108	109	110	111	112	113	114	115
116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
131	132	133	134	135	136	137	138	139	140	141	142	143	144	145
146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170	171	172	173	174	175
176	177	178	179	180	181	182	183	184	185	186	187	188	189	190
191	192	193	194	195	196	197	198	199	200	201	202	203	204	205
206	207	208	209	210	211	212	213	214	215	216	217	218	219	220
221	222	223	224	225	226	227	228	229	230	231	232	233	234	235
236	237	238	239	240	241	242	243	244	245	246	247	248	249	250
251	252	253	254	255	256	257	258	259	260	261	262	263	264	265
266	267	268	269	270	271	272	273	274	275	276	277	278	279	280
281	282	283	284	285	286	287	288	289	290	291	292	293	294	295
296	297	298	299	300	301	302	303	304	305	306	307	308	309	310
311	312	313	314	315	316	317	318	319	320	321	322	323	324	325
326	327	328	329	330	331	332	333	334	335	336	337	338	339	340
341	342	343	344	345	346	347	348	349	350	351	352	353	354	355
356	357	358	359	360	361	362	363	364	365	366	367	368	369	370
371	372	373	374	375	376	377	378	379	380	381	382	383	384	385
386	387	388	389	390	391	392	393	394	395	396	397	398	399	400
401	402	403	404	405	406	407	408	409	410	411	412	413	414	415
416	417	418	419	420	421	422	423	424	425	426	427	428	429	430

NAME .....

ADDRESS .....

.....

.....

.....Tel: .....

PRACTICAL COMPUTING JANUARY 1983 PCO 8361

SUBSCRIPTION ORDER FORM

☐ Please send me Practical Computing each month for 12 months

Cheques should be made payable to IPC Business Press Ltd. Cash with order please.

Name .....

Address .....

.....

.....

.....

Signed .....Date .....

☐ Subscription rate U.K. £12
☐ Overseas £18
Airmail rates can be supplied on application to the Subscription Department.

PRACTICAL COMPUTING JANUARY 1983 PCO 8361

BACK NUMBERS ORDER FORM

MONTH	YEAR	QUANTITY

PRACTICAL COMPUTING
READER SERVICE DEPARTMENT
OAKFIELD HOUSE
PERRYMOUNT ROAD
HAYWARDS HEATH
SUSSEX RH16 3DH

AFFIX STAMP HERE

SUBSCRIPTION ORDER FORM

☐ Please send me Practical Computing each month for 12 months

Cheques should be made payable to IPC Business Press Ltd. Cash with order please.

Name .....

Address .....

.....

.....

.....

Signed .....Date .....

☐ Subscription rate U.K. £12
☐ Overseas £18

Airmail rates can be supplied on application to the Subscription Department.

PRACTICAL COMPUTING
SUBSCRIPTION MANAGER
IPC BUSINESS PRESS
OAKFIELD HOUSE
PERRYMOUNT ROAD
HAYWARDS HEATH
SUSSEX RH16 3DH

AFFIX STAMP HERE

PRACTICAL COMPUTING JANUARY 1983 PCO 8361

The 16-bit Micro

EuroMicro™ SYSTEM Z100

th 8-bit compatibility
And colour graphics

oMicro's new desktop computer system
CPM-86 and CPM-80/CPM-85 programs.
ufactured for EuroMicro by Heath-Zenith,
the Z100 offers:

From £1,895

ocessors
16-bit power
8-bit compatibility
expandable to 768 Kb

to 10 Mb (floppy and
ster disk)
ng Systems
, CP/M 86, MSDOS
ler
10 terminals
s
solution 640 x 500 pixel
finition 8 colour pixel

Communications
2 RS 232 ports, expandable to 10, and 1 parallel port. (IEEE 488 available soon)
Signetics 3661 chip ensures hardware compatible communications with most mainframes
Expansion
IEEE S100 BUS/5 Slots
Power supply
300W switched mode; ensures high stability and regulation
Application Software
Word processing, financial modelling, business management, integrated accounting — all from leading software houses, including PEACHTREE

gh performance
lity

Multi-user Multi-tasking Microcomputer
in an attractive 20 slot
me with many possible IEEE
ptions.

r the development of
programs for the
umber of table top
ers based on
8/8086
sors.

£2,995



e, London N8 8ED. England

Prices shown are exclusive of VAT

EuroMicro Inc.

Practical Computing Volume 6 Issue 1 January 1983

Practical Computing

January 1983

Special issue
PORTABLE MICROS
Husky, Epson, HP-75C, Osborne and more

D-I-Y interface for the Spectrum
BBC machine-code disassembler

REVIEWS
16/32-bit Fortune
Apple Scrabble
Forth Ace

